# CONSERVATION INNOVATION GRANT
## Final Performance Report

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| Grantee Name: Sustainable Conservation | |
| Project Title: Mokelumne Watershed Environmental Benefits Program | |
| Agreement Number: 69-3A75-11-194 | |
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| Period Covered by Report: September 15, 2011 to September 15, 2014 | |
| Date of Submission: December 15, 2014 | |

Project Action Plan and Timeline Table

| Action | Timing | Milestones/Deliverables |
|---|---|---|
| 1. Community outreach and engagement | Oct. 2011 – Sept. 2014 | Presentations to community and professional organizations and stakeholder groups<br>Working Group meeting agendas & notes |
| 2. Environmental benefits quantification | Oct. 2011 – Sept. 2014 | Usable calculation tools, field measurement datasheets & user guides, response to expert review, and summary of monitoring recommendations |
| 3. Program Operations and Management System | Mar. 2012 – Mar. 2014 | Protocols for: credit issuance and transaction, adapt/develop registry to post & track transactions, guidance describing long-term Program management |
| 4. Pilot/test/implement tools and protocols on 3 restoration projects across the watershed | Oct. 2012 – Sept. 2014 | List of up to three identified restoration projects and partners, 1 field day per site to demonstrate how the tools and protocols are used, first Program annual report |
| 5. Send quarterly invoices, semi-annual reports, and final report | Oct. 2011 – Sept. 2014 | Quarterly invoices, semi-annual reports, and final report |
| 6. Participate in one NRCS CIG Showcase or comparable NRCS event | Oct. 2013 – Sept. 2014 | Presentation |

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# I. EXECUTIVE SUMMARY

The Mokelumne Environmental Benefits Program was developed to establish an ecosystem market, create consistent tracking and reporting of environmental benefits for land managers and landowners, as well as provide a mechanism for private landowners to sell units or credits of environmental benefits. We utilized a collaborative approach that engaged stakeholders on a regular basis to ensure product development was locally appropriate for the Mokelumne Watershed. As a result of this effort, we envisioned a future in the Mokelumne with accelerated community-based restoration, increased investment from beneficiaries to communities and restoration practitioners, and quantified environmental outcomes. This project meets the Natural Resources Conservation Service (NRCS) Ecosystems Markets category of "Development of regional partnerships, market infrastructure (such as ecosystem market registries), and integrated tools that facilitate the development of ecosystem markets."

Goal and Objectives

The project goal was to set up a pilot payment for ecosystem services (PES) program that creates a mechanism for beneficiaries to pay producers for the ecosystem services they receive. The project focused on conservation practices that improve water quality and wildlife in the Mokelumne Watershed, California.

To meet this goal the project had six objectives:

1) **Conduct community outreach and engagement** – Increase public and private investment in quantified ecosystem services gained by landowners and land managers implementing conservation practices;
2) **Develop environmental benefit quantification** – Create predictive quantification tools in order to improve the ability of investors to target their resources to projects that achieve more environmental outcomes for the investment;
3) **Develop program operations and management system** – Create a management system with verification and monitoring guidance so that projects' outcomes are consistently reported and tracked over time;
4) **Test demonstration tools and protocol on up to three restoration projects** – Test the integration of a crop certification program and quantification of ecosystem services; and
5) **Link a diverse watershed and its stakeholders** – Convene a stakeholder working group in order to link a diverse watershed and its stakeholders, which spans from forested landscapes to agricultural lands.
6) **Participate in one NRCS CIG Showcase or comparable NRCS event** – Webinar conducted on October 22, 2013 as part of 2013 NRCS Biology Webinar Series: http://www.conservationwebinars.net/webinars/incorporating-birds-into-tools-for-measuring-ecosystem-services. 27 of the 62 total participants work for NRCS.

All project deliverables were completed on time, including the quantification tool, Operations Manual, and other components of ecosystem market infrastructure. However, a stand-alone PES Program is not currently operating in the Mokelumne Watershed. We learned that three

factors have to be in place in order for a non-grant funded PES program to operate: 1) sufficient volume of projects producing environmental benefits; 2) significant and sustained investment from public natural resource agencies and corporations; and 3) overall administrative feasibility and viability.

The main barrier to establishing a PES program during the grant period was a lack of significant and sustained investment from both public agencies and corporations. The economic benefits analyzed in the forest and fuel treatment models mainly pertain to the public, making public agencies the primary investor. In the lower watershed, the benefits pertain to both the public agencies and corporations. However, the primary beneficiary is the public sector. Based on this, public agencies would be the primary target for restoration project funding because they have goals specific to riparian habitat ecosystem health. Corporations not motivated to invest in the water quality and habitat outcomes we modeled for this particular watershed.

Accomplishments

Our stakeholder working group, comprised of landowners, an agricultural trade association, a local resource conservation district, water authorities, environmental organizations, state and Federal natural resource agencies, a municipal water utility, and technical service providers, developed an action plan outlining ongoing coordination to share opportunities, successes, and lessons learned from restoration efforts, quantify the results, and explore collective funding, and committed to implementing the action plan beyond this grant period. This effort convened stakeholders that had not previously worked together, and proved a successful model for building coordination and communication across groups working in a diverse watershed to address natural resource concerns facing forests, ranches, and agricultural lands.

In the Upper Mokelumne watershed we produced a scientific modeling and economic analysis to evaluate costs and benefits of forest management as it relates to fire risk. This was a groundbreaking accomplishment because comparable analyses have only been done after a major wildfire occurs, and it is one of the only recent studies built upon primary research and modeling for a Sierra Nevada forest ecosystem.

In the Lower Mokelumne riparian ecosystem, we developed a regionally specific quantification tool that took into account the characteristics typical of riparian ecosystems across the broader Central Valley in California. As a result, we are pleased to report that the Central Valley Habitat Exchange, a separate CIG-supported effort, has begun adapting our tool.

In addition, we developed a draft standard for the crop certification program Lodi Rules to consider adopting next year. The draft standard would be the first time landowners participating in any environmentally beneficial program outside of Lodi Rules would receive recognition for that work by earning bonus points under *the Lodi Rules' Ecosystem Management* chapter within the certification program.

We also used the riparian habitat quantification tool and the guidance in the Operations Manual to estimate environmental benefits for two riparian restoration projects. This accomplishment demonstrates the value-added of a quantification tool, which can help:

1) Natural resource agencies and other potential investors predict estimated results from proposed restoration projects in order to support project comparison and ranking before making funding decisions;
2) Target funding allocations to the most beneficial projects; and
3) Report funding outcomes and track over time in a consistent way to show how individual projects are adding up to cumulatively achieve watershed health goals.

Alternative Technology Methods Employed

The upper watershed partners developed an avoided cost analysis, an alternative technology to conventional forest management analysis, by evaluating costs and benefits to forest management and resulting changes in fire risk. In the lower watershed we developed an alternative technology to estimating results gained from implementation of a restoration project that included a predictive quantification tool and an Operations Manual to consistently guide tool use and reporting of quantified environmental benefits. Finally, we employed a demonstration method to pilot the use of the quantification tools and operations manual on two restoration projects.

Quantifiable Physical Results

The Heritage Oak Winery restoration site was our first demonstration riparian restoration site, and resulted in the following predicted scores for conservation outcomes:

- Aquatic habitat – pre restoration potential 53%; post restoration potential 70%; improvement in score 17%
- Riparian bird habitat – pre restoration potential 35%; post restoration potential 69%; improvement in score 34%
- Stream shade – pre restoration potential 47%; post restoration potential 48%; improvement in score 1%
- Downstream flood attenuation – pre restoration potential 14%; post restoration potential 26%; improvement in score 12%

We also assessed the existing riparian habitat at another Lower Mokelumne Watershed property. Due to the landowner's goal to keep it simple, we a suggested a habitat restoration plan that does not include streambank setback and stabilization work that is a part of the Hoffman's project. Using the tool, we modeled the restoration plan to predict estimated environmental benefits, with the following conservation outcomes:

- Aquatic habitat – pre restoration potential 73%; post restoration potential 75%; improvement in score 2%
- Riparian bird habitat – pre restoration potential 64%; post restoration potential 67%; improvement in score 3%
- Stream shade – pre restoration potential 14%; post restoration potential 40%; improvement in score 26%

- Downstream flood attenuation – pre restoration potential 20%; post restoration potential 21%; improvement in score 1%

Economic Results

The long-term success of a PES Program is in part dependent on its overall administrative feasibility. We aimed to design a PES Program with an administrative structure that can be self-funded over the long-term by using a fee structure that is considered reasonable by landowners and funders. We conducted a cost analysis to estimate ongoing operations costs needed to run a PES Program, which informed revenue requirements that need to be generated through fees.

We conducted that analysis to be able to establish operational assumptions about the PES Program including the number of projects supported annually and administrative staff costs her hour. Annual operational costs were determined by estimating the staff hours and associated costs required to execute each step in the Operations Manual. We categorized program operational costs as 1) time-related costs or 2) direct costs:

1. Time-related costs are based on the number of hours it would take the Program Administrator, Technical Service Provider and Governing Body to execute tasks associated with Mokelumne Program operations. These time-related costs are the most significant operational costs for the Mokelumne Program. Time requirements are broken down by:
    a. **Fixed Costs**: annual costs which are primarily constant and not linked to the number of projects enrolled in the program.
    b. **New Project Costs**: annual costs which are primarily sensitive to the number of new projects that the program enrolls and supports each year.
    c. **Ongoing Project Costs**: annual costs which are primarily sensitive to the number of ongoing projects that the program supports each year.
2. Direct costs include costs for annual services and supplies to support operations, such as renting space for meetings, travel stipends for Governing Board members and covering contracts for the maintenance of infrastructure.

We have summarized our program operations cost estimate in Figure 1-1:

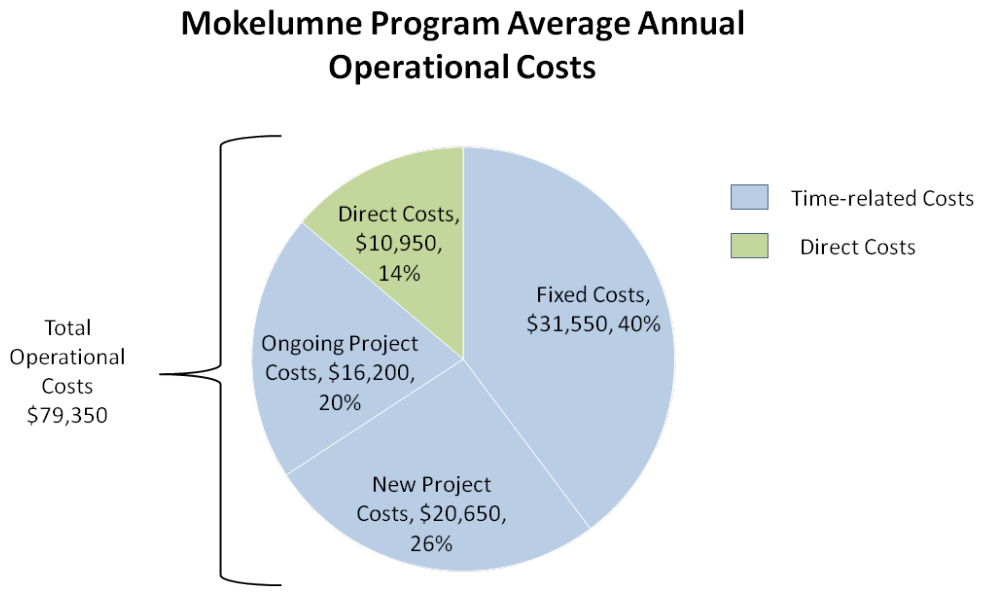


Figure 1-1: Proportion of time-related and direct costs that comprise average annual operational costs

Benefiting Customers

There are four main customers that benefit from this program:

- **Public natural resource agencies** – The utilization and promotion of the quantification tool by public agencies, including NRCS, can help guide where existing government grants and/or cost share programs should target their limited resources to achieve the best return on investment and ensure accountability to Congress and the public.
- **Corporations** – The tool developed provides corporations with the ability to quantify their return on investment. Although there is not much corporate interest in investing in the measurable outcomes we set out to quantify, some corporations have expressed interest in investing in other resource issues, such as water supply, and we are currently evaluating how our approach could be modified to meet this interest.
- **Landowners and land managers** – The program attracts public funding to restoration projects providing the most environmental benefits, which in turn benefits landowners since these projects are costly to implement. Through this approach, landowners can gain financial support for implementation of their restoration projects that is based on predicted environmental outcomes.
- **Ecosystem service market practitioners** – The field of practitioners working to develop and demonstrate ecosystem service markets can benefit from the marketplace infrastructure we developed and our lessons learned.

Major Recommendations

Ecosystem marketplace development needs to be done utilizing the following step-by-step process:

1) As a critical first step, identify the investor(s) and which environmental outcomes they are interested in.
2) Next, make sure that the investor(s) needs match with the watershed stakeholders' desired outcomes. Find common ground before moving forward with marketplace development.
3) Determine the level of detail, reporting, and verification rigor required in marketplace infrastructure by understanding what driver or motivation is causing the investor(s) to take this approach.
4) Identify the drivers that will motivate public and private investors before designing a PES program. Agree upon an entity that can articulate the program vision, coordinate with stakeholders across the watershed, and engage public and private investors. Seek to balance investors' motivations and stakeholders' environmental goals in order to prioritize metrics development.

Federal and Local Programs Helping to Implement

The Hoffman's project has been able to garner three public sector grants from two Federal programs and one local municipal water utility grant program, to support implementation of their riparian habitat project. The NRCS developed a restoration plan for the project and provided partial funding, and the East Bay Municipal Utility District (EBMUD) and the U.S. Fish and Wildlife Service's (USFWS) Partners for Fish and Wildlife Program also awarded grants to support the project's implementation. In addition, the Hoffman's provided the required matching funds in the form of in-kind labor. Table 1.1 outlines the other funds secured for this project and the approximate need for additional funds to complete implementation.

Table 1-1: Secured and needed funding for Heritage Oak Winery restoration site

| | |
|---|---|
| NRCS EQIP contract | $60,000 |
| US Fish and Wildlife Service Partners Program | $25,000 |
| EBMUD Partnership Fund | $21,195 |
| Total available | $106,195 |
| Current project cost (dependent on bioengineering work needed) | $192,750 |
| Approximate need | $86,555 |

Changes to Project Budget

While budget changes did occur during the grant period, they did not affect the scope of the project. The budget changes were mostly related to line item reallocations within the contractual category.

# II. INTRODUCTION

Project Overview

The Mokelumne River originates in the Sierra Nevada Mountains and flows into the Central Valley before joining the Sacramento-San Joaquin River Delta. The Mokelumne watershed provides significant environmental and economic benefits to the state and region, including hydroelectric energy, high value crops, timber, habitat for wildlife, and recreational benefits such as whitewater rafting and trout fishing. The river delivers drinking water to 1.4 million people and provides agricultural water supply and storage to irrigate over 700,000 acres of vineyards, walnuts, almonds, cherries and other crops.

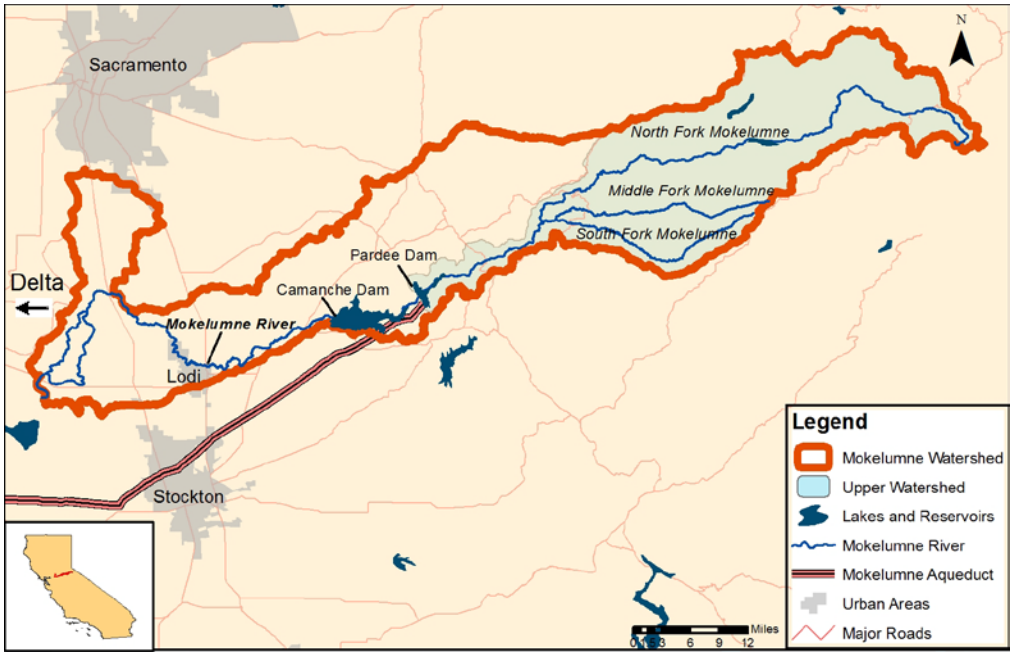


Figure 1-2: Map of the Mokelumne Watershed, California

The Mokelumne Environmental Benefits Program was developed to establish an ecosystem market, which creates consistent tracking and reporting of environmental benefits for land managers and landowners, as well as provides a mechanism for private landowners to sell units or credits of environmental benefits. This three-year project aimed to address two problems: 1) lack of incentives for landowners to voluntarily implement restoration projects; and 2) lack of tracking of restoration actions in a uniform way to evaluate how well they are collectively resulting in improvements that achieve watershed-wide goals. As a result of this program, we envisioned a future in the Mokelumne with accelerated community-based restoration, increased investment from beneficiaries to communities and restoration practitioners, and quantified environmental outcomes.

A stakeholder working group evaluated the current watershed conditions and major environmental issues facing communities. The group advised two approaches for a payment for

ecosystem services program. In the upper watershed, the partners modeled wildfires with and without fuel treatment scenarios. Using the results, they quantified the financial costs and benefits of fuel treatment, focusing on those elements to which a dollar value can readily be assigned. In the lower watershed, we developed performance metrics to predict and measure riparian habitat functions resulting from restoration projects.

The project combined the diverse expertise of several key personnel, including:

Kelli McCune, Senior Project Manager, who leads Sustainable Conservation's Ecosystem Services Initiative to accelerate the pace and scale of restoration on private lands in California.
Key expertise: stakeholder facilitation, conservation science, conservation finance
http://www.suscon.org/staffandboard/staff.php

Ann Hayden, California Habitat Markets Director, Ecosystems Program, currently leads EDF's work to advance habitat markets to restore critical habitat to benefit the environment and agriculture in California.
Key expertise: water resource management, policy, environmental markets development
http://www.edf.org/people/ann-hayden

Jeremy Sokulsky, Chief Executive Office, co-founded Environmental Incentives, and he works in California and other states to assemble the infrastructure to enable ecosystem service-based policies and incentives programs as tools to achieve measurable environmental improvement.
Key expertise: environmental markets development
http://enviroincentives.com/company/meet-the-team/jeremy-sokulsky-pe-mba/

Kim Carr, Sustainability Specialist, Sierra Nevada Conservancy and leads the organization's efforts across the Sierra Nevada region to develop forest and community initiatives to restore forest health, create local jobs and improve community well-being.
Key expertise: forest management, community development
http://www.sierranevada.ca.gov/about-us/staff-directory/KCarr

Cliff Ohmart, PhD, Vice President of Professional Services oversees all of SureHarvest grower programs, which provide a set of solutions for growers interested in developing sustainable programs.
Key expertise: sustainable crop certification program development
http://www.sureharvest.com/leadershipteam.php

Amy Merrill, PhD, Senior Riparian Ecologist, Stillwater Sciences has more than 20 years of experience in riparian and ecosystem ecology, restoration and watershed management. She leads Stillwater Sciences' work to apply an ecosystem service framework to quantify existing and potential environmental benefits associated with changes in resource management.
Key expertise: California riparian and floodplain ecology, ecological process modeling
http://www.stillwatersci.com/staff_directory_bio.php?cat=l-r&id=46

Goal and Objectives

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To meet this goal the project had six objectives:

1) **Conduct community outreach and engagement:** Increase public and private investment in quantified ecosystem services gained by landowners and land managers implementing conservation practices;
2) **Develop environmental benefit quantification:** Create predictive quantification tools in order to improve the ability of investors to target their resources to projects that achieve more environmental outcomes for the investment;
3) **Develop program operations and management system:** Create a management system with verification and monitoring guidance so that projects' outcomes are consistently reported and tracked over time;
4) **Test demonstration tools and protocol on up to three restoration projects:** Test the integration of a crop certification program and quantification of ecosystem services; and
5) **Link a diverse watershed and its stakeholders:** Convene a stakeholder working group in order to link a diverse watershed and its stakeholders, which spans from forested landscapes to agricultural lands.
6) **Participate in one NRCS CIG Showcase or comparable NRCS event:** Webinar conducted on October 22, 2013 as part of 2013 NRCS Biology Webinar Series: http://www.conservationwebinars.net/webinars/incorporating-birds-into-tools-for-measuring-ecosystem-services.

Project Funding

The project was funded by this NRCS CIG grant for a total of $372,478, and had a 1:1 cost share requirement of cash and in-kind contributions. Sustainable Conservation, Sierra Nevada Conservancy and Environmental Defense Fund provided the matching cash contributions. Many stakeholders provided in-kind support through their dedicated participation in quarterly meetings and calls, as well as deliverable review in between meetings. These stakeholders included: East Bay Municipal Utility District, Vino Farms, LLC, Foothill Conservancy, San Joaquin County Resource Conservation District, USFWS Anadromous Fish Restoration Program, Amador Calaveras Consensus Group, and the Lower Mokelumne Stewardship Steering Committee.

## III. BACKGROUND

Landowners and managers, including farmers, ranchers, and foresters, have a unique role in protecting and restoring fish and wildlife habitat, and improving water quality and supply. One major obstacle standing in the way of large numbers of landowners conducting voluntary restoration is a lack of incentives for landowners to voluntarily implement restoration projects. Restoration and habitat enhancement projects that improve water quality and support wildlife populations (and their maintenance) can cost tens of thousands of dollars. Government grants

for project installation costs are dwindling, and currently there is no mechanism to compensate landowners for the ongoing environmental benefits that their projects provide. Consequently, those who voluntarily engage in restoration on their land bear a disproportionate cost of protecting and enhancing ecosystem services that benefit society. Moreover, there has not been a consistent way to measure and track the environmental benefits improved through landowners implementing restoration projects.

Our program aimed to address the lack of both sufficient incentives to motivate more restoration, and quantification tools available to predict and measure the environmental benefits that are gained. Addressing these issues helps to avoid potential negative impacts to the environment, communities, and producers' economic welfare, including:

- Continued loss of ecosystem functions that provide viable habitat for fish and wildlife to thrive;
- No net increase in habitat restoration over time;
- Public investment not targeting the most beneficial projects and thereby achieving less return on investment;
- Loss of ecosystem services to communities that are normally provided by healthy and functioning ecosystems (i.e., drinking water becoming polluted and unsafe for consumption, or fish population crash that closes recreational and commercial fisheries); and
- Producers continuing to bear a disproportionate cost to implement restoration projects without garnering income for the multiple services that result from their land stewardship.

Many efforts have already tried or are currently attempting to address these issues by developing ecosystem markets. Almost all are developing markets in a regulated context, and a few examples include: The Bay Bank in the Chesapeake Bay, the Ohio River Basin Water Quality Trading Program, and water temperature trading in the Pacific Northwest to meet Clean Water Act requirements.

It is possible to develop an ecosystem market in either a voluntary or regulatory context, with each having its advantages and challenges. The main advantage of a regulatory setting is that there is clear demand, therefore some entity or entities are required to pay for improved ecosystem services. Some voluntary programs have been successful, mainly in other countries such as Ecuador and Columbia. Those efforts attracted new revenue streams to pay landowners in upper watersheds where large municipality drinking water supplies originate.

Back in the United States, Congress is increasingly demanding greater accountability from natural resource agencies to consistently report the environmental outcomes achieved through their grant programs. In general, agencies have typically relied on project partners to assist with project evaluation, but in recent years they are working to develop methods to track the environmental benefits or outcomes gained from their grant program allocations.

Our project was developed in a voluntary context. We may have had more success with engaging corporations as investors if our pilot had been developed in a regulatory context. However, we aimed to improve the effectiveness of public natural resource agencies, like USFWS and NRCS, which administer voluntary grant programs as one strategy to recover salmonid and other wildlife populations and improve water quality in California's Central Valley rivers. The quantification tool can be used to predict estimated environmental benefits from proposed restoration projects, therefore public funding can be targeted at the most beneficial projects, providing the greatest environmental return on investment.

The agricultural sector, including farming, ranching, and forestry, also benefits through increased accessibility to funding for restoration projects, as well as payment for the multiple ecosystem services that result from their efforts. Additionally, the environment including Sierra Nevada forests, Central Valley riparian forests, surface water quality, and wildlife habitat, benefits through improvement in ecosystem functions.

## IV. REVIEW OF METHODS

A stakeholder working group evaluated the current watershed conditions and major environmental issues facing communities. The group advised two approaches to address resource priorities in the upper and lower watersheds through developing a payment for ecosystem services program. Specifically, we utilized the following methods to address each project objective:

**Objective 1: Conduct community outreach and engagement**

We organized a stakeholder working group comprised of landowners, an agricultural trade association, a local resource conservation district, water authorities, environmental organizations, state and federal natural resource agencies, a municipal water utility, and technical service providers. The working group met quarterly and reviewed deliverables to advise and guide the development of the pilot effort. We also presented our pilot at numerous conferences throughout the three-year timeline across California and the nation.

**Objective 2: Develop environmental benefits quantification**

In the upper watershed Sierra Nevada Conservancy, The Nature Conservancy and the U.S. Forest Service led the production of a scientific modeling and economic analysis to evaluate costs and benefits of forest management as it relates to fire risk. This analysis modeled wildfire in the Mokelumne Watershed both with and without implementation of fuel-treatments scenario. We analyzed the size and intensity of five potential representative fires based on fire history in the region, current forest conditions, and state-of-the-art wildfire models. We modeled the fuel-treatments scenario to identify how active forest management would likely modify wildfire behavior and post-fire erosion over a 30-year period. Using these results, we quantified the financial costs and benefits of the treatments, focusing on those elements to which a dollar value can readily be assigned such as homes, infrastructure, timber, biomass energy, carbon and employment. The report is available to download at http://www.suscon.org/ecosystemservices/index.php.

In the lower watershed Stillwater Sciences led the adaption and development of a quantification tool that estimates and measures environmental outcomes in terms of four riparian habitat functions: aquatic habitat, bird habitat, flood attenuation and stream shade. It is important to note that we adapted Shade-a-lator from Oregon, which has been supported by USDA through a Conservation Innovation Grant. We developed the tool by considering and incorporating the recommendations and process described in USDA's April 2011 report, *Measuring Up: Synchronizing Biodiversity Measurement Systems for Markets and Other Incentives Programs*.

We developed the tool to fit the Lower Mokelumne riparian ecosystem while also taking into account the characteristics that represent riparian ecosystems across the broader Central Valley in California. We also formed a Technical Review Committee to advise and provide feedback on tool development. The quantification tool is built in Excel and includes data sheets that reflect the structure and format of the field data sheets to ease data transfer from hard copies to the Excel tool spreadsheet. We also wrote a User Guide to provide step-by-step directions to use the tools. As a result, the Central Valley Habitat Exchange, a separate CIG-supported effort, has begun adapting our tool.

**Objective 3: Develop program operations and management system**

We developed an Operations Manual by using the standardized steps utilized in other ecosystem service markets around the nation, including The Willamette Partnership. Figure 1-3 below outlines the standardized steps that are defined for the Mokelumne in the Operations Manual to consistently conduct transactions of environmental benefits between suppliers and buyers.


Figure 1-3: Program Operations Overview, Environmental Incentives

The blue chevrons outline the steps landowners and land managers take to define environmental benefit credits, and the green chevrons outline the steps investors take to pay for those outcomes. The orange chevron defines the administrative and technical support roles for managing a payment for ecosystem service program or environmental market. The Central Valley Habitat Exchange is also using this Operations Manual and customizing details in each step to fit their conditions, thereby avoiding redundancy and advancing their program development.

We also drafted a farming practice standard, to be considered for adoption next year, for the crop certification program called Lodi Rules, which is certified by Protected Harvest. The process for adding a standard to a Protected Harvest certification program is as follows. The grower group that is certified by a Protected Harvest program drafts a farming practice standard that they feel adds substance to the certification program and challenges them as farmers to continually improve on their sustainability program. The draft standard is submitted

to the Protected Harvest Board of Directors who reviews the standard for possible accreditation and inclusion as a new standard to that particular certification program.

Approximately 3 years ago the Lodi Winegrape Commission formed a standing committee to oversee the Lodi Rules program from the grower's perspective. The Lodi Rules Committee was approached as to their interest in considering adding a farming standard to the Lodi Rules program that provided growers certification points for being a participant in the Mokelumne Environmental Benefits Program. The Lodi Rules Committee agreed with work with Protected Harvest to draft a standard. Over a series of months and several meetings Protected Harvest worked with the Lodi Rules Committee on the standard and developed the final draft.

**Objective 4: Test demonstration tools and protocol on up to three restoration projects**
We used the riparian habitat quantification tool and the guidance in the Operations Manual to estimate environmental benefits for two riparian restoration projects. Stillwater Sciences conducted field site visits to collect pre restoration information and inserted the field data into the Excel tool to quantify baseline. Next, they used each restoration plan to model estimated results in terms of environmental benefits for aquatic habitat, riparian bird habitat, stream shade, and downstream flood attenuation. Finally, they subtracted the pre restoration score from the post restoration estimate in order to calculate the difference, or improvement in those four functions. Environmental Incentives led the process to demonstrate the Operations Manual steps by filling out the accompanying forms for a restoration project to report its expected results to the PES Program.

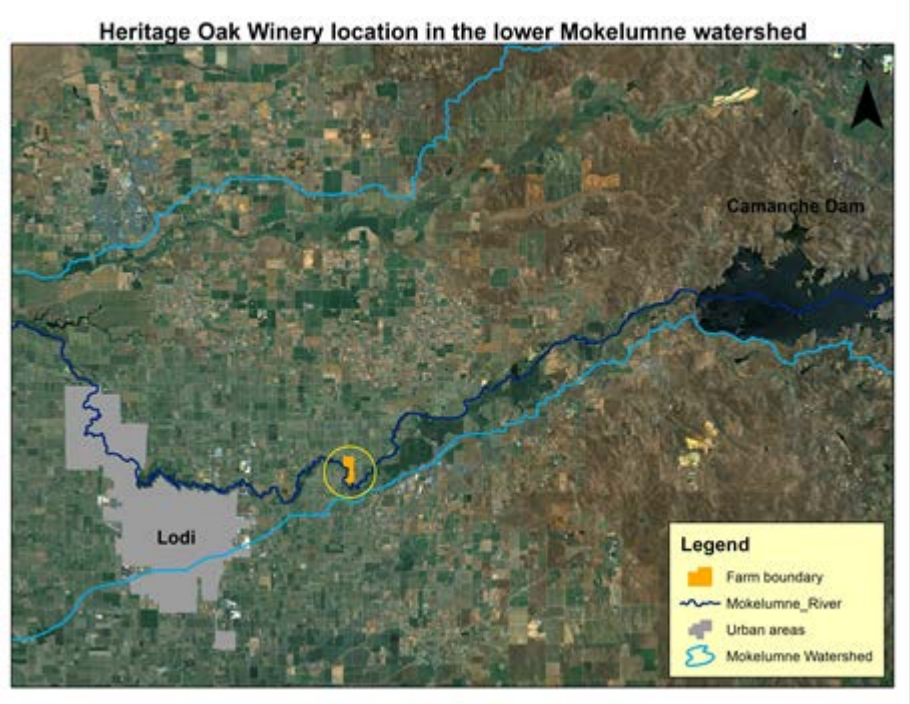


Figure 1-4: Riparian habitat restoration project location in the Lower Mokelumne Watershed

**Objective 5: Link a diverse watershed and its stakeholders**
We linked stakeholders from across the Mokelumne Watershed through the stakeholder working group that we convened on a quarterly basis. The working group also developed an action plan outlining ongoing coordination to share opportunities, successes, and lessons learned from restoration efforts, quantify the results, explore collective funding, and committed to implementing the action plan beyond this grant period. This means we were able to create a new process for stakeholders from the upper watershed and the lower watershed to coordinate into the future, which has not been done to date.

**Objective 6: Participate in one NRCS CIG Showcase or comparable NRCS event**
Nat Seavy, PhD, Research Director, Pacific Coast and Central Valley, Point Blue Conservation Science met Bill Hohman, PhD, Wildlife Biologist, National Wildlife Team, NRCS at a conference in 2012. At that time, Bill was organizing the 2013 NRCS Biology Webinar Series. The webinar audience, which includes NRCS biologists and their Federal, state and non-profit organization partners had identified a training need under the topic of ecosystem services. Nat had previously partnered with Sustainable Conservation and asked Kelli McCune to co-present for one of the monthly webinars in 2013. Kelli presented using a PowerPoint slide deck and responded to questions.

<u>Innovative Approach</u>
This project was innovative in its approach to attract and target limited restoration funding through the application of our new habitat quantification tool, as well as our strategy to identify corporations as investors. We developed and adapted a spatially-explicit and predictive tool so that any investor, whether a company or public natural resource agency, can understand the estimated project benefits before funding is awarded. The predictive ability also enables funders to compare estimated results for multiple projects. Furthermore, the tools can help improve accountability for how funds are being allocated by consistently tracking and reporting project results over time.

Traditionally, private corporations have not been actively contributing to restoration projects. We partnered with Environmental Incentives to develop a four-step approach, shown in Figure 1-5 below, that we used to systematically conduct research on potential investors and engage businesses. We focused our initial research on companies located in the San Francisco East Bay region because the Mokelumne River supplies their water for business operations.

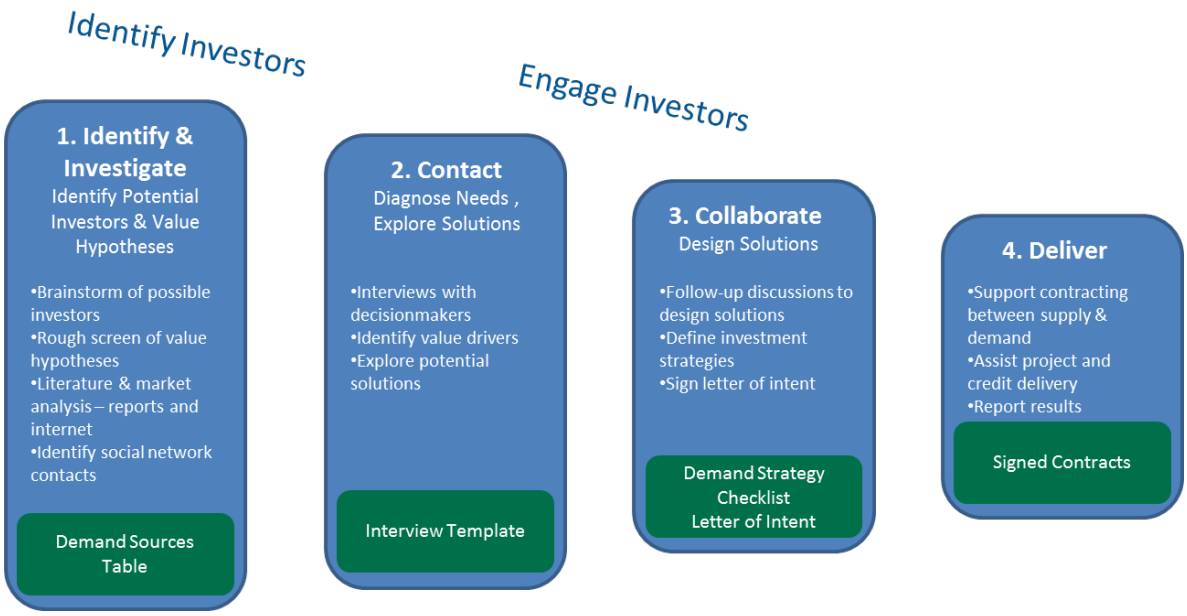



Figure 1-5: Four step process to identify and engage potential investors

Additionally, Sustainable Conservation and Environmental Defense Fund identified business beneficiaries in the lower watershed, as well as explored opportunities to engage companies that are not connected to the Mokelumne Watershed but have sustainability reporting requirements. Motivations to meet sustainability reporting requirements to large retailers or philanthropic funders, and/or produce compelling marketing pieces encourage a company to invest in quantified environmental benefits they can report on. Overall, we met with 23 businesses, trade associations, and non-governmental organizations that partner with business.

Comparison of Innovation to Existing Practices

One of the main differences between our effort and existing practices is there are no existing voluntary payment for ecosystem service programs in California that focus on riparian ecosystem and forest ecosystem functions. Companies, in particular, do not have a go-to program or place to invest in quantified environmental benefits. Through our interview process we learned that businesses are interested in access to these types of programs. In general, corporations are under more and more scrutiny from investors, customers, and the general public to tie sustainability investments directly to results that are backed up by reliable metrics. Also, public natural resource grant programs that use this approach increase efficiency and effectiveness by using predictive tools or metrics before making grant allocations. This, in turn, increases the environmental return on investment by targeting grant dollars to projects providing the greatest environmental benefits.

Regarding the quantification tool, use of the tool will take longer than current field assessment practices. We estimated that approximately eight hours will be required for a technical service provider to assess the restoration site, collect necessary information and run the Excel-based tool in the office to predict estimated outcomes. The resulting information can then be used to

calculate the environmental benefit per dollar of implementation cost. Finally, we estimated that on-site verification by a technical service provider will take approximately six hours to check that the restoration project was implemented according to its plan, document environmental conditions, and therefore confirm that the quantified outcomes are being provided.

Marketing

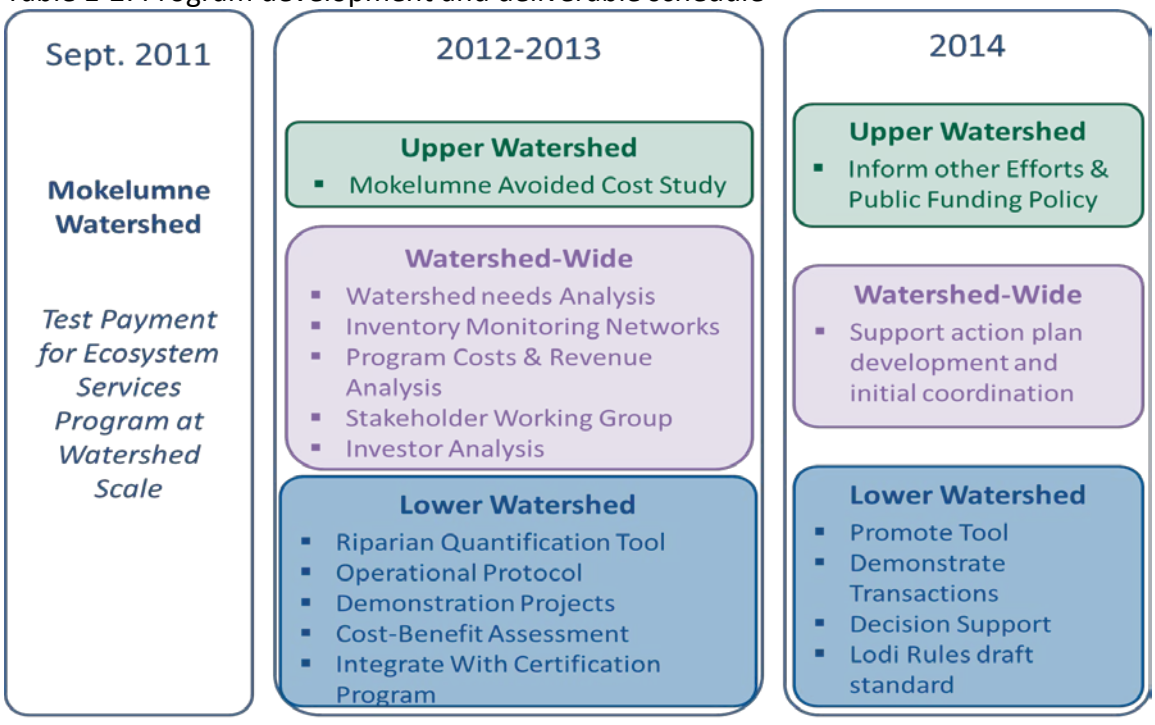
We analyzed public sector interest by meeting with public natural resource agencies, including NRCS and USFWS, to make sure that the products, in particular, the metrics, would be useful and fit their needs. We also analyzed corporate interest through interviews. During those conversations we marketed riparian habitat enhancement benefits, but did not encounter tangible interest in the services we were measuring. We learned that actions that can enhance water supply are a much more marketable product for private companies.

Changes in Producers' and Other's Management

In general, there is not much change in what a producer has to do differently in order to engage in this process. We envision that technical service providers support the producer by using the tool. Therefore the change in workload is for those that support producers in planning and implementing restoration projects. An agency's current standard project planning and funding process would need to accommodate a more in-depth site assessment. For example, NRCS would add work to the planning process when using the tool to predict results based on the proposed project plan.

Schedule of Events

Table 1-2: Program development and deliverable schedule



Successes and Lessons Learned

Our vision for this pilot program was to develop a viable business model that was self-sustainable through per-project transaction fees. Although this stand-alone program is not currently operating, a major success of the project is that the Stakeholder Working Group continues to work towards realizing this vision. Their continued commitment is a result of another success of the project, which was the organization and ongoing engagement of the Stakeholder Working Group. The working group provided a large amount of time to prepare, participate in, and follow up on action items from quarterly meetings. Additionally, they reviewed products throughout the entire 3-year timeline. During the last two quarterly meetings, stakeholders reflected on the original vision of this pilot and developed and committed to a future pathway based on learning thus far (Table 1-3). The working group sees value in continued coordination as a means to achieving the long-term vision of this program.

Table 1-3: Action Plan developed by stakeholders to achieve long-term vision

| ACTION | OUTPUT | OUTCOME |
|---|---|---|
| **Lower Mokelumne Watershed & Central Valley Habitat Exchange (CVHE) Communication:** The Lower Mokelumne River Watershed Stewardship Steering Committee will liaise with the CVHE in order to be connected to and stay informed of CVHE progress. | (1) The CVHE will incorporate the lower Mokelumne watershed geography in its scope to facilitate the funding of projects to protect and restore riparian habitat in the lower Mokelumne watershed<br>(2) The CVHE will learn from and use the Mokelumne Program's Operational Protocol and Riparian Habitat Quantification Tool | (1)Accelerate community based restoration<br>(2) Connect investment from beneficiaries to communities and people who implement restoration<br>(3) Quantify environmental outcomes and provide this info back to funders |
| **Mokelumne Watershed- wide Communication:** The Lower Mokelumne River Watershed Stewardship Steering Committee will liaise with the Amador Calaveras Consensus Group (ACCG) to keep each other updated and connected about: 1) performance-based approaches to restoration, 2) potential public agency or corporation funding opportunities that may be pertinent to the other part of the watershed, and 3) opportunities to work together on conservation/restoration. | (1) Mokelumne Watershed stakeholders will stay informed on the successes/challenges of a performance-based approach<br>(2) Mokelumne Watershed stakeholders will be able to take advantage of opportunities to use a performance-based approach to attract funding<br>(3) Stakeholders will be able to fund important conservation/restoration projects due to the synergies resulting from communicating across the Mokelumne Watershed | (1) Accelerate community based restoration<br>(2) Connect investment from beneficiaries to communities and people who implement restoration<br>(3) Quantify environmental outcomes and provide this info back to funders |

| | | |
|---|---|---|
| **Upper Watershed Funding Communications:** The ACCG will stay connected with the Forest Service, Sierra Nevada Conservancy, The Nature Conservancy and National Forest Foundation to learn about opportunities to connect with potential public agency or corporate investors/funders, such as the Mokelumne Fund: http://www.nationalforests.org/moke | (3) Stakeholders will be able to fund important conservation/restoration projects due to the synergies resulting from communicating across the Mokelumne Watershed and State. | (1)Accelerate community based restoration<br>(2) Connect investment from beneficiaries to communities and people who implement restoration<br>(3) Quantify environmental outcomes and provide this info back to funders |

The main lesson learned during the grant period, is that there is an order in which to follow to develop a new ecosystem marketplace. We had taken an approach to start all parts of ecosystem marketplace development simultaneously in parallel tracks, which had been done elsewhere in other efforts. We now know that, for a voluntary payment for ecosystem services program, the critical first step is to identify the investor(s) and which environmental outcomes they are interested in. We also learned that the key next step is to make sure that the investor(s) needs match with the watershed stakeholders' desired outcomes. Both of these steps need to be done before moving forward with marketplace development.

If beginning the project today, we would first gain an understanding of the private and public sectors' need for specific environmental benefits that would motivate their investment or commitment to invest in restoration projects. Instead, we gained this understanding simultaneously during the pilot program development, which included developing the pieces of market infrastructure. We learned there is no need to begin market infrastructure, such as creating a quantification tool, until investors' needs are clearly understood.

## V. DISCUSSION OF QUALITY ASSURANCE

The primary quantifiable data produced by this project are the improvements in four riparian ecosystem functions: aquatic habitat, riparian bird habitat, flood attenuation and stream shade. This section describes the steps we took to ensure the tool produces valid results.

In the lower watershed, the focus on riparian habitat was prioritized by the stakeholders in order to estimate and measure the water quality and habitat improvements that landowners can make by implementing riparian restoration projects. Therefore the quantification tool was designed to be applied to lands along the Lower Mokelumne River from approximately Jackson, CA, downstream along the Mokelumne River to Interstate 5. We also designed the tool to be applicable to similar riparian ecosystems along other Central Valley rivers.

The method for collecting field data at a riparian restoration site directs practitioners to delineate vegetation polygons within the site based on a consistent set of dominant plant species, up to 5.7 acres in size and on the same side of the river, in order to calculate a true

representation of the ecosystem services being improved at a riparian restoration site. Each distinct vegetation polygon is outlined on the field map and given a unique identification number. Each unique identification number is then recorded in on the vegetation data sheet in the field form, and vegetation information must be recorded for each polygon within each restoration site.

The data collection consists of answering questions about the landscape surrounding the restoration site and about the restoration site itself. This is because the landscape context affects the amount of ecosystem services that any individual site can provide. Therefore we developed an office data form that a practitioner completes at the office before going to the restoration site. There is also a field data form that a practitioner then completes at the restoration site prior to restoration implementation in order to collect current condition information that is entered into the Excel tool spreadsheet to calculate baseline. The office and field data forms are Word documents that match the Excel spreadsheet as a way to support ease of use when inputting the data into the Excel spreadsheet. The practitioner is envisioned to have the skill set that a NRCS soil conservationist possesses. It is important to note that the practitioner needs to be able to identify common woody plants to the genus level, given a list of potentially occurring tree and shrub species, and a handful of specified herbaceous plant species.

The practitioner also needs to be able to use the project's restoration plan in order to fill out the field data form a second time that reflects the changes that will occur at the site due to the restoration project being implemented. The tool estimates future changes in the site's capacity based on growth of vegetation over time. A set of calculations, based on observations and best available information on native and non-native plants common California's Central Valley, provides estimates of change in height, crown diameter, and crown density through time so that a user can enter information on plant species composition and planting density for each subsequent year after implementation. The Excel spreadsheet then uses this information to calculate the difference by subtracting the baseline score from the future condition to show the change in ecosystem services.

We calibrated the tool by using ten completed riparian restoration sites in the Lower Mokelumne Watershed. The restoration sites vary in age-since-restored, size, and geographic distribution along the Mokelumne River. We used monitoring data and reports to compare the tool's scoring with the on-the-ground observable results to calibrate the calculations to accurately produce current condition and improvement scores.

The tool produces a score that is a percentage based on a 0 to 100 percent possible function, and the tool also multiplies this score by the area of restoration to provide a functional acre unit for each ecosystem service, as well as combining the four functions into an overall riparian habitat functional unit. The rationale for this modular structure is to make it easier for a practitioner to compare alternative treatments at a single restoration site, which informs the project planning process. A funder may also be interested in the alternative treatment comparison as a way to understand which restoration plan is estimated to achieve more

environmental benefit, or evaluate the environmental benefit expected from each plan that has a unique implementation cost. A funder can also use these scores to compare several projects to each other that are requesting implementation funding. Finally, funders can use the scores to consistently report and track results in terms of environmental benefits gained from their investment.

## VI. FINDINGS

The following three key factors need to be in place in order to develop a stand-alone payment for ecosystem services program:

1) Sufficient volume of projects producing environmental benefits;
2) Significant and sustained investment from public agencies and corporations; and
3) Overall administrative feasibility and viability.

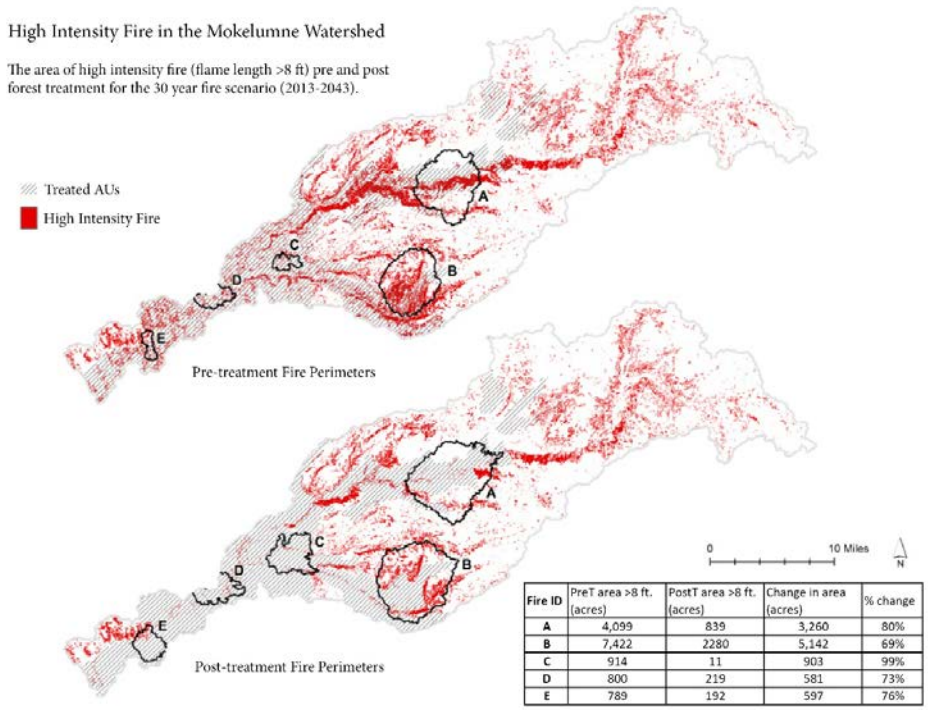
These factors are not currently in place in the Mokelumne Watershed for four main reasons:

1) The number of riparian habitat restoration projects expected on the Lower Mokelumne River are fewer than would be needed to cover the cost of operating the program through per-project transaction fees.
2) The public sector is the main potential investor because they have goals to achieve regarding riparian habitat-related environmental outcomes. However, corporations outside of the Mokelumne River are not currently motivated to invest in these particular benefits.
3) The overall administrative feasibility of such payment programs are completely dependent on the above two factors being significant in number and sustained over time, both of which are currently lacking.
4) Differing landscapes across the watershed proved challenging from project outset. Specifically, project partners and local stakeholders did not have the capacity or resources to develop a site-specific performance-based metric for the upper watershed that would measure forest and fuels management in a similar way as the riparian habitat function tool measured restoration improvements in the lower watershed. Due to this, projects in the upper watershed would lack site-specific quantified outcomes and could not be included in a watershed-wide program infrastructure as a way to increase per-project fee transactions to support a stand-alone program administration.

<u>Upper Watershed</u>

**1) Fuel treatments can significantly reduce the size and intensity of wildfires**

Proactive forest management can significantly modify fire behavior by reducing fire intensity, size and rate of spread. Our results showed that the modeled fuel treatments scenario reduced the size of each of the fires by 30 to 76 percent, or a total reduction in size of approximately 41 percent. More importantly, the modeled scenario significantly reduced the acreage of high-intensity wildfire by approximately 75 percent (figure 1-6). The modelling method did not allow for estimation of benefits from specific site treatments, only the aggregate benefit of selected watershed-wide treatment scenarios.




| Fire ID | PreT area >8 ft. (acres) | PostT area >8 ft. (acres) | Change in area (acres) | % change |
|---|---|---|---|---|
| A | 4,099 | 839 | 3,260 | 80% |
| B | 7,422 | 2280 | 5,142 | 69% |
| C | 914 | 11 | 903 | 99% |
| D | 800 | 219 | 581 | 73% |
| E | 789 | 192 | 597 | 76% |

Figure 1-6: Wildfire analysis area Pre- and Post-modeled treatments in the Upper Mokelumne Watershed

**2) The economic benefits of fuel treatments substantially outweigh the costs**

In total, across the categories of benefits we quantified in the avoided cost study, the value of avoided costs significantly exceeds the cost of proactive management. The avoided losses in terms of both costs and lost income opportunities include the value of structures saved from wildfire and the costs of fire suppression and post-fire restoration, as well as potential revenue from carbon sequestration, merchantable timber, and biomass that could be used for energy. For each cost category, we estimated a range of values from low to high. Using the high estimates for benefits ($224 million) resulted in a benefit-cost ratio for the fuel-treatments scenario of 3.3:1. Using the low estimate for benefits ($126 million), the benefits of investing in fuel treatments are still nearly twice the costs, with a benefit-cost ratio of approximately 1.9:1.

**3) There are many beneficiaries from increased fuel treatments**

The economic benefits of fuel treatments accrue to a wide range of landowners, public and private entities, taxpayers, and utility ratepayers. The primary beneficiaries are the State of California, federal government, residential private property owners (and their insurers), timber owners, and water and electric utilities. By comparison, the costs of fuel treatments are largely borne by public land managers (and by implication, taxpayers). An accelerated fuels-treatment program would also result in an estimated 35-45 fuel treatments and 7-10 biomass-to-energy jobs over a 10-year period. These figures represent a significant addition to the current number of comparable jobs in these rural areas.

Lower Watershed

1) **Improved public natural resource agencies' ability to target outreach and grant allocations**

We found that the public natural resource agencies and the municipal water utility working to recover salmon and other wildlife populations and improve water quality in the Mokelumne River are eager to improve their process for targeting limited grant funding to the projects that achieve the greatest return on investment for environmental benefits. They also recognize that quantification tools can help them be accountable to taxpayers and Congress by using the same metrics to consistently track and report progress toward achieving a healthy, functioning riparian corridor along the Lower Mokelumne River.

2) **New investment attracted from corporations**

We found that the riparian habitat environmental benefits accrue to both public agencies and corporations. However, the primary beneficiary is the public sector. Based on this, public agencies would be the primary target for restoration project funding because they have goals to meet regarding riparian habitat ecosystem health. Corporations not motivated to invest in the water quality and habitat outcomes we modeled for this particular watershed.

3) **Quantification Tool Results**

The Hoffman Family own and operate their vineyard and Heritage Oak Winery outside of Lodi, California. The family is proud of their ties to this piece of land, which has been in the family for five generations. They are partnering with Sustainable Conservation, EDF, Natural Resources Conservation Service, US Fish & Wildlife Service, and East Bay Municipal Utility District to plan and implement a riparian restoration project that is just under five acres. Their property abuts the Lower Mokelumne River. The streambank along their property is exhibiting instability and is prone to erosion, contributing fine sediment to river flows, and degrading the riparian corridor. The cause of the bank instability appears to be a function of the incised river system combined with poorly vegetated overly steep banks located on the outside bends of the river downstream from rock-hardened river banks. The Hoffman family's goals are 1) to enhance both instream-shading for fish and terrestrial wildlife habitat quality by restoring tree canopy in the riparian zone, 2) to slow erosion of streambanks and levees using bioengineered techniques while maintaining flood protection, 3) to maintain vehicle access for the on-going management of, and agritourism on, the restored riparian and agricultural areas of the property.

The Heritage Oak Winery restoration site was our first demonstration riparian restoration site, and resulted in the following predicted scores for conservation outcomes:

- Aquatic habitat – pre restoration potential 53%; post restoration potential 70%; improvement in score 17%
- Riparian bird habitat – pre restoration potential 35%; post restoration potential 69%; improvement in score 34%
- Stream shade – pre restoration potential 47%; post restoration potential 48%; improvement in score 1%
- Downstream flood attenuation – pre restoration potential 14%; post restoration potential 26%; improvement in score 12%

Stream shade improvement potential is low because the Hoffman's property is located on the north side of the Mokelumne River. This is out of the control of the Hoffman's ability to affect change simply because of how the northern hemisphere is positioned relative to the sun. For example, this can be contrasted to the other project included below, which is located on the south side of the river.

A second landowner further downstream from the Hoffman's property expressed interest in doing a riparian restoration project. He is a longtime recreational fisherman who values having Chinook salmon in the Mokelumne River and wants to ensure the salmon are thriving for his kids and grandchildren to enjoy. His project goals are twofold: 1) to enhance both instream-shading for fish and terrestrial wildlife habitat quality by restoring tree canopy in the riparian zone, 2) to conduct weed management by removing invasive vegetation and replanting with native vegetation.

We assessed the existing riparian habitat and suggested a simple habitat restoration plan for this second property. Using the tool, we modeled the restoration plan's intended outcome to predict estimated environmental benefits, with the following conservation outcomes:

- Aquatic habitat – pre restoration potential 73%; post restoration potential 75%; improvement in score 2%
- Riparian bird habitat – pre restoration potential 64%; post restoration potential 67%; improvement in score 3%
- Stream shade – pre restoration potential 14%; post restoration potential 40%; improvement in score 26%
- Downstream flood attenuation – pre restoration potential 20%; post restoration potential 21%; improvement in score 1%

The small increases in aquatic habitat, riparian bird habitat and downstream flood attenuation are due to a couple factors, including a high pre restoration score and designing simple invasive vegetation removal with native vegetation replanting. Larger improvements for habitat and flood attenuation functions occur when larger areas are restored that expands the floodplain to provide these functions rather than simply replacing small areas of invasive plants with native vegetation. Due to other business priorities, at this time the landowner has not indicated when he would want to move forward with a new riparian restoration project, but we will remain in contact to confirm future implementation.

<u>Mokelumne Watershed</u>

We found that stakeholders were motivated to form their own action plan for next steps beyond the grant period based on 1) reflecting on the original vision of this pilot to create a mechanism for beneficiaries to pay producers for the ecosystem services they receive, and 2) considering our findings. To this end, they see value in continued coordination as a means to achieving the longer-term vision to: 1) accelerate community-based restoration; 2) connect investment from beneficiaries to communities and people who implement restoration; and 3) quantify environmental outcomes and provide this information back to funders.

Regarding corporations engaging as potential investors, we learned there may have been greater interest from them had we modeled water supply. This is due to growing recognition of potential risk related to water scarcity. More and more companies are calculating their "water footprint," meaning they are calculating the amount of water used to make their products. As a result, many are beginning to realize the indirect, yet critical, role water plays in their business through agricultural supply chains. For many companies, upwards of 90 percent of their corporate water footprint can be traced to their sourcing of agricultural products. In an increasingly water constrained world, consumers and investors are demanding greater disclosure and accountability of corporations. This will result in an increasing effort by large corporations to source from agricultural producers that are helping to conserve and protect the ecosystem services of watersheds in which they operate.

# VII. CONCLUSIONS AND RECOMMENDATIONS

## Conclusions

Because one cannot manage what is not measured, incremental project results are important as they help a funder understand what their investment is achieving on the ground. To that end, ecosystem service markets and PES programs are important to continue supporting as one viable approach to achieve conservation goals and economic sustainability across public and private lands.

**Upper Watershed**

The avoided cost analysis shows that it makes economic sense to invest in forest management to reduce the risk of destructive, high-severity wildfires in the upper Mokelumne Watershed. Although achieving such benefits requires a significant increase in the pace and scale of fuel treatments, the long-term cost savings far exceed the costs of the initial investment. To the extent that the Mokelumne is representative of other fire-adapted forested watersheds of the Sierra Nevada and the broader western United States, this makes the economic case for significantly increasing investment in proactive fuel treatments in western forests.

**Lower Watershed**

The quantification tools are valuable to the public natural resource agencies and the municipal water utility. Although not formally adopted yet, they see that the quantification tools or metrics can help them: 1) predict estimated results from proposed restoration projects to support project ranking and comparison before making grant allocations; 2) target grant program allocations to the most beneficial projects; and 3) report grant program outcomes and track over time in a consistent way to show how individual projects are adding up to cumulatively achieve watershed health goals.

## Recommendations

Ecosystem marketplace development needs to be done utilizing the following step-by-step process:

1) As a critical first step, identify the investor(s) and which environmental outcomes they are interested in.

2) Next, make sure that the investor(s) needs match with the watershed stakeholders' desired outcomes. Find common ground before moving forward with marketplace development.
3) Determine the level of detail, reporting, and verification rigor required in marketplace infrastructure by understanding what driver or motivation is causing the investor(s) to take this approach.
4) Identify the drivers that will motivate public and private investors before designing a PES program. Agree upon an entity that can articulate the program vision, coordinate with stakeholders across the watershed, and engage public and private investors. Seek to balance investors' motivations and stakeholders' environmental goals in order to prioritize quantification tool development.

## VIII. APPENDICES - DELIVERABLES PROVIDED ON MAILED CD ROM

Appendix A: Stakeholder Working Group meeting agendas and notes
Appendix B: Upper Mokelumne Avoided Cost Analysis:
http://www.suscon.org/ecosystemservices/index.php
Appendix C: Riparian Habitat Quantification Tool, Tool User Guide, Tool Monitoring Recommendations
Appendix D: Program Operations Manual
Appendix E: Draft Lodi Rules Standard
Appendix F: Performance Tracker
Appendix G: Tool Scores for Two Demonstration Sites
Appendix H: Performance Report Template
Appendix I: Presentation and Participant List for NRCS Showcase Event

## IX. TECHNOLOGY REVIEW CRITERIA

We are not recommending the process or methods in the project for field use because the technology developed would not be funded as an NRCS Conservation Practice.