



**Reinvestment for Resilience:
Restoring Landscapes and Communities**

A Concept Proposal

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Project Summary

This project will examine how payments for ecosystem services can be used to mitigate the impacts of climate change, restore landscapes and communities, and produce rural jobs. On-the-ground pilot projects will be established in 6-18 areas to assess ecosystem services and mechanisms that can be utilized to secure and reinvest payments from services to improve landscape and community resiliency. Mitigation of climate change landscape impacts will be accomplished by improving landscape resilience, which involves improving natural systems adaptability to change, and sustaining productivity and habitat for a diversity of species.

The Climate Change Challenge

A changing climate affects all landscapes in diverse and sometimes unpredictable ways. A warming climate is already affecting forests and watersheds in the Sierra Nevada region of California. In the last 20 years, Lake Tahoe and six other large lakes in the region have warmed faster than the air temperature. Coldwater fisheries are directly affected by such warming, but as temperatures continue to rise, warm-water fisheries will be also affected through altered algal and plankton relationships and other biological processes.

The Sierra Nevada is not alone. Recent studies of long-term streamflow records in the Pacific Northwest have found that summer base flows have significantly decreased. A changing climate is affecting forests and watersheds elsewhere, as well. At a landscape scale, species are moving farther north and into higher elevations. Scientists have recently suggested that in the coming decades, survival of some species will require northward movement of kilometers, or significant upslope movement to bring them to wetter or cooler habitat.

Effects from climate change are unlikely to be linear, and as species adapt to changing conditions, ecosystems may “tip” into new conditions or states. As temperature and biological activities interact in new ways, adaptation for some species will become increasingly difficult, and some will be unsuccessful.

Particularly in the West, riparian and terrestrial habitat are undergoing change by altered fire regimes. As rain is replaced by snow at higher elevations, the all-important reservoir in the mountains that we call the snowpack is reduced, resulting in earlier runoff and longer dry seasons. These changes increase the risks, and length and severity of the fire season, contributing to more frequent and larger, more catastrophic fires.

A changing climate, increasing frequency and risk of catastrophic fire, and changing water regimes necessitate a re-evaluation of what constitutes appropriate forest management. As communities and urban areas dependent on forests for water feel the pinch from increasingly scarce water, the demand for additional reservoirs or alternative water sources will increase, especially in areas where snowmelt is the primary source of runoff.

For years, a primary approach to species and habitat conservation has been to preserve and protect those areas of high biological diversity along with habitats that support threatened and endangered species. A number of conservation organizations work to preserve “hot spots,” areas of particularly high and unique species diversity, but climate change threatens this strategy, or any strategy that focuses exclusively on fixed places.

Whether the habitat is a water body, watershed, or forested area, climate change threatens to fundamentally affect the very conditions that make such areas a priority for conservation and protection. Yet, areas that are not currently rated as high priority may become so if they're managed in ways that integrate uses and efforts are dedicated to building more resilient landscapes that can provide high quality habitat.

Rural areas across the U.S. have been undergoing profound socioeconomic impacts over the last two decades and these impacts are likely to worsen in the coming years, particularly as climate change impacts grow more acute. Beyond areas like Lake Tahoe in California, Jackson, Wyoming, and those communities in the Southwest and Eastern U.S. where well-to-do retirees, telecommuters, recreationists, and others have spurred building booms, rural communities have lost younger residents and good paying jobs as resource-sector jobs have dried up. These losses have spawned additional job losses in the sectors that serve them. School populations have plummeted as jobs and families leave. In many areas, rural schools have lost one-third or more of their students in the last decade alone, and communities are struggling to remain vibrant and viable. Families that have worked the land are being pushed away, leaving few to maintain and restore landscapes in need of attention, and leaving behind socioeconomically devastated communities. Changing environmental conditions over the last two decades have been only loosely connected to these profound socioeconomic changes, but as climate change impacts become more acute they will further aggravate socioeconomic problems.

Finally, as spiraling government deficits are exacerbated by rising costs of responding to other climate change impacts such as increased hurricane intensity, our nation's ability to mitigate climate change impacts on forests, watersheds, and rural communities will be constrained. Real and projected climate change impacts compel a new approach that incorporates maintenance and restoration of large-scale landscapes or a multi-jurisdictional "all-lands" approach that builds the resilience of forests, watersheds, and rural communities.

A new approach is needed that does not rely only on increasingly limited state and federal dollars and, instead, develops new ways to secure payment for the many benefits or services that resilient landscapes provide and invests these payments in fostering more resilient landscapes and communities. More resilient systems are more adaptable, have the capacity to more effectively respond to a changing climate, and continue to provide vital ecosystem services, including species and habitat protection and high quality water. The Reinvestment for Resilience project is a critical first step to advance understanding of the work that's needed, including identifying ways to create jobs that will improve both rural landscapes and communities.

Project

The "Reinvestment for Resilience: Restoring Landscapes and Communities" project will explore and demonstrate how landscapes can be managed to improve resiliency. This approach begins with an "on-the-ground" empirical examination of ecosystem products and services (hereafter services) and the development of new mechanisms to fund landscape management over the long term. Pilot projects will be established in 6-18 areas. In each pilot project area, project researchers will analyze: 1) landscape services; 2) institutional mechanisms that exist or can be established to secure payment for services; and 3) based on case findings, develop

recommendations for short- and long-term implementation of an ecosystem services program that improves landscape and community resilience. A brief description of each of these project foci and the scale of the pilot areas follows.

1) *Examination of Landscape Products and Services*

In each pilot area, five to seven of the most important services will be identified and assessed. In contrast to the many ecosystem service studies that focus on parsing and cataloging services, this project will analyze a subset of services that offer the best opportunity to reduce climate change impacts and improve ecosystem resilience. Improved ecosystem resilience results in natural systems that are better able to adapt to change and sustain landscape productivity and habitat for a diversity of species. Key attributes of services to be analyzed also include their existing and potential value, the potential for securing value through payments, and the potential for creating jobs. Examples of important services include water production for municipal and agricultural use and hydropower production, carbon and carbon storage, biodiversity, agricultural and forest products, and recreation. We expect the most important services to vary among cases.

Production functions for the most important services will be established and mapped using geospatial tools. Values of services will be calculated. Where wood and water are identified for energy production, energy balances for pilot watersheds will be calculated to assess the true costs and benefits of utilizing local resources versus importing them. This includes evaluation of the energy that could be produced using local energy sources compared to the costs of importing energy or products from elsewhere.

Reinvestment for Resilience will also focus on integration and resilience of primary ecosystem services. Integration involves management for multiple species and diverse ecosystem conditions and services.

2) *Investigation of Institutional Mechanisms to Secure Payment for Services*

Building on identification of key services, this work involves examination of existing and potential mechanisms to collect money for services that can be reinvested back into pilot areas to maintain and improve the landscape and communities and create jobs. Several examples demonstrating this general approach involve water suppliers investing in upstream management to reduce expenses for water storage and delivery of high quality water to consumers. The New York Watershed involving the City of New York and Hudson Valley agricultural and forestland is perhaps the best known. More recently, the Denver Water Board has identified specific costs and has begun to invest in measures to reduce sediment produced from burned forests that reduce reservoir storage capacity and water quality.

There are state and federal efforts at valuing carbon storage and agencies exploring paying for habitat conservation areas that offer fertile ground for developing mechanisms that can generate revenue to pay for improving resiliency. Exploration of how institutional mechanisms can contribute to community improvement will also include examination of ways residents of these communities have a role, voice, and a hand in the work of building and maintaining resilient landscapes and communities.

3) *Recommendations for Implementation of Ecosystem Services*

Recommendations for short- and long-term implementation of ecosystem services program will be developed by aggregating findings and lessons from the pilot cases. The case study approach allows for principles and key recommendations to be developed from a diversity of cases and, at the same time, allows for identification of key differences that are important for developing broad policy recommendations that will accommodate varying landscapes and institutional settings. Institutional mechanisms for investment will correspond to the key services of each of the pilots, but will also be collectively examined to identify state or federal mechanisms that can be established to value and facilitate payments to improve landscape and community resiliency. The case study approach anchors policy recommendations in real world examples and in the context of landscape and community outcomes.

Pilot Case Selection and Cost

Pilot cases will range in size from 250,000 to 500,000 acres and focus on a contiguous landscape, and most typically a watershed. This scale is selected because integration and resilience typically involve large scales that can provide terrestrial and aquatic services today, and contribute to future species needs as well. A 250,000-500,000 acre watershed can provide a volume of services worth investing in, as well as production of ecosystem services that humans and natural systems depend upon. Embedded communities may play a role in managing the landscape, and will more than likely directly benefit from investment in it. At the same time, this scale is small enough to be understood. Pilot areas will likely involve mixed ownership, but this is not required. Mixed ownerships encourage a broader array of stakeholders. Pilot areas could correspond to Forest Service regions, or be anchored in a subset of them.

Six to eighteen cases will be selected for analysis dependent on scope and available funding.

Small: A focus on California—the Sierra Nevada—6 cases (\$175,000 to \$250,000 per case)

Medium: The Intermountain and Pacific West—12 cases (\$150,000 to \$225,000 per case)

Large: Nationwide—18 cases. (\$125,000 to \$195,000 per case) Costs per case can be reduced with less work devoted to identification and establishment of institutional mechanisms for establishing ecosystem service payments.

Initial support is requested from the Department of Agriculture and the U.S. Forest Service because of the agency's responsibility for managing lands producing a variety of valuable ecosystem services and because agency land will be included in the pilot areas. Additional support will be sought from other agencies, including (but not limited to) the National Science Foundation, and private funders.

An advisory body, involving agency and university scientists and others, will be established to provide project oversight and assist in the selection of pilot cases. Pilot project study teams will also involve agency, university, and NGO scientists.

Project Implementation

Phase I (2-3 months)

- Develop and refine project study components
- Secure funding for project launch
- Identify additional public and private sources of support

- Identify project partners

Phase II (3-6 months)

- Establish a multidisciplinary project advisory body involving agency, university and NGO scientist involvement
- Develop a list of 24 pilot sites for evaluation for inclusion in the study
 - Examine the hypothesis that pilot sites be 250,000 to 500,000 acre watersheds
 - Explore regionalizing pilot cases
 - Examine other federal and state agency initiatives that can be leveraged with this project
- Select 6-18 cases for study inclusion
- Identify agency, academic, and NGO scientists to be involved in the pilot cases
- Establish science teams to participate in ecosystem service evaluation, energy balance studies, etc, by cases
- Submit grant proposals for additional funding (National Science Foundation, other governmental support, private foundations, and others)
- Conduct key informant interviews to identify key resource issues and challenges, and local understanding of and willingness to engage in exploration and valuation of ecosystem services

Phase III (8-24 months)

- Launch pilot studies
 - Establish a local advisory body— such as a Community Resource Council—for each pilot—this could be linked to already established Resource Advisory Committees or some other appropriately focused body that is comprised of a representative mix of interests
 - Collect biophysical baseline information and map data
 - Identify key services in each pilot
 - Develop biophysical production functions for valuing services and spatially display resource data
 - Develop energy balance flows in pilots to examine carbon impacts associated with exogenous and endogenous products used for energy
 - Identify implications of climate change on ecosystem services
 - Examine institutional opportunities and limitations for reinvestment
 - Explore implementation of reinvestment strategies and mechanisms
 - Identify potential for reinvestments in resiliency to ameliorate climate change impacts
- Explore similarities and differences of cases regionally (and nationally if the project scope allows)
 - Develop lessons on service provision
 - Identify institutional mechanisms and programs for valuing, collecting, and reinvesting for resiliency for landscape and community
- Develop a report on findings and policy recommendations for larger-scale ecosystem services and Restoration for Resilience Project implementation including but not limited to the following:
 - The implications of similarities and differences regionally and nationally

- Identify how a program can be launched to advance development and maintenance of an ecosystem services program that monitors progress in developing a large-scale Reinvestment for Resilience program, with an adaptive component that blends monitoring with program improvement and improvement in on-the-ground and policy tools
- The potential for Reinvestment in Resiliency to reduce the impact of climate change
- An adaptive framework for improved understanding of the administrative structures and reinvestment strategies necessary to improve the resilience of natural systems.

Sierra Institute Experience and Capabilities

The Sierra Institute for Community and Environment (<http://sierrainstitute.us>) is a not-for-profit research and education organization dedicated to promoting healthy forests and watersheds by investing in the wellbeing of rural communities and strengthening their role in decision-making. Founded in 1993, the Institute is based in the rural community of Taylorsville in California's Sierra Nevada with associates in Oregon. It combines research in the social sciences with education and direct collaboration with government, community, and tribal groups to generate the knowledge and to build the capacity to promote and sustain healthy landscapes and rural communities.

The Sierra Institute for Community and Environment has carried out a number of assessments and facilitated educational and capacity-building activities for a variety of agencies and groups. Projects relevant to this proposal include:

- Participated in the core team that led the Sierra Nevada Ecosystem Project (SNEP). For SNEP, Sierra Institute staff also led the community assessment team and the public participation team, the latter of which developed and published the paper “The Role of the Public in Adaptive Ecosystem Management” in the SNEP report to Congress;
- Completed an assessment of the Secure Schools and Community Self-Determination Act (Public Law 106-393) for the Departments of Agriculture and Interior. The review informed the re-authorization debate in Congress, including recommendations that were incorporated into the subsequent legislation;
- Staff led a five-year effort to develop and implement a multiparty monitoring program for the Collaborative Forest Restoration Program (created under Title VI of the Secure Rural Schools and Community Self-Determination Act (P.L. 106-393)) to fund collaborative, community-based partnerships that improve forest ecosystem functioning and encourage restoration-based economic development in watersheds across New Mexico;
- Led a social science team in Forest Ecosystem Management Assessment Team (FEMAT), the Clinton Administration's team that produced the Northwest (Option 9) Forest Plan;
- Evaluated the forest restoration industry in Humboldt County to determine its overall importance to the local economy. The study provided a first-ever quantification of the number of full-time jobs created by the restoration sector and was published in the journal “Environmental Restoration”;

- For ten years, facilitated and coordinated 15 community-based groups from Oregon and California to advance community-based approaches to natural resource management including monitoring processes for improved public land resource management;
- Staff have written or edited three books and numerous peer-reviewed papers on community involvement in natural resources; and
- Currently working on two projects focused on community involvement in management of mixed ownership lands and ecosystem services in two watersheds in Northern California.

With its rural location in Taylorsville, California, its wide experience in community-based analysis of resources and resource use, and its reputation for maintaining excellent working relationships with state and federal land management agencies and other NGOs, the Sierra Institute for Community and Environment is positioned to effectively lead and successfully implement this project.