

Western Farmers and Ranchers as Problem Solvers

*A Compilation of Case Studies
Highlighting Locally-Driven Solutions
to Western Water Resource Challenges*



**Water Summit
U.S. World Water Day
March 22, 2016**



Protecting and enhancing
Western irrigated agriculture

Introduction

For family farmers and ranchers, finding solutions to constantly emerging water resources challenges is just business as usual. This report compiles a number of case studies that highlight real-world examples of water conservation, water transfers and markets, aging infrastructure problems, watershed restoration, and ecosystem enhancement. The report describes unique complications facing local water users, the creative solutions that can be developed to meet those problems and recommendations that ensure continued, locally-driven success. With the release of this report, we seek to expand the reach of these lessons learned by farmers and ranchers – working collaboratively with government agencies, conservation groups, and tribal interests coping with the drought – to help scale efforts that support better management of water for both economic purposes and environmental uses.

About the Family Farm Alliance

The Family Farm Alliance is a nonprofit organization composed of family farmers and those in related industries throughout the Western states dedicated to the preservation of irrigated agriculture. The organization was formed to ensure that its members are afforded an opportunity to air their views and concerns to the public, to legislators, and to regulators. The Alliance is a grassroots organization, and therefore works directly with individual farmers in order to preserve the tradition of farming which has developed in the Western states and which provides the country with a majority of its food and fiber. The principal objective of the Alliance is to help ensure the continued availability of adequate irrigation water supplies to Western farmers.

The Alliance's Problem-Solving Philosophy

The Alliance has a long tradition of developing practical solutions to the challenges facing Western agricultural irrigators. The organization conveys these solutions to Congress, the executive branch, and other water policy makers through a variety of forums. In the past decade, Alliance representatives have testified 50 times before Congressional committees on water and environmental legislation and related issues. Through the years, we have also published several reports that have provided guidance to policy makers on issues important to irrigated agriculture. For example, in 2007, the Alliance was one of the first national agricultural associations to proactively address climate change implications for producers when it released "Water Supply in a Changing Climate – The Perspective of Family Farmers and Ranchers in the Irrigated West". For family farmers and ranchers, finding solutions to constantly emerging challenges is just business as usual. Nature, the markets and the government are always finding new problems to throw at farmers, and farmers who are not determined, resourceful and innovative do not succeed – at least not for long.

Innovative Solutions

Family farmers and ranchers have a proven track record of finding solutions to constantly emerging challenges. The ongoing, initial response of irrigators and water agencies to current water supply challenges can provide some insight into the possible measures that might be taken to cope with long-term water supply reductions resulting from climate change and competing uses. This report compiles a number of case studies that highlight real-world examples of water conservation, water transfers and markets, aging infrastructure problems, watershed restoration, and ecosystem enhancement. It describes unique complications facing local water users, the creative solutions that can be developed to meet those problems and recommendations that ensure continued, locally-driven success.

The reader should come away from this with the clear message that water managers, ranchers and farmers are resourceful and creative individuals. They should be actively solicited by federal water policy makers to

participate in resolving the water conflicts of the West. The following real-world examples are intended to provide templates for success as Congress and the Administration consider developing legislation and polices to address the current drought and water management for the future:

- Employing New Technology: Elephant Butte Irrigation District (New Mexico)
- Collaboration, Ecosystem Restoration, and New Storage: Yakima Basin (Washington)
- Empower Locals to Develop New Storage: Sites Joint Power Authority (California)
- Collaboration, Conservation, Energy and Water Reliability, and Regulatory Assurances: Deschutes River Basin (Oregon)
- Long-term Environmental Enhancement and Water Supply Reliability: Klamath Settlement Agreements (California / Oregon)
- Conservation and Drought Resilience: Upper Colorado River Basin (Colorado / Wyoming)
- Locally-Driven Watershed Management: Little Snake River Basin (Colorado / Wyoming)

Irrigators and their local water agencies have responded to the recent Western drought with determination, resourcefulness and innovation. They also are bringing those attributes to bear in planning for a future where “drought” may be a long-term or even permanent condition. Some of these actions are intended to address the immediate crisis; others have been implemented as part of the broad portfolio of actions that successful farmers are employing to stay profitable in today’s fierce economic and regulatory climate. If federal agencies are willing to take lessons from how farmers and ranchers are coping with the drought, the result would likely be better management of water for both economic purposes and environmental uses. The Alliance hopes that these case studies will provide policy makers and other stakeholders with a more nuanced understanding of the diversity and complexity of western agricultural water conservation and an appreciation of what continuing to take agricultural lands out of production might mean.



CASE STUDY #1: Employing New Technology (Elephant Butte Irrigation District - New Mexico)

With less snow pack runoff and a more intense monsoon season, the Elephant Butte Irrigation District (New Mexico's largest irrigation district) has been instrumental in developing a storm weather tracking system that gives water managers time to react to monsoon events that can bring torrential rain events into the Rio Grande Valley. The new system can detect the storm event 20 miles away from the valley, calculate the rain event and determine the storm track before it hits the valley floor. The District then captures it in the Rio Grande River, diverts it into their canal system to irrigate farm land and into a system of drains that allow the storm water to recharge the underground aquifer.

Setting

Elephant Butte Irrigation District (EBID) is the New Mexico portion of the Rio Grande Project (RGP) in southern New Mexico and far west Texas, providing for international treaty delivery by the United States to Mexico. This region of the Chihuahuan Desert has great potential for agricultural production dating back to pre-Columbian times, but this productivity has been tempered by periodic severe and sustained droughts. The major concern now is that the drought we are facing may be more than just a drought. It is likely a harbinger of a permanent shift to a more arid climate in the area. The EBID delivers water to 90,640 acres through an extensive network of miles of canal system. Drought has become one of the greatest water issues facing the West; the District and its members have countered with innovative, creative and conservative practices to deal with this crisis.

Need

The profound drought that the RGP has experienced in the past 16 years has led to dramatically reduced spring snowmelt runoff from southern Colorado and northern New Mexico. Historically, snowmelt runoff has been the controlled and regulated source of supply for the RGP. For most of the last 16 years, snowmelt runoff has been far below the historical average. Local monsoonal rainfall and resulting intense and violent runoff was more of a hazard than a viable water source. Very basic flood control infrastructure in the form of earthen dams and conveyance channels to the Rio Grande, EBID drains and canals was developed from the 1950s to the 1970s, with the objective of evacuating storm water from the watersheds and irrigation system as quickly as possible to avoid structural or property damage from the intense flood waters of the monsoon.



Summer monsoon over the Mesilla Valley. Photo by N. Khandan.

EBID responded to the drought that began in the early 2000s by viewing storm water not as a threat but as a valuable resource. They began placing sensors equipped with telemetry on most of the main arroyo systems in the district to collect rainfall runoff data. One of the challenges of storm water management within the district is that there are at least 20 major watersheds and hundreds of small watersheds within the whole system. However, the US Bureau of Land Management (BLM) owns most of the land where the sensors need to be placed. While EBID has achieved some access and cooperation with the BLM, much more collaboration is needed.

Approach

Drought and the prospect of an increasingly arid climate have motivated EBID to rethink the management of storm water, essentially to “grab the bull by the horns”. They began to look at storm water flows as a viable source of water. In the absence of resources to build large new flood control infrastructure, EBID has relied on state-of-the-art information infrastructure with strategic improvements to existing facilities that are deficient and degraded to more effectively capture and beneficially use the previously unusable and hazardous monsoonal flows coming into the District below the major Project storage facilities at Elephant Butte and Caballo reservoirs.

Storm Water Capture in the district involves high intensity, generally monsoonal events downstream of Caballo Dam. The historical strategy was to evacuate water downstream as quickly as possible. Now the goal is to capture water in flood control dams, agricultural canals and drains. The direct use of storm water allows EBID to meet downstream demand as well as providing opportunity for infiltration into the aquifer. In 2013-14, several thousand acre feet were captured in canals, drains and in the bed of the Rio Grande after reservoir releases had ceased for the year. Additional benefits include improved downstream flood protection, enhanced riparian habitat and improved water quality.

Strategic Time Frame

Preparation is the key to managing storm water, and EBID’s staff track storm formation from satellite imagery while it is still days away, off the Pacific coast, in the Gulf of Mexico, or streaming off the tops of the Sierra Madres in Mexico. As storm systems approach and their structure becomes clearer, Doppler Radar from the National Weather Service’s National Mosaic and the EPZ radar station in Sunland Park, New Mexico provide information on the tack of specific cells that may produce runoff within a timeframe of several hours.

Tactical Time Frame

As storms hit the area, it is critical to know how intense a precipitation event will be so that the appropriate action can be taken. Decisions on where to capture storm water and where to avoid it must be based on reliable information. While Doppler radar gives a general idea of storm intensity, actual rainfall hitting the ground is the key process, indicating runoff events with lead times of two hours to several minutes. Using telemetry data gathered remotely out in the field, EBID quickly analyzes where a storm is likely to hit, where it actually does, and then how much storm water is generated and fed into the system. With enough rain gauges in place, the data generated can greatly increase public safety in the event of a major storm event.

Rainfall Monitoring

EBID is developing a network of rainfall gauges in the upper reaches of the key watersheds that drain into the Rio Grande, often through EBID facilities. These gauges continuously report data through a radio telemetry system that includes alarms sent to key personnel cellphones when precipitation events occur. The district is working to get a rain gauge in each one of the contributing watersheds. The continued expansion of the data coverage area will provide a more complete picture, resulting in better water resource management. Further collaboration and support from the BLM is critical.

The knowledge of where precipitation is falling and at what intensity allows EBID personnel to fine-tune their response and capture the runoff where it is feasible and safe. The district has developed a compact rainfall gauge with radio telemetry that can be backpacked into critical watersheds in wilderness areas and national monuments where motorized vehicles are prohibited.

Arroyo Flow Gauging

As rainfall runoff collects and concentrates in arroyos, both the opportunity and danger of capturing storm water become clear. EBID refines its response as instrumented gauges in major arroyos report flow rates in real time through the district's radio telemetry system. Very large events may require avoidance at the local level, but may be captured once they flow down the river and peak flow rates are attenuated. Smaller events can be captured directly and managed within EBID's conveyance and drainage system. EBID has modified drains, originally designed for the low flows associated with water table control to allow impoundment and regulation of significant arroyo flows. As arroyo flows reach the Rio Grande, focus switches to EBID's river gauging stations. EBID maintains six river gauges that are used by the district and other local agencies to monitor the status of reservoir releases as well as floodwater in the main stem of the river.

Diversion of Storm Water

Diversions are done primarily at Leasburg and Mesilla Dams. Timing of the diversions is critical because the leading edge of a storm surge can have very high debris content. It is key to let the first surge of debris pass by before capturing for farm use or aquifer recharge. Captured storm water could potentially be several hundred acre feet or more per event.

Lessons Learned: While EBID's primary goal in storm water capture is to either use the water directly for irrigation or infiltrate it as aquifer recharge, the district's efforts have many benefits. First, the storm water capture helps ensure the safety of persons and property downstream. Secondly, storm water capture sites such as Selden Drain provide riparian habitat for many bird and wildlife species. Finally, detention allows die-off time for potentially harmful microorganisms associated with storm water runoff, improving water quality. This multi-benefit approach is truly a bright spot in an otherwise bleak drought.



Storm water diverted into the Leesburg canal after reservoir releases had ended for the year.

CASE STUDY #2: Collaboration, Ecosystem Restoration and New Storage (Yakima Basin - Washington)

Setting

Washington's Yakima River Basin begins in the Cascade Mountains and extends to the confluence of the Columbia River, spanning 6,100 square miles of forests, rangeland, shrub steppe, and intensely irrigated cropland. Though dry, the basin's lowlands are extremely fertile, producing wine and juice grapes, apples, cherries and other tree fruit, timothy and alfalfa hay, mint, and 75% of the nation's hops. The area's 464,000 irrigated acres contribute approximately \$4 billion in annual farmgate dollars to Washington's economy, while more than 1.7 million acres of publicly-owned land attracts outdoor recreation enthusiasts from across the state and nation. Hiking, camping, rafting, snowmobiling, angling and hunting are all popular pursuits, generating another \$1 billion in economic benefits.

Challenges

The economic success and ecological integrity of the Yakima Basin face significant challenges. The area has experienced 14 droughts since the 1970s, and its infrastructure is not drought resilient. Current irrigation demands require 2.4 million acre-feet (AF) of water annually, whereas the five Bureau of Reclamation reservoirs constructed between 1910 and 1933 store only 1 million AF. The remaining 1.5 million AF has historically been stored in the Cascade snowpack, which melts during hotter summer months to refill the creeks, streams and reservoirs that hydrate the basin.

In 2015, the Cascades received an average amount of precipitation, but warming temperatures caused it to fall as rain rather than snow. This caused a 'snowpack drought', where a lack of accumulated snow meant no runoff to see farmers, fish or wildlife through an unusually hot and dry summer. Prorateable (junior) irrigation districts received only 47% of their water allotment and tens of thousands of fish died due to high in-stream temperatures. Meanwhile, the entire state of Washington was placed into a state of federal emergency as more than 1 million acres were lost to wildfires, including 41,000 acres on the Yakama reservation.

Demands on Yakima Basin water increase every year. It is the lifeblood of farms feeding the nation, of unique recreational opportunities, of pristine natural areas, and of the eventual restoration of extirpated



The Yakima River flows through the Yakima Canyon between Ellensburg and Yakima, Washington. Photo source Washington Dept. of Ecology

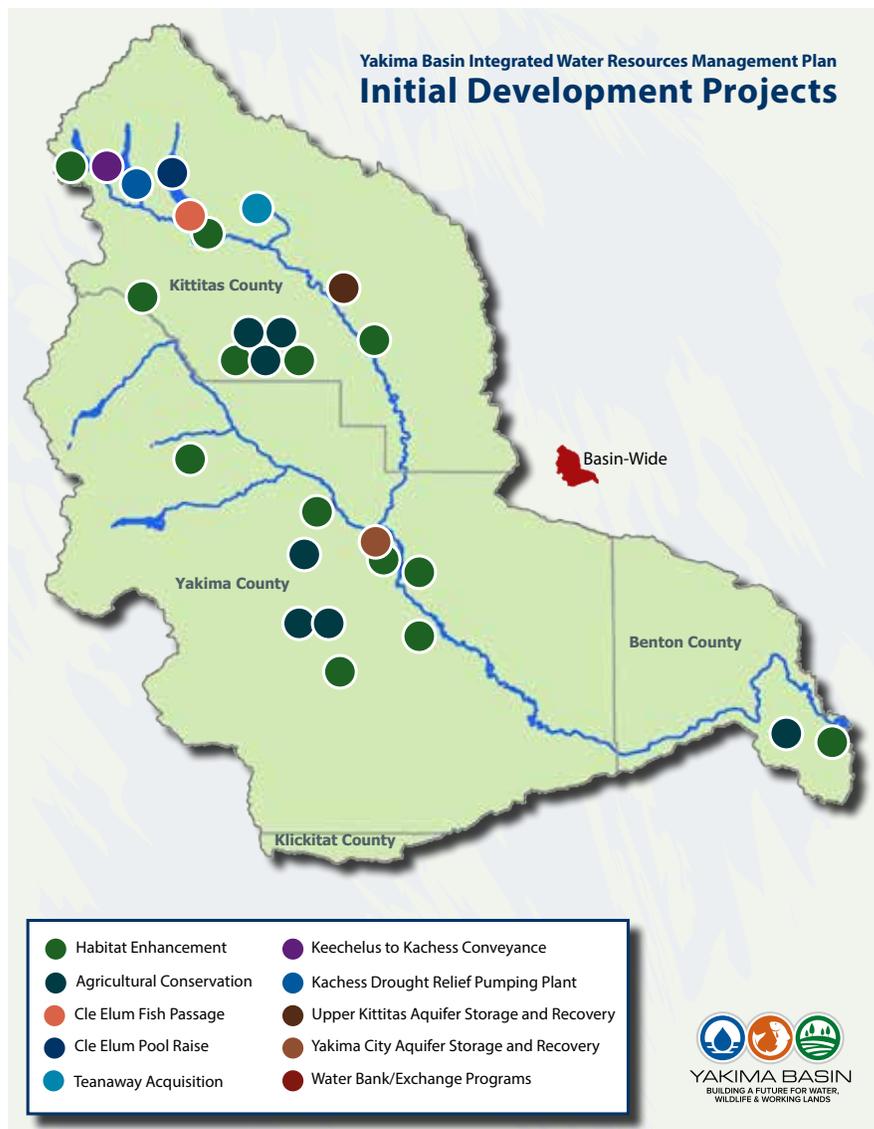
and endangered fish. Every drop of surface water is already allocated through a complicated series of tribal, senior and junior water rights., but shortfalls during drought years have historically been resolved through lengthy and costly lawsuits. One of the longest-running, *Acquavella*, began in 1977 with more than 6,600 parties and has yet to be resolved despite failing to address issues such as groundwater or flows for fish and riparian health. Decades of such litigation and entrenched ideology prevented the basin’s various stakeholders from deciding on a comprehensive plan for water development and best use.

The Plan

In 2008, two major factors created an untenable status quo that brought these stakeholders to the table: the impacts of climate change, and the Black Rock project, which would cost a \$7 billion proposal to reroute water from the Columbia River into the Yakima. It was clear that the climate regime was shifting to warmer winters, and none of the Yakima Basin parties were happy with Black Rock’s price tag, environmental impacts, or potential precedents. Historical opponents including irrigators, the Yakama Nation, business interests and conservation groups came together with state, federal and local government agencies to determine an alternative plan for the Yakima Basin’s water needs.

The Yakima Basin Integrated Plan is the result of their hard work and compromise. It is a 30-year, \$3 billion package of actions that will ensure a reliable and sustainable water supply for communities, farms, wildlife, fish, working lands and recreation. The solutions put forward by the Yakima Plan restore ecosystem functions, increase fish habitat and population recovery, improve increase the stability of stream flows and ensure the reliability of agricultural irrigation and municipal water supply. The Yakima Basin Integrated Plan was developed through a collaborative public process where stakeholders weighed their needs versus their wants, came to understand the views of their traditional opposition, and negotiated to reach a consensus. In order to keep all the users at a table, the group created a framework of key elements that align with their diverse priorities:

- Enhanced water conservation efforts
- Habitat restoration and protection
- Establishing fish passage throughout the basin,



- Surface water storage
- Groundwater storage
- Structural and operational changes to existing infrastructure
- Increased water marketing

Each element receives an equal amount of attention and focus from Yakima Basin Integrated Plan projects, ensuring that all needs are met in an equitable fashion. The projects selected for implementation in the first 10 years (or Initial Development Phase) of the plan exemplify this. They include establishing fish passage at a reservoir that currently obstructs 48 miles of pristine habitat, protecting that aquatic habitat with a Wild and Scenic Rivers designation, conserving 85,000 acre feet of water on an annual basis by upgrading irrigation systems, accessing 200,000 acre feet of inactive storage at an existing reservoir, restoring flood plains and meadows to control flood damage and recharge groundwater, working between agencies to streamline existing water markets, installing a pipeline to help balance water levels between reservoirs, and protecting 70,000 acres of forested uplands, meadows, flood plains and shrub steppe. The stakeholder group behind the Yakima Basin Integrated Plan determined these projects would have the greatest impacts for the lowest cost, and address many of the increasingly urgent needs driven by climate change and declining snowpack.

Combining the key elements also optimizes project outcomes, such that users see benefits from projects that traditionally would not impact their needs. During the 2013 Washington State Legislative Session, the unique coalition behind the Yakima Basin Integrated Plan worked collaboratively to pass bipartisan legislation supporting the implementation of the Plan and securing over \$132 million in funding for the effort. The central component of that funding package was the acquisition of the Teanaway Community Forest, a threatened but intact 50,000-acre mid-elevation forest in the upper Yakima River watershed, that is now conserved and managed for the water supply and fisheries goals of the Yakima Plan.

Kittitas Reclamation District: Projects with Multiple Benefits

The strong and diverse coalition continues to develop innovative ways meets the wide ranging water needs in the Yakima Basin. During the 2015 drought the Kittitas Reclamation District, a key stakeholder in the Yakima Basin Integrated Plan, utilized its canal system to reroute water meant for downstream users into nine dry tributaries. This action provided a natural path for water heading to the lower Yakima Basin. Downstream diverters recaptured the flow, sending it to designated farmers and other users via canals, but along the way this “borrowed” water provided environmental services. Trees and shrubs that shaded streams and stabilized banks were kept alive, reducing future flood risks. The healthier, wetter environment



allayed the risk of fire. Perhaps most importantly, stranded pools of ESA-listed steelhead received cold, clean water and access to higher elevation habitat.

In order to accomplish this, KRD had to broker agreements with irrigation districts in the lower Yakima Basin. They reached out to the Washington Department of Ecology, which quickly crafted agreements and permits. The Yakama Nation and the Washington Department of Fish and Wildlife helped identify the most at-risk tributaries, while KRD staff worked nights and weekends to construct the systems necessary to move water between canals and adjacent streams. Additional relief efforts by conservation groups like Trout Unlimited compensated farmers for fallowing fields;. While the drought limited crop production, these programs offered an alternative source of revenue, a beneficial use for their water, and kept water in streams for fish and wildlife.

An Integrated Solution

Lessons Learned: Rerouting irrigation water through natural streams as opposed to canals seems like a common sense solution, but it would not have been possible without the partnerships and relationships created through the Yakima Basin Integrated Plan collaborative process. With so many moving parts to coordinate, this deceptively simple concept could have fallen apart at any time. It succeeded because the groups involved had already spent years sharing findings, discussing potential projects, and building trust and respect. Their efforts kept streamside ecosystems alive, supported fish and outdoorsmen and ensured farmers received allotted water, all while providing joint benefits for agriculture and the environment--two sectors long in conflict. Collaboration makes this approach a model, one that is being copied throughout other western watersheds. In a recent hearing before the Senate Energy and Natural Resources Committee, Deputy Secretary of the Interior Michael Connor referred to the Yakima Basin Integrated Plan as "a model – not just for working through watershed challenges, but for any natural resources management [issues]."

The Yakima Basin Integrated Plan offers the best opportunity to resolve long-standing problems afflicting the Basin's ecosystem and economy. Its importance for the basin and its status as a national model has received bipartisan recognition and support; in 2015, Senators Cantwell and Murray (D-Wash.) introduced S. 1694, which, if adopted, would authorize federal support for Initial Development Phase projects. Representatives Reichert and Newhouse (R-Wash.) introduced a house companion bill, H.R. 4686, in February of 2016. When implemented with this broad backing, the Yakima Basin Integrated Plan will greatly improve operational flexibility to support streams and environmental needs, while keeping irrigators and farms solvent under a wide range of climate conditions, both now and under possible future hydrologic projections.

CASE STUDY #3: Empower Locals to Develop New Storage, Using Streamlined Permitting and Innovative Financing (Sites Project Authority – Northern California)

Growing concerns about the delays and costs associated with the proposed Sites off-stream reservoir project in the Sacramento Valley of California, as well as the need for a local voice, led to the formation, in August of 2010, of the Sites Project Authority (SPA). To help address the longer term water supply needs throughout the west, Sites proponents are seeking new federal assistance tools to help local agencies better manage and develop new water supplies critical to a more drought resilient economy.

Sites Reservoir is foundational to the long-term economic health of Northern California and the state as a whole. Sites will bring 1.8 million AF of new water storage to California. The Sites Project represents the kind of new, smart storage that California needs, one that will not only create additional supplies behind the dam itself, but will allow significant additional water to be stored in other upstream reservoirs (Trinity, Shasta, Oroville and Folsom) due to coordinated operations and integration efficiencies. In a year like 2015,

if Sites were in place, it is estimated there would have been an extra 400,000 AF of water in storage north of the Delta to meet the water needs of agriculture and California cities, as well help meet the Central Valley Project obligations for environmental water for fish and waterfowl. For 2016, DWR has estimated that an additional 500,000 AF of water could have been diverted during the storms through the end of February.

NEPA Challenges

Local water managers' experience with the Sites project exposed several bureaucratic and regulatory challenges. Importantly, the environmental review process that Reclamation is forced to deal with through existing federal law does not support the common sense approach that the Project Authority has attempted to pursue on the Sites project. Under the National Environmental Policy Act (NEPA), a great deal of time and money is expended on studies and analysis of multiple inferior alternatives to the original purpose and need statement, only to use the Environmental Impact Statement (EIS) process to eliminate these lesser alternatives and arrive back at the project that was originally proposed as the solution with the greatest benefit for the dollars expended.

In the case of the Sites project, the Bureau of Reclamation (Reclamation) and the DWR initially investigated and considered 52 alternative reservoir sites before identifying Sites Reservoir as the preferred location for an offstream, north-of-Delta storage reservoir. That iterative screening process was completed in 2008, yet some critics have recently suggested that even that process was carried out too quickly and perhaps the agencies should have taken even more time to examine still other sites before narrowing the list to three separate storage configurations at the Sites location. Ironically, the three configurations being evaluated today in the Environmental Impact Review (EIS) are very similar to the project originally envisioned in the 1960's.

Further, under NEPA, the costs of alternatives are not considered until after the environmental review documents are completed. This is not a practical way to develop a project. In the case of water supply, a project proponent can end up with a project that no one can afford, sacrificing any opportunity for even incremental storage benefits. The process must consider project costs, both the total costs and how the project is going to be paid for, earlier in the process.

Other Regulatory Challenges

In his 2011 State of the Union Address, and again in August 2011, President Obama called for further steps to enhance the efficient and effective permitting and environmental review of infrastructure development "through such strategies as integrating planning and environmental reviews; coordinating multi-agency or multi-governmental reviews and approvals to run concurrently; setting clear schedules for completing steps in the environmental review and permitting process; and utilizing information technologies to inform the public about the progress of environmental reviews as well as the progress of Federal permitting and review processes."

All of these are worthy goals, but in water resources development, at least in California, there is little evidence that these goals are actively being implemented and turned into new practices. Since Fiscal Year 2002 and 2012, Reclamation spent approximately \$12.7 million on the Sites feasibility study alone and DWR has spent \$42 million¹. Unfortunately, despite this effort and the many promised benefits that would result from the Sites project, local project proponents still found themselves in a place where it was difficult to clearly articulate the benefits of the project, the costs, and how the project would be funded. While part of the delay was certainly due to the complexities associated with multiple state and federal agencies being involved in the project, other delays were attributable to shifting environmental requirements, which is ironic since one of the project's strengths is the flexibility it provides to shift its operations to align with

1. Source: July 2015 Memorandum of Understanding between USBR & Sites Project Authority

revised priorities for both public benefits and consumptive uses. For example, delays in completing the Sites project environmental review process are attributable in part to changes in operational conditions described in the Central Valley Project Operations Criteria and Plans Biological Opinions (BOs) in 2004/2005 and then again based upon a Biological Opinion from (a) U.S. Fish and Wildlife Service regarding the Delta Smelt issued in December 2008 and (b) National Marine Fisheries Service regarding salmonids issues in June 2009. In both

California's Surface Water System

2/3 to 3/4 of Supply
 City of Sacramento
 2/3 to 3/4 of Demand

2016 March *in acre-feet Source: DWR



instances, DWR and Reclamation had to go back and remodel the project, based on the revised BOs. As Reclamation's Mid-Pacific Regional Office noted in a letter to "Interested Parties" in May 2009, "Changes are continuing so rapidly that our studies and reports are not keeping pace."

This new information did not, in fact, change the fundamentals of the project. The fundamentals of the project remained sound, but the process stalled, in spite of the best efforts of Reclamation and DWR, further increasing costs and further delaying the availability of the many benefits a Sites Reservoir will provide. Growing concerns about the delays and costs associated with the Sites project as well as the need for a local voice, led to the formation, in August of 2010, of the Sites Project Authority.

Sites Project Authority

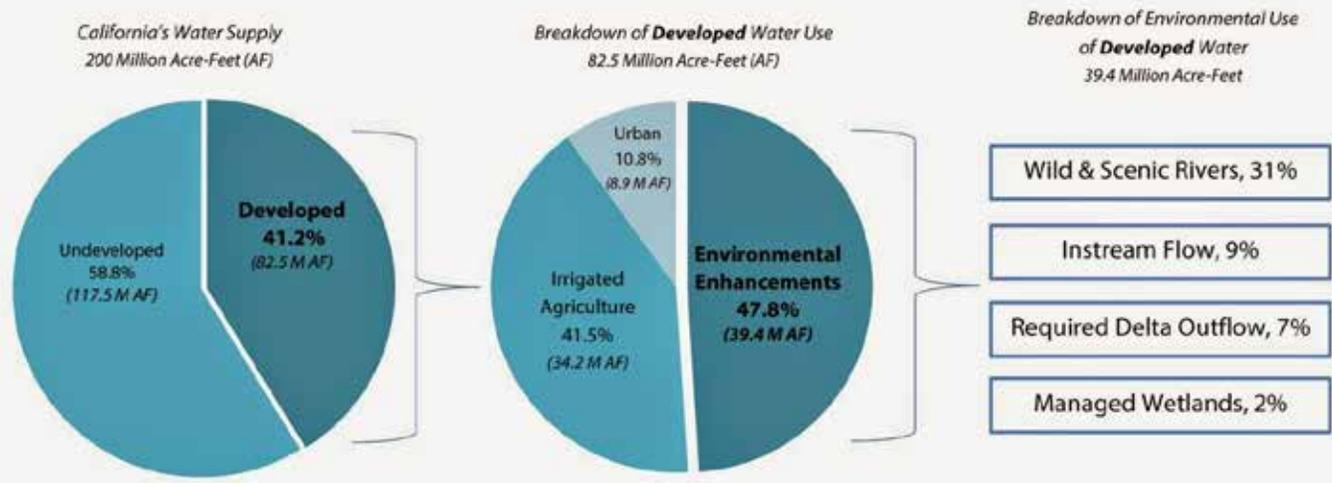
The Sites Project Authority (SPA), which includes Sacramento Valley counties and water districts, was formed with the stated purpose of establishing a public entity to design, acquire, manage and operate Sites Reservoir and related facilities to improve the operation of the state's water system. The Authority's mission, stated in its governance document is, "To be a proponent and facilitator to design and potentially acquire, construct, manage, govern, and operate Sites Reservoir and related facilities; to increase and develop water supplies; to improve the operation of the state's water system; and to provide a net improvement in ecosystem and water quality conditions in the Sacramento River system and the Delta."

The Project would also provide improvements in ecosystem and water quality conditions in the Sacramento River system and in the Bay-Delta, as well as provide water supply reliability improvements to a large area of the State of California. The formation of local Joint Power Agreements (JPA's) was included as a key provision in the 2009 California Water Package Water Bond legislation for the purposes of pursuing storage projects that could be eligible for up to 50% of project funding for public benefits.

The SPA took a common-sense approach when it began working with Reclamation and DWR to put together Foundational Formulation Principles. Local project proponents envisioned a project that would be

California Water Use

Environment | Agriculture | Urban



Agriculture only uses 17.1% of California's total water resources. When you consider the fact that California's undeveloped water supply is also dedicated to environmental protection, **the environment actually accounts for 78.5% of California's total annual water use.**

Source: California Dept. of Water Resources - Water Plan Update, 2013 - Vol. 1, Chapter 3: California Water Today (Appendix Table 3-2)

integrated with the system they already had, and one that would also operate effectively regardless of future operational changes to the larger system, such as construction of new conveyance to export water users located south of the Delta. The SPA wanted to maximize the benefits associated with existing infrastructure and provide as much benefit as possible to both the existing state and federal water projects in a cost-effective manner.

RIFIA Guaranteed and Secured Loans

Modeled after the successful and popular Transportation Infrastructure Finance and Innovation Act (TIFIA) program, which provides assistance to large-scale transportation projects and the Water Infrastructure Finance and Innovation Act (WIFIA) pilot program approved in the Water Resources Reform and Development Act, the Reclamation Infrastructure Finance and Innovation Act (RIFIA) authorized in S. 2533 would offer long-term, low-cost financing for a variety of water infrastructure projects, including surface and groundwater water storage projects.

Specifically, the bill would authorize Reclamation to provide secured loans, as well as guaranteed loans to any water infrastructure project that the Secretary determines would contribute to a safe, adequate water supply for domestic, agricultural, environmental, or municipal and industrial use; a project for groundwater replenishment, groundwater storage, or surface storage; a project for enhanced energy efficiency or hydropower development in the operation of a water system; a new water infrastructure facility project, including a water conduit, pipeline, canal, pumping, power, and associated facilities; a project to reclaim and reuse municipal, industrial, domestic, agricultural wastewater, and naturally impaired ground and surface waters; a brackish or sea water desalination facility; and a project for accelerated repair and replacement of an aging water distribution facility.

Funds, under the Act, would be available to finance the planning, design, and construction, as well as the acquisition of real property or an interest in real property if the acquisition is integral to an otherwise eligible project.

RIFIA offers the opportunity to greatly leverage limited federal funds. A \$100 million a year program investment would support no less than \$1 billion in water infrastructure financing and would likely result in no more than a two to three million dollar charge against federal outlays, making it a very cost-effective way for the federal government to provide much needed water infrastructure financing assistance in advance of extraordinary drought and chronic water shortages. S. 2553 allows the Secretary to collect any charge against outlays from the borrowers, eliminating all charges against outlays when the funds are appropriated to implement the program.

The following table estimates construction financing costs achieved using RIFIA versus traditional municipal bond financing for one Sites Reservoir alternative.

RIFIA VS. Municipal Bond Financing

Comparison of Construction Financing Costs for Sites Alternative E*	
Traditional Financing; Interest Rate of Five Percent for Construction Cost Paid by JPA Members	
TOTAL PROJECT COST	\$4,208,000,000
California Water Bond Funding for Construction	\$1,252,000,000
Balance of Construction Cost (including interest accrued during construction) Paid by JPA Members**	\$2,956,000,000
Annual JPA Capital Cost Repayment Obligation	\$189,946,668
Estimated Average Annual Water Supply Price (300,000 AF; Capital Costs Only; No O&M)	\$633 per acre foot
RIFIA/Federally-Backed Financing; Interest Rate of 2.69 Percent (Rate as of March 11, 2016)	
TOTAL PROJECT COST	\$4,208,000,000
California Water Bond Funding for Construction	\$1,252,000,000
Balance of Construction Cost (including interest accrued during construction) Paid by JPA Members	\$2,956,000,000
RIFIA Financing (49 percent of total project costs)	\$2,061,920,000
Balance of JPA Costs Repaid at 5 percent over 30 years)	\$894,080,000
Annual JPA Capital Cost Repayment Obligation	\$148,510,881
Estimated Average Annual Water Supply Price (only Capital Costs; no O&M)	\$495 per acre foot

*Alternative E – no new intake for the Delevan pipeline or pumped storage with a 1.8 MAF reservoir. No bridge is included. Total Cost = \$3.3B

**Assumes accrual of \$864,000,000 in interest during construction

The federal government should work with Western water users to explore methods of highly leveraging limited federal funding in order to increase its impact and, in effect, do more with less. Although federal funding for water infrastructure projects is already leveraged in the form of local matching requirements for federal grants, this leverage can be increased by developing innovative, market-based financing tools that provide significant financial savings for localities while shifting the bulk of financial risk from the taxpayer to the private sector. Proposals like those included in S. 2533, introduced by Senator Dianne

Feinstein, and other bills seek to authorize new funding and financing opportunities to support non-federal investments in needed water supply projects, like the Sites Project. RIFIA would provide local agencies with access to low-cost, long-term financing for much needed water infrastructure investments. Further, S. 2533 allows the U.S. Interior Department to enter a memorandum of understanding with California and up to four additional states to establish a pilot program that designates a state as lead agency for purposes of the National Environmental Policy Act of 1969 (NEPA).

Lessons Learned: Local project proponents for developing new surface water storage in Northern California approached the Sites project with the goal of making the best possible use of limited resources, and in the end, local irrigators believe they have identified a project that is both affordable and will provide significant benefits. Innovative approaches to financing (RIFIA) and allowing the State to serve as a lead agency for purposes of NEPA can improve flexibility, save money, and create a more efficient permitting process. The proposed project maximizes ecosystem benefits consistent with the State water bond, which states that at least 50% of the public benefit objectives must be ecosystem improvements. Other benefits include water supply reliability, water quality improvements, flexible hydropower generation, more recreation benefits and increased flood damage reduction. In short, SPA leaders approached the Sites project with the goal of generating water for the environment while improving statewide water reliability and regional sustainability in Northern California. They believe they have achieved that goal.

CASE STUDY #4: Collaboration, Conservation, Energy and Water Reliability, and Regulatory Assurances (Deschutes River Basin - Oregon)

Farming and ranching have long played important roles in Central Oregon's development. Agriculture continues to contribute to the region's economy through job creation, capital investment, and reliable economic activity. From thriving farmers' markets in Bend and Tumalo, to internationally competitive farms in Madras, Redmond, and Terrebonne, farming is a critical part of our region's way of life. Irrigation districts (Districts) play an invaluable role in conveying water supplies throughout the Deschutes Basin to many farm and ranch families, and are also working diligently to improve fish and wildlife habitat.

The Districts in partnership with conservation groups and local, state, and federal agencies are increasing instream flows in rivers and creeks, improving fisheries passage into historical habitat, and working to establish ecologically important wetlands. Since 2000, the Districts have reduced their annual diversions by over 80,000 acre-feet to increase flows in the Deschutes River, Little Deschutes River, Crooked River, Ochoco Creek, Whychus Creek, Tumalo Creek, and Crescent Creek, benefiting salmon, steelhead, bull trout, Oregon spotted frog, and other species. The Districts are also working with Fortune 500 companies to develop clean, renewable hydropower. Four small, micro-hydropower projects are now producing enough electricity for 6,000 homes.

The Districts are working with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and a dozen basin stakeholders on the Deschutes Basin Habitat Conservation Plan (DBHCP). When complete, the DBHCP will result in the implementation of restoration and enhancement projects to protect and improve fish and wildlife habitat.

The Districts are also involved in the Upper Deschutes Basin Study. This collaborative initiative is being funded with \$1.5 million by the U.S. Bureau of Reclamation and Oregon Water Resources Department to develop contemporary information for future water-management options in the Deschutes Basin. The study is scheduled for completion in early 2018.

Deschutes Basin Board of Control

The Deschutes Basin Board of Control represents the eight Districts profiled on the following pages.

Arnold Irrigation District

Arnold Irrigation District has worked aggressively to modernize its water conveyance system. Since 1995, the District has eliminated 11 miles of canals and ditches, and lined or piped nearly nine miles of canals to prevent seepage losses. These efficiencies have reduced the District's average peak demands on the Deschutes River. In cooperation with conservation interests, Arnold landowners have also implemented a number of instream leases to benefit fish and wildlife. Since 2010, Arnold has entered over 70 separate (and temporary) instream leases, resulting in as much as 30.5 cubic feet per second (cfs) of additional flow in the Deschutes River near Bend.

Central Oregon Irrigation District

In 2016, Central Oregon Irrigation District will begin the process to remove the Cline Falls Dam on the Deschutes River. COID's removal of this dam will allow resident trout and wildlife to migrate naturally through the former dam site, accessing river and riparian habitat along the Upper Deschutes. The District will finance a share of the removal costs of this 120-foot long, five-foot tall concrete and wood dam, which was originally built over 100 years ago. The District is working with the Upper Deschutes Watershed Council, agencies, and others to secure the remaining project funding and regulatory approvals. COID is also in the process of completing its System Improvement Plan, which will guide the District's future water conservation projects.

Lone Pine Irrigation District

Lone Pine Irrigation District has undertaken several innovative water conservation projects. In partnership with the Deschutes River Conservancy (DRC), these projects are benefiting the District's farmers and ranchers, as well as fish and wildlife in the Deschutes River. In 2006, the District and the DRC initiated the first temporary winter release of stored water in the upper Deschutes River. In this successful pilot program, an additional 36 cfs of water were released during December. This program was repeated in 2007-2008. And then in 2010, Lone Pine installed a plastic liner in its wooden flume to reduce summer diversions from the Deschutes River by up to 1.5 cfs.



The Three Sisters - Faith, Hope and Charity - stand watch over the Deschutes River Basin.

North Unit Irrigation District

North Unit Irrigation District, in partnership with the DRC and others, is undertaking one of the largest streamflow improvement initiatives in Oregon's history. In Phase 1, five miles of the District's main canal were lined with concrete to conserve water historically lost to seepage. The conserved water will replace supplies that would have been diverted from the Crooked River. In Phase 2, a section of COID's I lateral canal was piped, conserving 1,300 acre-feet to advance North Unit's enhancement efforts while improving COID's delivery efficiency. North Unit is also working on a multi-phased Lateral 58-11 Piping Project to conserve an estimated 570 acre-feet of water while providing pressurized deliveries to improve on-farm efficiencies and reduce pumping costs. The District is also working with private companies to develop small micro-hydropower projects in its service area.

Ochoco Irrigation District

Ochoco Irrigation District has taken significant steps to increase instream flows in the Crooked River, benefiting steelhead and other fish and wildlife species. The District led discussions with the Confederated Tribes of Warm Springs and conservation groups on a collaborative agreement to allocate "uncontracted" water supplies stored annually in Prineville Reservoir for Crooked River fisheries. The District's efforts culminated in a new law, the Crooked River Collaborative Water Security and Jobs Act of 2014 (see below). The law allocates up to 60,000 acre-feet of water stored in the reservoir (in an average year) for the environment. The law also authorizes a water exchange on McKay Creek, an important steelhead tributary.

Swalley Irrigation District

Swalley Irrigation District has implemented a remarkable water conservation program that has resulted in 39 cfs of permanent instream water rights for 45 miles of the Deschutes River, from the North Canal Diversion Dam in Bend to Lake Billy Chinook. In 2009, the District successfully completed piping 5.1 miles of open canal at a cost of \$11 million dollars, and built a small hydropower unit outside the City of Bend. This unit generates 0.75 MW of clean, renewable energy. Since 1995, the District's annual diversions from the Deschutes River have been reduced by nearly one-third, leaving more water in the river for salmon, steelhead, other fish and wildlife, and recreational benefits. Swalley is also helping to lead the installation of a new fish ladder at the North Canal Diversion Dam.

Three Sisters Irrigation District

Three Sisters Irrigation District is now beginning to pipe the last 14,000 feet, or nearly three miles, of the Watson-McKenzie Main Canal. This \$4.7 million dollar conservation project will result in the creation of a permanent instream water right of 3 cfs in Whychus Creek, benefiting salmon, steelhead, bull trout, and other species. In conjunction with this project, a .70 MW hydropower turbine is up and running, generating clean, renewable energy capable of powering 275 homes. When this phase of the project is complete, Three Sisters will have piped over 57 miles, or nearly 90%, of its entire system of canals, and created instream rights of 31 cfs in Whychus Creek.

Tumalo Irrigation District

Tumalo Irrigation District is now working on Phase IV of the Tumalo Feed Canal Piping Project. In this \$2.1 million dollar project, nearly 3,400 feet of the District's six-mile-long open canal will be piped, conserving 776 acre-feet of water. All of the conserved water will be dedicated to permanent instream flows in Tumalo Creek, Crescent Creek, and the Little Deschutes River, improving habitat for steelhead, Oregon spotted frog, and other species. Tumalo has piped 28,600 feet in the Bend Feed and Tumalo Feed canals, and an additional 9,562 feet of open canal in the Tumalo Feed Canal, allowing the District to contribute over 10 cfs to instream flow in Tumalo Creek and 6 cfs to instream flow in Crescent Creek.

The City of Prineville

The City will begin construction in 2016 on its new \$9 million dollar wastewater and wetland project. Once completed, the project will treat and return up to two million gallons of water to the Crooked River daily, while supporting a new 160-acre wetland complex. Several different types of wetland habitat will be created, along with two miles of riparian habitat improvements. The City's successful water conservation efforts have also resulted in saving 130 million gallons of water annually through the replacement of leaky main line water pipes, the installation of new meters, and more advanced urban water management.

Conserving Water

Irrigation districts throughout Oregon's Deschutes Basin are implementing an array of water conservation, fisheries improvement, and hydropower projects. These projects help hardworking small family farmers and ranchers raise crops, and benefit the environment. Since the 1960s the Districts have significantly reduced their water use. These conserved water supplies are increasing instream flows in the Deschutes River, Crooked River, Whychus Creek, Tumalo Creek, and other smaller tributaries; improving habitat for salmon, steelhead, other fish and wildlife; and providing recreational benefits. Many of these projects, such as piping irrigation canals, also increase public safety and create the opportunity for developing small hydropower generation with zero carbon emissions.

Oregon Spotted Frog

In the summer of 2015, two environmental groups gave notice of their intent to sue the U.S. Bureau of Reclamation and three of the Districts under the Endangered Species Act regarding the Oregon spotted frog. This litigation has now begun. Regardless of the outcome, the litigation will affect the many collaborative processes underway to improve habitat for numerous species, including the Oregon spotted frog. The litigation may also threaten the water supplies of many Central Oregon families. Meanwhile, the Districts along with state and federal agencies and several other constructive environmental groups have been working for several years to improve habitat for the frogs. Among the constructive actions are the following:

- In 2008, the Districts and City of Prineville began development of the Deschutes Basin Habitat Conservation Plan (HCP). Scientific studies on the frog and its habitat needs are underway, and the final plan will include steps to improve the frog's habitat in the Deschutes River and its tributaries.
- The Fish and Wildlife Service has awarded six matching grants to develop the plan, totaling \$2.6 million. The Districts and City have contributed an additional \$2.7 million.
- Tumalo and Central Oregon irrigation districts initiated a pilot study in late 2014 to determine the benefits of increasing releases from Crescent Lake to improve frog breeding success in Crescent Creek and the Little Deschutes River. A test release of water from Crescent Lake, which began in November 2014, was increased to 30 cfs in February 2015.
- Central Oregon Irrigation District voluntarily released water from Crane Prairie Reservoir in early 2015 (prior to the irrigation season) to counteract unusually low natural flows in the Deschutes River due to drought in an effort to improve frog-breeding conditions.
- The Districts are working with the U.S. Forest Service and U. S. Fish and Wildlife Service on a pilot program to determine the feasibility of creating Oregon spotted frog habitat in the Ryan Ranch meadow. If the pilot is successful, a long-term

program could be implemented.

- The Bureau of Reclamation has provided nearly \$7 million in competitive, cost-shared WaterSmart grants for canal lining, piping, and hydropower projects. These projects will help improve habitat for fish and wildlife.

Learn more about the Oregon spotted frog at <http://www.fws.gov/oregonfwo/articles.cfm?id=149489458>

The Crooked River Act

In 2014, President Obama signed into law H.R. 2640, the Crooked River Collaborative Water Security and Jobs Act of 2014 (Public Law 113-244). This law is the culmination of over 30 years of collaborative work by Ochoco Irrigation District, North Unit Irrigation District, the City of Prineville, Crook County, the Confederated Tribes of Warm Springs, and many conservation groups. Congress deliberated on the legislation for several years, held hearings in the U.S. Senate and House of Representatives, and ultimately wrote detailed and specific language to ensure the Act's responsible implementation. Numerous stakeholders who worked well together on the legislation for several years all supported the final bill, and celebrated its enactment. Key provisions include the following actions to benefit fish and wildlife, including reintroduced steelhead in the Crooked River. The Act authorizes:

- The Bureau of Reclamation to annually release up to 60,000 acre-feet of "uncontracted" water stored in Prineville Reservoir for fish and wildlife purposes;
- An exchange of senior McKay Creek water rights for stored water from Prineville Reservoir, freeing up these senior rights to remain instream in a key tributary for steelhead;
- Temporary instream leases by landowners inside Ochoco Irrigation District, to work with conservation groups on increasing flows in the Crooked River; and
- A new hydropower facility to be designed, permitted, and constructed at Bowman Dam, which will produce clean, renewable energy.

Lessons Learned: Irrigation districts that comprise the Deschutes Basin Board of Control are important members of the Family Farm Alliance. Since the 1960s, local irrigation districts, cities, counties, and others have undertaken an unprecedented array of voluntary measures to conserve water, return water in-stream for fish and wildlife purposes, and use irrigation water supplies to generate renewable carbon-free energy. District-led conservation projects have reduced diversions by more than 200,000 acre-feet annually, leading to higher in-stream flows in the Deschutes River and its tributaries. Recent projects by four districts alone have resulted in the piping or lining of 58 miles of canals, resulting in a return of 91.5 cubic feet per second of water in-stream. All of these measures are designed to sustain agricultural productivity, reduce diversions and increase in-stream flows in the Deschutes River and its tributaries.

One of the first applications of ESA section 10(j) in the United States by the National Marine Fisheries Service (NMFS) occurred in the Deschutes Basin because of the proactive water conservation and fisheries restoration work completed to date by local irrigation districts, along with cities, counties and others in Central Oregon. These water users have received assurances from NMFS that their lawful use of water supplies will not be at risk to the ESA while this designation is in effect. Many water users in other parts of the West have done much to conserve water, restore ecosystems, and take other actions to steward the environment, and have yet to receive the sort of regulatory "assurances" that the Deschutes Basin districts have. The relationship that exists between the local water users and federal regulatory agencies in the Deschutes Basin should serve as a model for other regions of the West.

Raising wool and beef, and growing alfalfa, grass hay, carrot seed, wheat, and other products requires a sustainable supply of water. Improving instream flows for salmon, steelhead and other fish and wildlife

species also requires sustainable supplies of clean water. The efforts underway in Central Oregon are a terrific example of how to preserve our important agricultural economy in places like Deschutes County, while improving habitat in Oregon's iconic Deschutes River.

CASE STUDY #5: Long-term Environmental Enhancement and Water Supply Reliability (Klamath Settlement Agreements - California & Oregon)

Until recently, no one thought a comprehensive solution for the Klamath Basin was possible. For the last decade, major conflicts have raged through the basin. 2001 was a terrible water year for farmers and fish. Low water levels in Upper Klamath Lake forced the U.S. Bureau of Reclamation to shut off water to farmers in the Klamath Reclamation Project to protect ESA listed suckers, idling 200,000 acres of land. Farmers and local business suffered significant economic losses. Local farmers mounted numerous protests and tensions among irrigators, Federal agencies, Indian tribes with fishing rights in the Klamath basin, and conservation and fishing groups ran high.

In the spring of 2002 water was restored to the farmers in the Project; later that summer, high water temperatures caused a large fish die off—an estimated 33,000 salmon died. In 2006, weak salmon runs in the Klamath River forced the closure of all commercial salmon fishing on the West Coast prompting Congress to provide economic emergency funding to fishermen that totaled \$60 million.

Finally, PacifiCorp, the power company that owns four dams on the Klamath River, was going through a contentious process to renew licenses for the dams from the Federal Energy Regulatory Commission. Under that process, PacifiCorp's customers were facing significant costs for the installation of fish ladders and screens to provide safe passage so salmon could migrate past the dams; also, some groups and various state and Federal agencies were urging the removal of the dams.

How did the people in the Klamath Basin move from one of the most contentious water fights in the United States to a broad-based agreement? Are there lessons that would help resolve other major natural resource issues?

It started with courage. A number of people came to the conclusion that things were so bad that there had to be a better way. The protests and litigation created a lot of heat and cost time and money, but had not produced more water or more fish. Several leaders for the tribes and irrigation districts stuck their



In 2014, irrigators in the Upper Klamath Basin, the Klamath Tribes, the State of Oregon and the federal government signed the Upper Klamath Basin Comprehensive Agreement to address water and fishery issues.



Two hawks and an American Bald Eagle keeping vigil on the center pivot in the Klamath Irrigation District. Photo by Joe Spendolini Photography

necks out and started talking to each other. As these leaders got to know and trust each other, in addition to talking, they started listening. These conversations gave them a better understanding of other communities' interests and values and their hopes and fears.

The real courage came when these leaders started looking for common ground. They concluded that any solution had to work for all of the communities in the basin. The tribes wanted their fishing restored, but did not want to put their neighbors out of business. The farmers and ranchers needed water, but also wanted the fish to survive.

The parties realized that any agreement would need support from all of the key interests in the basin. Most of these interests were already participating in the Federal Energy Regulatory Commission relicensing process for the PacifiCorp dams. As various groups discussed what to do with the dams they also identified other actions that were needed to restore fisheries and provide more certainty for irrigators.

The parties recognized that there were mutual gains that were achievable only through settlement. To achieve these gains negotiators had to find ways to address the critical needs of the parties. In many cases, the negotiations developed creative solutions that brought additional benefits to the table. In other cases, the parties were forced to compromise and none of the parties got everything they wanted. This was distasteful and hard to swallow, but required to achieve the overall benefits.

In 2010, Representatives of 45 organizations, including Federal agencies, California and Oregon, Indian tribes, counties, irrigators and conservation and fishing groups agreed to a comprehensive solution for the Klamath Basin. The Klamath Basin Restoration Agreement (KBRA) and the Klamath Hydroelectric Settlement Agreement (KHSAs).

The KBRA was intended to result in effective and durable solutions which would: 1) restore and sustain natural fish production and provide for full participation in ocean and river harvest opportunities of fish species throughout the Klamath Basin; 2) establish reliable water and power supplies which sustain agricultural uses, communities, and National Wildlife Refuges; and 3) contribute to the public welfare and the sustainability of all Klamath Basin communities.

The KHSAs lays out the process for additional studies, environmental review, and a decision process to remove four dams owned by PacifiCorp. The four dams are Iron Gate, J.C. Boyle, Copco 1 and Copco 2 dams on the Klamath River. The KHSAs includes provisions for the interim operation of the dams and the process to transfer, decommission, and remove the dams.

In 2014, irrigators in the Upper Klamath Basin, the Klamath Tribes, the State of Oregon and the federal

government signed the Upper Klamath Basin Comprehensive Agreement (UKBCA) to address water and fishery issues. The three agreements were developed to provide a comprehensive solution for water, fishery, and power issues in the Klamath Basin.

Klamath Recent Developments

The KBRA terminated on December 31, 2015 because the federal authorizing legislation was not enacted.

KHSA and UKBCA are still in effect, they did not terminate with the KBRA, but they also require federal authorization legislation and their implementation is interdependent with the now-terminated KBRA.

The States of Oregon and California, PacifiCorp and the federal government in early 2016 – through the U.S. Departments of the Interior and Commerce – announced an agreement-in-principle (AIP) to move forward with amending the Klamath Hydroelectric Settlement Agreement (KHSA). Under the AIP, the parties to the KHSA will pursue its implementation through the administrative process governed by the Federal Energy Regulatory Commission, using existing funding and on the same timeline. The AIP signatory parties issued draft amendments to the KHSA in March and are working to finalize the amended KHSA.

The KHSA amendments focus primarily on the dam removal portion of the broader pact, the AIP stated that the move is an important and necessary first step toward maintaining the broader Klamath settlements (a concept supported in 2015 by the Family Farm Alliance).

The states and the federal government are actively working with all Klamath Basin stakeholders – Members of Congress, tribes, farmers and others – on a comprehensive resolution to restore the basin, advance the recovery of its fisheries, uphold trust responsibilities to the Tribes, and sustain the region's farming and ranching heritage.

Lessons Learned: The philosophy and effort that drove the three Klamath Agreements - the Klamath Basin Restoration Agreement, the Klamath HydroElectric Settlement Agreement and the Upper Klamath Basin Comprehensive Agreement - reflect an intensive, collaborative effort that has consumed much of the last decade. If such a diverse group can come to a settlement on one of the most contentious set of issues in the nation, there are lessons to be learned. First, it requires leaders with the courage to recognize that the status quo is not sustainable and a willingness to reach out to others to explore solutions. Second, the parties that are essential to implementing a solution have to be willing to find common ground. Third, the parties have to commit the policy-level attention, time, and resources to see the process through. Leaders from federal and state governments, tribes, irrigation organizations, counties, and conservation and fishing groups committed to participate in the process and also provided the people and resources to see the negotiations through to conclusion. Finally, resolving complex disputes requires creativity, stamina, and a lot of patience and can often benefit from professional facilitation or mediation.

For more information: A summary and copies of the three Klamath agreements, annual reports, and other materials are available at: <http://www.klamathcouncil.org>.

CASE STUDY #6: Conservation and Drought Resilience (California, Colorado & Wyoming)

The Family Farm Alliance (Alliance) and National Young Farmers Coalition (NYFC) in 2015 teamed up to publish a report, "Innovations in Agricultural Stewardship: Stories of Conservation & Drought Resilience in the Arid West," which focuses on five case studies that profile producers across the Colorado River Basin and beyond who – with curiosity, creativity and seasons of trial and error – are conserving resources while enhancing productivity. The aim of this work was to elevate the voices of farmers and ranchers who are employing smart solutions to build drought resilience, steward water and grow good food.

In the arid West, drought and climate variability are colliding with population growth, spiking the demand for food and fresh water. Take the Colorado River Basin, a river system that irrigates 15% of U.S. produce and 85% of U.S. winter produce and supplies water to over 35 million people in seven U.S. states.

In 2012 the Bureau of Reclamation released a report that anticipates a 3.2 million acre-foot gap between water supply and demand in the Colorado River Basin by 2060. Suggestions to meet this gap indicate taking 6-15% of existing irrigated agriculture out of production. But continuing forward in this direction has serious implications for our national food and water supply.

Amongst the five western producers we interviewed, who are conserving resources while enhancing productivity, we found a number of commonalities, including:

- Farmers are investing in irrigation efficiency and conservation but efficiency improvements may be cost-prohibitive for some producers;
- Farmers and ranchers manage their water for multiple values;
- Soil health is critical to drought resilience, productivity and water conservation. It is an investment with long-term benefits that connects producers across operation types and enhances water-use efficiency.

Farmers and ranchers are our first line of innovation for climate change adaptation and drought resilience.

Agriculture has a significant role to play in water conservation. But all too often discussions of what to do about water scarcity take place off the farm, far away from the people and landscapes that will be most affected. In order to develop smart policy, it is critical to understand how farmers and ranchers are building drought resilience, stewarding water, and growing good food for all of us.

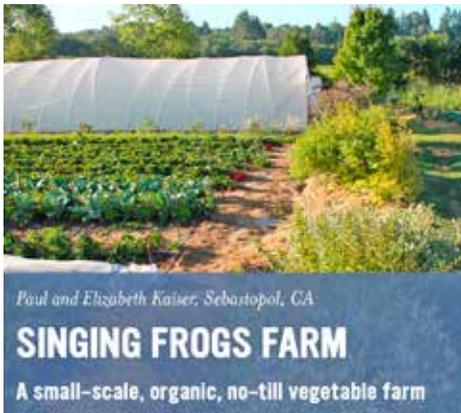
The following is a summary of those case studies. Our hope is these case studies will provide policy makers and other stakeholders with a more nuanced understanding of the diversity and complexity of western agricultural water conservation and an appreciation of what continuing to take agricultural lands out of production might mean.



In western Colorado, rancher Cynthia Houseweart owns and operates Princess Beef, a grassfed beef operation she founded over 15 years ago with her husband, Ira. A historic drought in 2012 led many ranchers to cull their herds as their pastures dried up. Yet Houseweart's pastures stayed alive, even after irrigation was turned off in August. Houseweart attributes this to how she manages her soil. As she recalls, "Down here on our place...it stayed green... [The soil] holds the moisture so much better when the ground can soak it up."

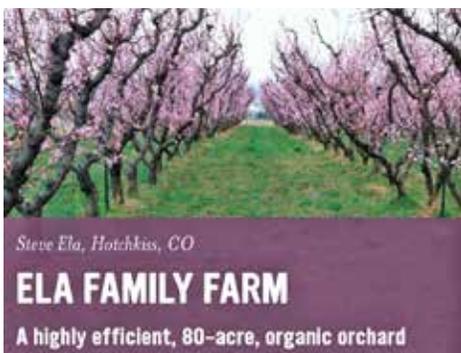
Houseweart practices rotational grazing, which builds organic matter, naturally fertilizes the land, and helps conserve water. Houseweart has also not tilled her land in two decades. This allows the soil to act like a sponge to hold water in place. Even in extremely dry years, Houseweart has a buffer against drought.

For irrigation, Houseweart invested in center pivot irrigation, which is typically around 80% efficient. She rotates her cattle behind the sprinkler, which both increases pasture fertility and reduces the amount of cutting and baling hay she needs to do. Houseweart collaborates with a broad host of partners, from her local Natural Resources Conservation Service (NRCS) agent to a strong local growers' network. As drought persists, this farmer-driven, collaborative, and holistic approach to conservation and productivity are essential to meeting the challenges ahead.



In a low valley just outside of Sebastopol, California, farmers Paul and Elizabeth Kaiser grow hundreds of vegetable varieties in an increasingly dry climate. Though not part of the Colorado River Basin, the Kaisers offer a keen example of a drought resilient farm. In the midst of California's driest year on record, the Kaisers increased revenue on their two-and-a-half acre farm while drastically reducing water consumption. The Kaisers focus on the health of their soil to maximize irrigation efficiency and crop productivity. By practicing no-till agriculture, they keep the soil intact and help retain moisture on-farm. In this process, the Kaisers have increased their soil organic matter (SOM) by four times to an astounding 9.5% SOM at a six-inch depth. With every percent increase in SOM, the soil can hold twenty

thousand gallons of water per acre or more. When intense rains come, the Kaiser's soil retains that moisture and also evades damaging erosion. The Kaisers use drip irrigation, which operates around 90% efficiency. Their path to conservation has been a process, as Paul explains, "When we started farming here... I was typically running the irrigation system two to three hours every-other day. Now I am down to 45 minutes to an hour every five to seven days." This is on the same crops. Healthy systems and creative management keep the farm functioning through drought.



In Colorado's North Fork Valley, orchardist Steve Ela grows 80 acres of organic apples, peaches, pears, plums, and cherries. To enhance water security, the farm owns water rights from multiple sources. This offers Ela options throughout the growing season, and buffers the farm in shortage. When Ela's family bought the orchard in 1987 it was furrow irrigated, but Ela was determined to optimize his water-use efficiency. He worked with his local Natural Resources Conservation Service (NRCS) agent to design and install a permanent drip irrigation system. This has increased effective irrigation, so the trees receive only the amount of water they need. Ela's irrigation upgrades have not been

cheap—permanent drip cost Ela \$2,500 per acre, which can be cost-prohibitive for many farmers. But his investments have paid off: in the last 27 years, Ela has increased the orchard's gross revenue by 450%.

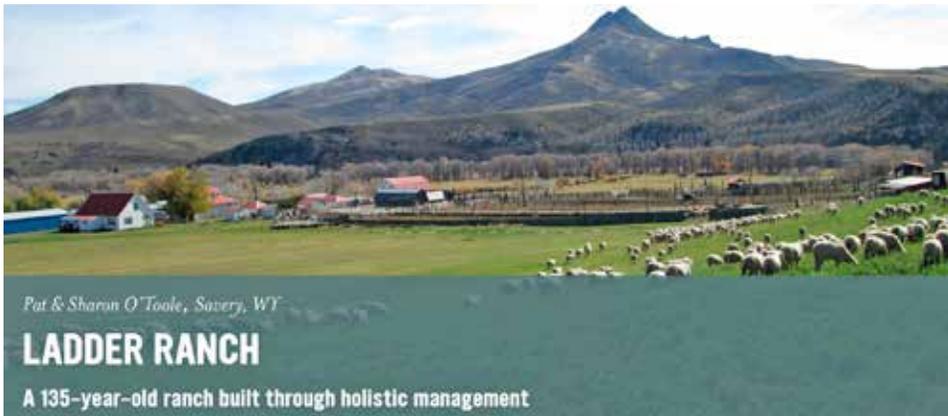
Ela plants a permanent cover crop mix, which holds water in the soil, provides nutrients, and enhances fruit health. His soils also cool the orchard, reducing moisture loss to heat stress. The water balance prepared by Applegate Group states that Ela has scaled his conservation and efficiency nearly as much as possible: "There does not appear to be a significant amount of additional water that could be saved by increasing water conservation practices...." By focusing on soil and irrigation efficiency, Ela is taking a multi-faceted approach to enhancing productivity even amidst ongoing drought.



Outside of Paonia, Colorado, young farmer Harrison Topp grows stone fruit on his family's orchard. Unlike Steve Ela, Topp has a single source of irrigation water: surface water from the Fire Mountain Canal. The canal is operated by the Fire Mountain Canal and Reservoir Company, which determines operations. When water is released from the Canal, Topp receives the entire amount diverted at this point until the water is turned off. There is no benefit to him—and in fact some disincentives—to use less than his full allocation. Topp uses furrow irrigation, which is often considered less efficient than sprinklers or drip irrigation. But for Topp, installing more efficient irrigation is cost-

prohibitive. In addition, flood irrigation provides resilience. In dry years, the Fire Mountain Canal can be turned off as early as July. This means Topp risks losing late-season irrigation, which is critical to fruit ripening. Furrow irrigation, in addition to Topp's soil health practices, stores water in the soil and provides more certainty later in the season. According to the water balance prepared by Applegate Group, "Under the current method of canal operation, converting to micro sprinklers or a drip system would not help solve the potential water shortage late in the season and it could, in fact, negatively impact the orchard."

While Topp is concerned about conservation, he is limited by the restraints of the system within which he operates. This point is critical to understand why water management must be as local as possible.



At the Colorado-Wyoming border, ranchers Pat and Sharon O'Toole, together with their children and grandchildren, raise cattle, sheep, and horses on the same property Sharon's great grandfather first homesteaded in 1881. The O'Tooles practice holistic management, an approach that accounts for the environmental, social, and economic health of the

operation. They build soil health and drought tolerance by planting cover crops and utilizing rotational grazing. For irrigation, they use side-roll sprinklers and flood irrigation. While flood irrigation is considered less efficient, here the "excess" water supports habitat, trout fisheries, and downstream users.

To the O'Tooles, there is no inherent conflict between production and conservation. As Pat puts it, "We were always taught to keep one eye on the livestock and one eye on the landscape. One does not do well without the responsible management of the other."

The water balance prepared by Applegate Group confirms that "72% of return flows in this area return to the stream within the same month that they are diverted, while most of the remainder returns over the following 4 months." In this specific case, increased irrigation efficiency could hinder other conservation values, an example of the need for nuanced approaches to water management.

Lessons Learned: Some of the farmers highlighted above are integrating efficient irrigation technology with soil health to increase both productivity and water savings. Others are navigating conservation within constraints outside of their control, such as the operations of the ditches which deliver water to farms. To paint a fuller picture of the complexities and nuances of agricultural water conservation in the West, the Alliance and NYFC worked with the engineering firm Applegate Group to create a water balance for three of the case studies, as summarized above. These water balances utilize a technical, objective approach to assess the producers' water rights, current conservation efforts, and barriers or opportunities for future conservation. They underscore the reality that conservation practices are different on every operation and unique from farm to farm.

As the pressures of climate variability and drought increase, farmers and ranchers are at the forefront of our national adaptation strategy. Producers are coming together to help one another, but they also need support from consumers, policy makers, scientists, and service providers. The intent was that these case studies would provide policy makers and other stakeholders with a more nuanced understanding of the diversity and complexity of western agricultural water conservation and an appreciation of what continuing to take agricultural lands out of production might mean. Now is the time to engage farmers and ranchers

as allies in finding innovative solutions that support the health of our land, water, and western communities.

A copy of the Alliance/NYFC report can be downloaded at: http://www.youngfarmers.org/wp-content/uploads/2015/05/NYFC-template-FINAL_lowNew.pdf

CASE STUDY #7: Locally Driven Watershed Management (Little Snake River Basin - Colorado & Wyoming)

The Little Snake River watershed in south-central Wyoming is a portrait that weaves into it the environment and conservation, the community and its economy. It is a portrait that caught the attention of John C. Fremont, while traveling through the Little Snake Watershed in 1844, who wrote, “The country here appeared more variously stocked with game than any part of the Rocky Mountains we had visited: and its abundance is owing to the excellent pasturage and its dangerous character as a war ground”.

The symbiotic relationship between food production and the environment lives on today.

“There is no inherent contradiction between being able to produce food on the landscape while achieving conservation if we are smart enough to figure it out,” says Pat O’Toole, who ranches in the Little Snake River Valley.

The Little Snake River Basin today is the permanent home to 21,000 mule deer, 9,000 elk, 25,000 pronghorn antelope, 2,500 Sage Grouse, 20,000 mother cows, 10,000 domestic sheep, and 800 people. Land ownership in the basin consists of 68% federal, 8% state, and 24% private lands. For the last three decades the Little Snake Basin has clearly demonstrated that conservation and food production are compatible. This is achieved through strong local leadership working with a myriad of federal, state, and local agencies, nonprofit conservation organization, private landowners, and the interested public in a collaborative, goal-oriented “on-the-ground” approach to conservation and production. For the last two and half decades, the local conservation district has lead efforts with numerous partners to address resource issues while maintaining or enhancing agriculture production in the watershed.

Water Storage and Species Recovery

In an era where new surface water storage projects face tremendous political and regulatory hurdles, Little Snake River residents led an innovative initiative that resulted in the construction of a multiple purpose reservoir in the headwater reaches of the watershed. While providing a reliable water supply to downstream ranching communities, the stored water released from High Savery Dam has contributed to the recovery of the Colorado River Cutthroat Trout, a candidate species for listing under the federal Endangered Species Act. The reservoir has a minimum inviolate pool which the Wyoming Game and Fish Department uses to support the largest brood population of Colorado River Cutthroat Trout in the entire Colorado River Basin. This “environmental pool” is tapped into by fisheries managers to provide much-needed cool freshwater flows for over 40 miles of downstream recreational fisheries.



Littlefield Creek 1991 (top) and 2012 (bottom)

Irrigation Infrastructure & Native Fish

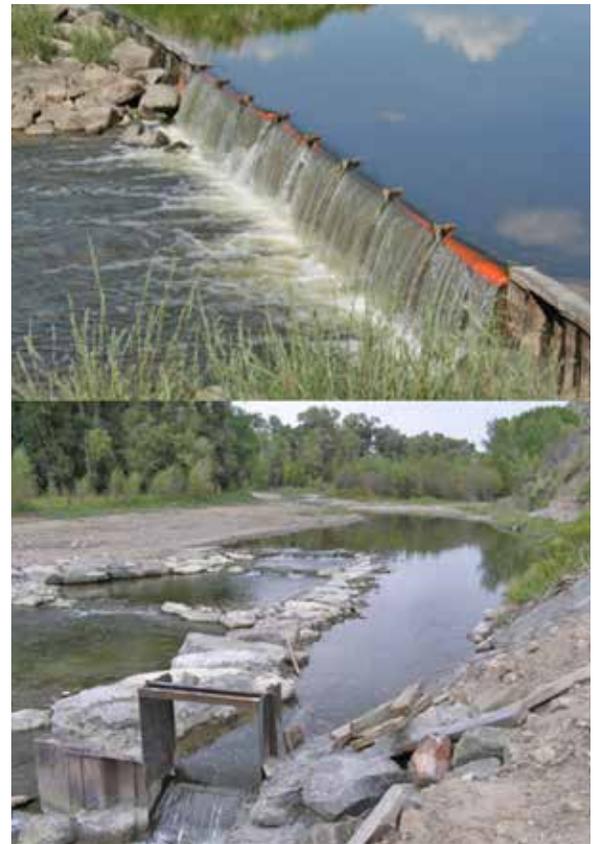
In addition to providing supplemental water for fisheries from High Savery Reservoir, irrigators have worked with conservation partners like Trout Unlimited, the Wyoming Water Development Commission, Wyoming Wildlife and Natural Resource Trust Fund, and the U.S. Fish and Wildlife Service Partners program to modify every diversion structure in on the Wyoming side of the watershed to allow for fish passage. Several low-head diversion structures employ natural channel design concepts to allow for three warm water sensitive fish species to successfully navigate the diversion structures. In the last seven years, fifteen irrigation diversion structures have been modified at a cost of over \$8 million dollars. Eight years ago, the aquatic habitat was highly fragmented and access by native fish may have been restricted to only a few miles of river. Today, the irrigation diversion structures have opened up the entire watershed, so that fish can now literally move from the lower basin to the Continental Divide, over a 100 stream miles away.

Wetlands, Clean Water, and Livestock Grazing

More wetlands have been conserved, enhanced, and created in the Little Snake River Basin in the last two decades than anywhere in the State of Wyoming. Locally-led efforts have resulted in over 2,000 acres of wetlands being conserved or enhanced. The centerpiece of this effort is the Muddy Creek Wetland complex, where over 125 bird species and tens of thousands of birds utilize the area for resting, nesting and reproducing. This area also maintains an existing livestock grazing program involving four different ranching entities. Research conducted by the University of Wyoming has demonstrated significant reduction in nonpoint source pollution as a result of the filtration these wetlands provide in the Muddy Creek area. Since 1997, the federal Environmental Protection Agency (EPA) – via the agency’s “319 Success Stories” bulletin - has three times publicly recognized these types of efforts to reduce nonpoint source pollution, all led by the local conservation district.

Livestock Grazing, Water Quality and Federal Lands

Beginning in the early 1990’s, the local conservation district, area ranchers and the federal Bureau of Land Management (BLM) initiated a long-term watershed based grazing management program. Key goals were to enhance riparian areas and aquatic habitat while maintaining viable grazing operation with a philosophy that emphasized no



One of fifteen existing irrigation diversion dams (top) which was modified in 2015 to incorporate a fish passageway.



Little Muddy Creek 1989 (top) and 2012 (bottom)



The Importance of Forests, Fires, and Source Water Protection in the West

Improving the condition of our nation's forested lands is of primary importance to water providers, private business, municipalities, and agricultural users. National Forest lands are overwhelmingly the largest, single source of water in the U.S. and, in most regions of the west, contribute a majority of the water that supplies our farms and cities.

But our nation's forests and watersheds are unhealthy. Decades long fire suppression, ongoing drought, and other exacerbating factors have contributed to deteriorating forest conditions, which results in increased risk of catastrophic fire conditions. These unnatural fires impact the hydrologic characteristics of watersheds, including runoff timing, water yield, sediment transport, water temperature and water chemistry. Fires that once burned with low intensity and improved forest conditions are now burning with greater severity, over larger expanses of land and cause detrimental, long term impacts.

The Forest Service is working to improve forests and watersheds through landscape-scale based restoration, but the magnitude of the issues and the ongoing budget limitations impact the federal agency's ability to operationalize the work that is needed. Public-private partnerships are becoming increasingly important to meet these challenges, and are catalyzing implementation of new and innovative mechanisms that can better expedite the restoration of landscapes that provide the clean and abundant water supplies the nation's populations depend upon.

net loss of Animal Unit Months (the amount of forage required by one animal unit for one month). Today, this effort has led to over 200 miles of stream restoration on over 600,000 acres of mixed federal, state and private lands. This effort has been twice recognized by EPA in their 319 Success stories bulletin for substantial improvement in reducing nonpoint source pollution and improving water quality. In addition, native fishes have been re-established in many of the streams where these efforts have occurred, all while maintaining active grazing practice on riparian systems.

Small Water Development Drought Mitigation (Wildlife and Livestock)

Average annual precipitation in the Little Snake River Basin ranges from 7 inches at lower elevations (6,000 feet) to 55 inches at the Continental Divide (10,000 feet elevation). Like much of the Western U.S. drought is a common occurrence that impacts both the ranching community and the native wildlife. The agricultural community in partnership with the BLM has pursued very substantial efforts in the form of numerous small water development projects to mitigate the impacts associated with drought on rangelands in the Little Snake River Basin. Hundreds of stock ponds, wetlands, spring developments, stock water pipe lines, wells, and other hydrologic modifications have been constructed on over 1 million acres of rangelands in the Basin to provide reliable water sources for both livestock and wildlife.

Restoring Keystone Aspen Communities for Water and the Environment

Aspen communities are the second-most widely utilized wildlife habitat type in the Rocky Mountains. These communities also provide substantial forage for livestock, as well as serving as keystone indicators of watershed health and function. West-wide,

aspen communities are in steep decline. The Little Snake River Conservation District, working with numerous federal, state, and nongovernment organizations, initiated an aggressive aspen rehabilitation and restoration program that has treated over 4,000 acres of aspen stands in the Little Snake River Basin. By reducing invading conifers, moisture and mesic areas (a type of habitat with a moderate or well-balanced supply of moisture) important to overall health and water yield are increased. In the face of changing climate, these measures provide resilience for the environment, sustainability for local ranchers and hunting opportunities for sportsmen.

Lessons Learned: Local, regional and state land managers should be encouraged and provided the tools to lead watershed enhancement efforts. Since 1991 numerous agencies, organizations, and NGO's have recognized landowners and the local governmental natural resource agency, the Little Snake River Conservation District (LSRCD), as leaders in natural resource conservation. These successful efforts have all been locally-led.

A business minded approach is key to achieving healthier more resilient forests and watersheds. Due to the magnitude of the issue and significant budget limitations the Forest Service is unable to plan and implement restoration on their own. There are also significant administrative barriers to achieving healthier, more resilient forests and watershed. The environmental planning process required to permit restorative actions on Federal Lands has become complicated by lengthy judicial reviews that slow restoration to a standstill. High turnover within the Forest Service creates long-term uncertainty in local policy and management direction for partner and other stakeholders. A business minded approach is key to achieving healthier more resilient forests and watersheds. Due to the magnitude of the issue and significant budget limitations the Forest Service is unable to plan and implement restoration on their own. There are also significant administrative barriers to achieving healthier, more resilient forests and watershed. The environmental planning process required to permit restorative actions on Federal Lands has become complicated by lengthy judicial reviews that slow restoration to a standstill. High turnover within the Forest Service creates long-term uncertainty in local policy and management direction for partner and other stakeholders.



Takeaways for Consideration by the Federal Government - Conclusion

The Congress and the federal government certainly cannot change the hydrology of the West, but there is a role it can play to support family farmers and ranchers. Policy makers should understand the following observations and principles as they develop new solutions to the Western drought:

- State water laws, compacts and decrees must be the foundation for dealing with shortages.
- Water use and related beneficial use data must be accurately measured and portrayed.
- Benefits of water use must reflect all economic / societal / environmental impacts.
- Water conservation can help stretch water supplies, but has its limits in certain situations.
- Technologies for water reuse and recycling are proven effective in stretching existing supplies for urban, environmental and other uses.
- Planning for water shortage in the West must look to the long-term in meeting the goals of agriculture, energy, cities, and the environment.
- A successful water shortage strategy must include a “portfolio” of water supply enhancements and improvements, such as water reuse, recycling, conservation, watersensitive land use planning, and water system improvements. New infrastructure and technologies can help stretch water for all uses.
- Temporary fallowing proposals should be approached in a thoughtful, thorough manner only after urban, energy and environmental users of water demonstrate a better management of their share of the finite supply.
- Unintended consequences associated with reducing productive agricultural land/groundwater recharge/riparian habitat benefits should be avoided and, if unavoidable, minimized and fully mitigated.
- Source water protection entails partnership-based, landscape-scale restoration of our forests and watersheds in the Western US – and ultimately requires a shift in the policies and mechanisms that the federal government uses to budget and implement treatments and incentivize industry to get the work done.
- The Forest Service must think outside of the box, to develop, retain and grow partnerships with private partners who are willing and able to help accelerate the pace and scale of forest restoration in western National Forests.
- In order to pay for the millions of acres of forest lands in the West that require restoration, a strong forest products industry must exist to utilize and add value to the forest residuals and offset the cost of implementing restoration treatments. In areas where it is uneconomical for industry to treat, incentives must be provided by public and private partners who benefit from improve forest and watersheds conditions.
- A more streamlined approach for analyzing and approving restoration in key municipal and agricultural watersheds is desperately needed. Forest Service policy should refocus on watershed protection under the multiple use mandate and provide more equal consideration amongst all other resources.
- The Forest Service should work to provide more lateral and promotional opportunities within a state to retain the valuable institutional knowledge and networks with stakeholders and local businesses who can add to the public-private partnership momentum within a state.

Western farmers and ranchers need to manage water as if every year is a drought year. We need to invest in storage facilities to capture water in wet years, we need to look to innovative technology to enhance

supplies and delivery and we need to get the very most benefit from the water we have available. The ability to measure, assess and show value for how that water is used is incumbent on every water manager – environmental, urban and agricultural.

Only together can we in the West plan and prepare for our collective future. If we don't, we ensure only that the next drought will be worse than this one.

Acknowledgments

The Family Farm Alliance gratefully acknowledges and thanks the following individuals and organizations for their contributions to this report:

Thad Bettner, P.E., Glenn-Colusa Irrigation District (California)

Rebecca Davidson, Salt River Project (Arizona)

Gary Esslinger, Elephant Butte Irrigation District (New Mexico)

Kate Greenberg, National Young Farmers Coalition (Colorado)

ShanRae Hawkins, Deschutes Basin Board of Control (Oregon)

Larry Hicks, Little Snake River Conservation District (Wyoming)

Mark Limbaugh, The Ferguson Group (Washington, D.C.)

Patrick and Sharon O'Toole, Ladder Ranch (Wyoming)

Nicole Pasi, American Rivers (Washington)

Karen Ray, Elephant Butte Irrigation District (New Mexico)

Ed Sheets, Ed Sheets Consulting (Washington)

SmithBates Marcomm Solutions (Oregon)

Joe Spendolini, Joe Spendolini Photography (Oregon)

Urban Eberhart, Kittitas Reclamation District (Washington)

James Watson, P.E. Sites Project Authority (California)

Scott White, Klamath Water Users Association (California & Oregon)





P.O. Box 216
Klamath Falls, OR 97601