Testimony of Margi Hoffmann

On behalf of
Farmers Conservation Alliance
and
The Family Farm Alliance

Before the
U.S. Senate Energy and Natural Resources Committee
Subcommittee on Water and Power

Hearing to Examine the Use of Technology and Innovation to Increase Water Security and Enable Economic Development in the West

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Chairman McSally, Ranking Member Cortez Masto, and Members of the Subcommittee:

My name is Margi Hoffmann, and on behalf of the Farmers Conservation Alliance (FCA) and the Family Farm Alliance (Alliance), I thank you for this opportunity to present this testimony on a matter of critical importance to both memberships: the use of technology and innovation to increase water security and enable economic development in the West.

FCA is a non-profit organization that partners with irrigation districts, farmers, ranchers, and other agricultural water delivery providers to help them modernize their systems for the benefit of agricultural resilience, domestic energy security, and the environment. In short, FCA works to keep the water flowing for food, farms, and fish. Much of the water withdrawals in the Western United States are for irrigated agriculture, moving through infrastructure that was often constructed over 100 years ago. FCA recognizes that modernizing these systems is the single greatest opportunity in rural economic resilience and the environment.

FCA is currently working to modernize districts in four Western states and will scale the Irrigation Modernization Program across the Western U.S. We work in close partnership with irrigation districts, farmers, and ranchers. FCA works with federal agencies, such as the Bureau of Reclamation (Reclamation), Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA) Rural Development, and U.S. Department of Energy (DOE), to name a few. We also work closely with state and local elected officials, community leaders, and environmental non-profit organizations. FCA's proven methodology shows that irrigation modernization brings communities together to solve water resource issues collaboratively and negates the need for costly litigation.

The Family Farm Alliance is a grassroots organization of family farmers, ranchers, irrigation districts, and allied industries in 16 Western states. The Alliance is focused on one mission: To ensure the availability of reliable, affordable irrigation water supplies to Western farmers and ranchers. We are also committed to the fundamental proposition that Western irrigated agriculture must be preserved and

protected for a host of economic, sociological, environmental, and national security reasons – many of which are often overlooked in the context of other national policy decisions.

This testimony will illustrate the problems Western farmers and ranchers face in terms of water supply reliability, and outline what Western producers and organizations like mine are doing to address these challenges. We believe the examples presented in this testimony show that the best solutions are locally driven and collaborative. They often are highly innovative and employ a range of new technologies that best address unique local challenges. In many cases, multiple benefits are achieved, including a more secure water supply, ecosystem improvements, and economic stability.

Personal Background

I have been the Director of Strategic Operations for the Farmers Conservation Alliance for four years. During that time, I have worked with FCA, irrigators, farmers, ranchers, federal, state and local agencies, and environmental non-profits to develop, pilot, demonstrate, and scale the Irrigation Modernization Program across the Western states. Prior to joining FCA, I served as a natural resources policy advisor to two Oregon Governors, and I have worked on collaborative approaches to solving natural resource issues in the Western United States for over 10 years. My particular focus has been on the timber, agricultural, and domestic energy development sectors.

FCA and Alliance Collaborative Philosophy

FCA's Irrigation Modernization Program focuses on helping irrigation districts and the farmers they serve revolutionize their infrastructure. Past initiatives have focused on specific goals, such as water conservation, hydropower production, system efficiencies, or broader conservation benefits. Unfortunately, there has been little progress in creating a methodology that attracts large-scale investment in comprehensive, unifying solutions. FCA's innovative program reduces the cost and time required for project planning and implementation, addresses key regulatory and institutional barriers, leverages funding from multiple resources. It further demonstrates how modern agricultural water management can mitigate the impacts of long-term drought and other serious environmental and agricultural challenges.

Perhaps most importantly, FCA's program moves beyond typical engineering and/or data collection. We also focus on developing strategic partnerships with irrigators, and agency and community stakeholders. Through these partnerships, we identify the values and goals the partners collectively want to achieve in the future, quantify the benefits of modernization, and develop strategies for funding and implementation. FCA has proven that focusing on the broader social context of communities and better understanding their needs helps accelerate the pace and scale of irrigation modernization, never losing sight of all of the benefits modern systems provide more broadly.

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. Through the years, the Alliance has also published several reports that have provided guidance to policy makers on issues important to irrigated agriculture.

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. 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 may 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.

FCA and the Alliance have a track record of working with diverse partners to achieve solutions with mutually beneficial outcomes. For example, both organizations are members of the Western Agriculture and Conservation Coalition (WACC), a diverse group of organizations that first came together a decade ago around the Farm Bill conservation title with the goal of supporting the common interests of agriculture and conservation. Other founding steering committee members included Trout Unlimited, The Nature Conservancy, California Farm Bureau, Environmental Defense Fund, Public Lands Council, Arizona Cattle Growers Association, Wyoming Stock Growers Association, and the Irrigation Association. The threats to a viable and sustainable rural West are numerous, complex, and variegated. A broad and authoritative voice like that of the WACC is needed to effectively address these threats with collaborative solutions.

Why Irrigation Modernization Matters

Aging agricultural infrastructure, expanding population, persistent droughts, and declining fish populations are stressing scarce water resources. Farmers in the Western United States rely on irrigation to grow food. But the dams and canals that capture and convey this water from rivers to farms are aging and sometimes inefficient. In many scenarios, farmers and rivers do not get the water they need. By replacing outdated infrastructure with modern technologies, farmers can do much more with less. Irrigation modernization addresses fundamental problems in aging infrastructure, unifies solutions for rural farming communities, and enhances the enviornment. Irrigation modernization positions rural communities for long-term resilience, enhancing our domestic food supply and a healthy environment for generations to come.

Economic and Food Production Benefits from Western Irrigated Agriculture

Western agriculture is a significant contributor to the economy. The Alliance in 2015 published “The Economic Importance of Western Irrigated Agriculture” (prepared by the Pacific Northwest Project), a white paper specifically drafted to be read by policy makers seeking to better understand the direct economic impact of Western irrigated agriculture. The report also serves to acknowledge the growing chorus of voices bringing attention to food security and irrigated agriculture as a national economic issue. The full magnitude of irrigated agriculture’s contribution to the economy is rarely, if ever, quantified in terms of total household income for the Western U.S. region. For the 17 Western states studied in the report, the total household income impacts from irrigated agriculture, associated service industries, and food processing sectors is $172 billion. There are also direct and indirect linkages to the economy derived from a low-cost food supply. For example, inexpensive food makes available large blocks of disposable

income to the consumer spending economy, which is one reason why U.S. citizens currently spend less of their disposable income on food than anyone in the world.

Western irrigated agriculture is a major source for our availability of high-quality food. The farmers and ranchers who bring us this food are part of the irrigated agriculture industry that is a huge economic driver in many Western states, particularly in rural communities. Given the magnitude of the food security issue to economic wellbeing, protecting and encouraging irrigated agriculture should be a high priority.

Innovative Solutions

Irrigators and their local water agencies are responding to the challenges of reduced water supply reliability 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. Throughout the West, farmers, ranchers and irrigation agencies have undertaken creative measures to efficiently manage increasingly scarce water resources in providing water supply to irrigated agriculture. Some of these actions were intended to address the immediate crisis of recent western droughts; 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. We have found that, when federal agencies are willing to work collaboratively with farmers and ranchers, the result is better management of water for both economic purposes and environmental uses.

The water shortage problems we all face vary by region, topography, climate, soil conditions, hydrology, and crop. These problems have some elements in common, including inadequate or deteriorating water storage infrastructure, inflexible or outdated operational requirements, and regulatory conditions on operations. Often times, government agencies are not nimble enough, or not motivated to seek out and embrace better ways of doing things to ensure the most benefit for the broadest suite of public interests. Solutions also vary by state or by region, but they, too, are characterized by certain common elements, including creativity, flexibility and balance.

Below are some examples of successful Western solutions and potential solutions where technology and innovation improve water security and bolster economic development.

Collaboration, conservation, energy and water reliability, and regulatory assurances: Farmers Conservation Alliance (CALIFORNIA, MONTANA, NEVADA, OREGON)

Derby Dam Downstream Fish Passage (NEVADA)

FCA, in partnership with Reclamation, has broken ground on the Derby Dam fish screen. When construction is completed (scheduled for fall 2020), this innovative technology will restore watershed connectivity and support fish movement along the Truckee River. The finished project will promote both the recovery of the federally threatened Lahontan Cutthroat Trout (LCT), as well as fishing and recreation opportunities in Nevada. Derby Dam, completed in 1905, was one of the first U.S. Reclamation Service projects, organized under the Reclamation Act of 1902. After the completion of Derby Dam, the LCT lost access to their spawning habitat, which eventually led to their extirpation in the Truckee Basin. This project combines the biological expertise of the U.S. Fish and Wildlife Service

(USFWS), the engineering and construction expertise of Reclamation, and FCA's innovative Farmers Screen to fully restore LCT's access to their full reach of habitat, from Pyramid Lake up the Truckee River.

Basin-Wide Irrigation Modernization (OREGON)

FCA, in partnership with the Deschutes Basin Board of Control, NRCS, Energy Trust of Oregon, Oregon Department of Environmental Quality and local environmental organizations have worked to develop comprehensive modernization strategies for seven districts in the Deschutes Basin. Collectively, the impact of modernizing these districts will save 555 cubic feet per second and improve 514 miles of stream over 100,000 acres of agricultural land. This translates into $900 million in economic development, improved water quality and increased habitat protection for threatened and endangered species. Working together, the partners over the past three years have been able to leverage nearly $150 million from the federal and state governments, demonstrating the "art of the possible" for the community. This project has helped to alleviate the tension between agricultural and environmental interests, and has galvanized a partnership in modernizing infrastructure to achieve a mutual benefit.

In-Conduit Hydroelectric Generation: Irrigation Modernization Acceleration Tool (OREGON)

In partnership with DOE, FCA worked to develop a case study that assesses the impact of installing in-conduit hydroelectric generation facilities in irrigation district systems. In-conduit hydropower generates electricity using pressurized water flowing through a closed-pipe system to spin a turbine. Irrigation districts can sell the power generated to local utilities, providing the district with an additional revenue stream that they can use to accelerate investment in modernization projects.

Central Oregon Irrigation District (COID) is one of the largest irrigation districts in Oregon, serving urban, suburban and rural communities. The district provides water to about 45,000 acres using over 700 miles of mostly open irrigation canals that, in some cases, lose up to 50% of the water diverted to seepage and evaporation. The single largest opportunity for water savings is to convert open canals to closed, pressurized pipe. The biggest challenge is figuring out how to pay for the cost of conversion.

In COID's Pilot Butte canal, the district has the potential to generate approximately 10 megawatts of hydroelectric energy. Installing these energy generation facilities would save each farmer in their district approximately $400 and provide the district over $9 million in value, every year. The projects would also help the district to return 167 cubic feet per second of water to the Deschutes River, and support 330 local jobs and over $15 million in regional economic activity. Installing in-conduit hydroelectric generation facilities increase rural energy security and provide irrigation districts with a value-added revenue stream to accelerate their investment in irrigation modernization.

Economic and Environmental Value of Infrastructure Co-Location

Irrigation districts across the West will install hundreds of miles of modernization projects in the coming years. However, community resilience extends beyond water infrastructure, including the need for energy security and access to affordable internet, cable and telephone services. A significant barrier to improving telecommunications and energy infrastructure in rural areas is the great expense associated with siting, right of way acquisition, engineering, permitting, and construction. Irrigation modernization projects already cover most of these costs, improving the feasibility of installing fiber optic and electric

transmission/distribution lines, with several benefits. Building out these three infrastructure components individually would cost over $3 million per mile. However, co-locating the infrastructure projects in an irrigation district right-of- way concurrent with district modernization would save well over $2 million per mile. In addition, this fiber optic network enables farmers and ranchers to utilize the best available technology to maximize smart infrastructure and increase production, Irrigation districts would further be able to earn revenue from the lease of their right-of-way to an internet service provider or electric utility, accelerating their investment in modernization projects.

Improved snow measurement and runoff forecasts: Friant Water Users (CALIFORNIA)

As in much of the West, many of California's farms and cities rely on water that is stored for much of the year as snowpack. But patterns of snow accumulation and melt are changing; temperatures are higher in the "shoulder season," more precipitation is falling as rain instead of snow, and our snowpacks are diminishing. Throughout the Western U.S., water users are working adapt to these changing conditions while maintaining secure, reliable supplies of water. While adapting to the loss of snowpack may ultimately require new storage, building new storage requires time and has become difficult to permit and fund. Thus, operational improvements at existing water storage facilities have become even more important. In response to these pressures, over the past several years, a group of irrigation districts and other water agencies in California have been investing in a pilot application of a new technology that has dramatically improved both the measurement of snowpack in the Sierra Nevadas and runoff forecasts.

This new technology, called the Airborne Snow Observatory (ASO), emerged in the past seven years from NASA's Jet Propulsion Laboratory. It uses plane-mounted cameras and laser technology to measure snow depth and reflectivity on multiple points in every square meter of a watershed multiple times during months of snow accumulation and melt. The measurements and aerial imagery that are collected can be used to estimate the amount of water supply stored in the snowpack and assess flood risk and other on-the-ground conditions, such as forest health. They are also used to generate predictions of runoff into rivers, streams, lakes, and reservoirs that have shown to be 96%-98% accurate. This improves on conventional methods that have been shown to have up to 60% accuracy.

The program has already demonstrated improved understanding of peak runoff events, giving flood managers a two-week advance warning to make management decisions. Such advance warning also helps anticipate operations that could enhance groundwater replenishment projects. This is critically important in California and other highly productive agricultural regions with stressed groundwater basins.

Since 2013, water districts in California, including those in one of our member districts, the Friant Division of the Central Valley Project, have worked together with NASA, the California Department of Water Resources, Reclamation, and the USDA's Agricultural Research Service (USDA-ARS) and NRCS National Weather and Climate Center to operate the ASO program. The ASO operators conduct the flights and collects measurements; the USDA-ARS produces runoff forecasts; and local, state, and federal agencies use the information to manage water for multiple uses, including irrigation, flood protection, and groundwater recharge.

The ASO program began with the 460 square-mile upper Tuolumne River basin and by 2019 USDA-ARS had produced runoff forecasts for almost all the southern Sierra Nevada (nearly 21,000 square miles) that represents approximately one-third of California's agricultural water supply. In 2018, Turlock Irrigation District used ASO-derived information to save more than 150,000 acre-feet of water at Don Pedro Reservoir that would otherwise have been released to make flood space available. In other words, ASO can allow for increased water supply storage in existing reservoirs without needing new permits or construction. The Friant Water Authority estimates that, once fully implemented, the ASO program could improve deliveries by as much as 100,000 acre-feet in a given year through more effectively managed runoff. Additionally, Reclamation has used ASO-informed runoff forecasts to help refine Central Valley Project water supply estimates and improve operations for the restoration of salmon below Friant Dam.

This technology has broad relevance for flood, water supply, and environmental operations across the Sierra Nevada and Cascade Mountains; the front range of the Rocky Mountains of Colorado, Wyoming and New Mexico; the Colorado River tributaries in Utah and Arizona, and the Pacific Northwest, just to name a few. Unfortunately, despite its broad value, the program faces an uncertain future, as state, federal, and local funding is drying up.

Using best available science and the practical know-how of farm and refuge managers to reactive natural floodplain processes: Northern California Water Association (CALIFORNIA)

The Northern California Water Association (NCWA) represents water districts, water companies, small towns, rural communities and landowners that beneficially use both surface and groundwater resources in the Sacramento Valley. NCWA is part of a diverse coalition of conservation organizations, farmers, local governments, water suppliers and academic institutions who have come together to advance a new model for water management, fish and wildlife habitat restoration, and land use that seeks to reactivate historic floodplains in the Central Valley. This innovative, sweeping program is intended to upgrade California's aging water and flood infrastructure while simultaneously enhancing the function of river ecosystems for the benefit of fish and wildlife populations. Many successful projects have shown that integrating a working 21st Century scientific knowledge of how rivers work into the management of farms, flood protection and water infrastructure creates a system that functions far better for fish, birds, wildlife, farms, and cities.

California's Sacramento Valley is a rich mosaic of human settlement, farms, managed wetlands, and meandering rivers that support people, fisheries, and wildlife. Farms, rural communities and cities thrive next to wildlife refuges and rivers, and together they support millions of birds and other wildlife that have lived there for millennia. Nearly all of the Sacramento Valley floor is part of the historic floodplain—the naturally flood-prone areas surrounding the river. Before levees and dams were built to protect people from catastrophic floods, this floodplain supported robust fish and wildlife populations.

The Sacramento Valley is fertile ground for developing a new path forward for holistic water management. This approach incorporates best available science and the practical know-how of farm and refuge managers to innovatively reactivate the floodplain. Farmland (primarily ricelands), wildlife

refuges, and the river bypasses designed for flood protection can be managed to work together for dynamic conservation and to mimic the historic floodplain in the Sacramento Valley. Importantly, these features continue to provide flood protection for Sacramento and other parts of the Valley. Spreading out and slowing down water across this landscape mimics natural flows and provides multiple benefits year-round. This allows farmers to cultivate rice and other crops for humans during the spring and summer, habitat for wild birds, reptiles, and other fauna in the fall, and food and rearing habitat for migratory birds and native fish species in the winter.

This program embraces the best available science and the work of leading scientists from the University of California and throughout the world. Their work demonstrates the value and importance of reactivating floodplains as the key element to improve conditions for fish and wildlife within a managed water system like the Sacramento Valley. This effort engages many forward-thinking landowners in the Sacramento Valley who are implementing environmental farming practices and wetlands management techniques that reactivate the traditional floodplain for multiple benefits. This includes juvenile fish growing and rearing in fields in the bypasses; producing food on farm fields to be released to the river for salmon; the Delta Smelt food program for the north Delta; and reconnecting oxbows to the river channel.

This management regime also supports the return of birds and other species along the Pacific Flyway. It builds on the documented environmental success in the Sacramento Valley, where collaborative partnerships between scientists, conversation groups, agencies, and landowners have resulted in farms, refuges and managed wetlands providing essential habitat for waterfowl and shorebirds. This program recharges precious groundwater, consistent with state policy. And, it provides nourishment, spawning and safe rearing and migration for juvenile salmon, as learned from the reconnection of Butte Creek with the floodplain in Butte Sink and Sutter Bypass.

This innovative strategy implements and improves dynamic conservation strategies designed to create, retain and enhance habitat in temporary and adaptable ways. This will reinforce the value of floodplains and help species thrive in a changing world. Developing and deploying dynamic conservation strategies is especially important for migratory species–both birds and salmon - and will also become increasingly important for biodiversity conservation.

Science and experience are showing that flood protection river bypasses, farmland and wildlife refuges that occupy historic Central Valley floodplains can be managed to mimic the historic natural processes and patterns which create and sustain fish and wildlife habitat.

Using canals to augment tributary flows and reconnect lost fish spawning habitat: Kittitas Reclamation District (WASHINGTON)

As part of Washington State's Yakima Basin Integrated Plan, a watershed-wide integrated collaborative approach to managing water resources for multiple benefits, the Tributary Supplementation Program (TSP) is now in its fourth year since its inception. The TSP uses the Kittitas Reclamation District (KRD) canal to augment flows to six upper Kittitas County tributaries that are intersected by the main and south branch KRD canals. Sections of these tributaries to the Yakima River historically have dried up during

summer and fall due in part to human-caused changes in flow regimes, such as irrigation diversions, resulting in loss of literally miles of spawning habitat for native fish species, including some protected as threatened or endangered species under the Endangered Species Act (ESA). Dry sections of these tributaries are supplemented with river water delivered through KRD irrigation canals, reconnecting the lost spawning habitat to the river.

Under the Integrated Plan, several entities are working together to address flows, habitat restoration, fish passage and Coho Salmon supplementation. These include Washington State Departments of Ecology and Fish & Wildlife; Reclamation, U.S. Fish & Wildlife Service and National Marine Fisheries Service; Trout Unlimited and Kittitas Conservation District; Yakima Tributary Habitat Enhancement Program; Yakama Nation and Kittitas Reclamation District.

Water conservation is a key component of this program. The ability to supplement flow to these creeks depends on increasing canal capacity to deliver irrigation and tributary water. KRD has lined about four miles of canals, resulting in conserved water and canal efficiencies that allow for the TSP to occur without impacting irrigation deliveries. Water quality and fish monitoring remain important components of the TSP, with an emphasis on flow, water temperature, dissolved oxygen (DO) and pH; and relative fish abundance by species. Installation of PIT tag detection arrays this past spring was a key addition to the monitoring program, allowing for the tracking and monitoring of tagged fish in the rejuvenated tributary habitat. As a result, recent spawning surveys have detected Chinook redds (nests) in the newly reopened tributary spawning beds.

Integrating agriculture, science, technology and ecology: The Intermountain West Joint Venture (Western United States)

The Family Farm Alliance works closely with the Intermountain West Joint Venture (IWJV), a leader in utilizing science and technology advancements to link agriculture, hydrology, and wildlife habitat conservation. The IWJV's Water 4 Initiative is focused on the importance of maintaining agricultural land for habitat conservation and landscape resiliency within western states. The rapid fragmentation of agricultural wildlife habitat, as well as crop conversions and changing irrigation practices, have implications that reverberate beyond agriculture and begin to impact local water availability for people and wildlife. Integrating agriculture, science, technology, and ecology can lead to improved understanding of key linkages related to the importance of agricultural irrigation and the need to invest in modernizing irrigation infrastructure. Such investments also have collateral benefits for landscape resiliency including groundwater recharge, habitat enhancement, and conservation of fish and wildlife.

There is a unique opportunity to address long term food security through investments in agricultural infrastructure that in turn have benefits for wildlife conservation. Below are three specific examples of IWJV scientific research projects currently underway to better understand the role of agriculture, conservation, and the importance of maintaining/modernizing irrigation infrastructure.

Quantifying the exact farm acreage needed to sustain bird populations

Spatial analysis combined with detailed water bird population information has allowed IWJV to begin to quantify the exact number of agricultural acres that need to be enhanced/protected in the Klamath

Basin in California and Oregon (among other locations) to provide habitat to sustain water bird and waterfowl populations. This has critical implications for the broader agricultural community in the Pacific Flyway. If habitat is not maintained in the Klamath Basin, migrating birds will likely move south, to California's Central Valley, earlier in the season. This earlier migration means birds may arrive before rice is harvested, resulting in potentially devastating impacts to rice production. This is just one example showing the importance of understanding landscape systems as a whole and the ripple effects that can occur through habitat loss.

In the West, bird habitat has been lost due to aging irrigation infrastructure, changes to traditional irrigation practices, diminishing volumes of water due to reduced snowpack, and fragmented agricultural land. IWJV is focused on better understanding these linkages. In this way, tools can be provided for strategic decision-making related to investments that benefit agriculture. These include modernizing aging infrastructure to provide water during critical periods for agricultural production while also providing vital habitat for fish and wildlife.

Long-term analysis of wetlands, agriculture, and water

The IWJV is integrating new research on water dynamics with land use practices. This integration will be used to identify historical patterns of overlapping agricultural production and wildlife habitat availability. With these patterns identified, decisions can be made as to where modernization of existing infrastructure will have the greatest long-term likelihood of meeting the water needs required to sustain agriculture. This data can be used to inform decision makers on where to make vital investments into aging agricultural infrastructure. These improvements are critically important for agriculture and the environment, since they can help provide water to wet meadows that support fish and wildlife.

Carbon Sequestration

Carbon storage in terrestrial ecosystems is seen by some as an increasingly important means to offset greenhouse gas emissions. In arid and semi-arid sagebrush rangelands of the West, green carbon (i.e. plant carbon) stores are concentrated in mesic[1] and wetland systems that contain ten times the abundance found in surrounding uplands. Water within these sagebrush landscapes plays an important ecological role that supports this carbon storage capacity and influences distribution of wildlife, like sage grouse and water birds. Water in these landscapes also supports and sustains human settlement and rural economies.

IWJV is proposing new science to identify carbon storage benefits associated with IWJV's habitat conservation initiatives. This could allow for "win-win" outcomes for migratory birds and greenhouse gas emission offsets. Work would leverage existing IWJV sage grouse mesic and wetland hydrologic models for the West, in addition to above/below ground carbon storage models developed by partners. Final products would be used to quantify past and future carbon sequestration linked to land protection and restoration outcomes. Demonstrating mutual wildlife and carbon storage benefits has the potential to greatly expand interest in conservation investments. This, in turn, could positively impact migratory bird populations in the long-term.

[1] In ecology, a *mesic* habitat is a type of habitat with a moderate or well-balanced supply of moisture.

Challenges

The true value of intact systems and agricultural lands that support those systems has not been fully recognized. This is a significant detriment to agriculture and conservation. The land fragmentation issue has impacts for water infrastructure and food security. Addressing this problem means protecting land before the fragmentation has started. Unfortunately, this is easier said than done. Right now, federal appraisal services (through Appraisal and Valuation Services Office, NRCS, etc.) require too much time. These delays are compounded when appraisals are so low they fail to incentivize landowners to move forward with conservation easements. That is because the value of the land associated with a prospective easement often does not increase until the development pressure is already there (and the system is unraveling).

This valuation challenge is a constant struggle. Federal agencies have a process that can support efforts to pay higher than fair market value of an appraisal. However, the internal approval processes vary, and there does not seem to be much desire to pursue these options within agencies. Federal funds and resources spent to pursue promising easements on important lands end up being wasted on inefficient and ineffective appraisal processes. As a result, these lands never end up getting protected. Congress could play a role in protecting land by helping to streamline and incentivize these conservation investments.

IWJV continues to build the critical linkages needed to demonstrate opportunities for "win-wins" between the agricultural and conservation communities. The above examples of cutting-edge science being utilized and developed by IWJV can help correlate the value of agricultural lands and practices to conservation outcomes. These outcomes, in turn, can be used to identify and inform the importance of investing in irrigation infrastructure. The end result is multiple benefits for people, wildlife, and local economies.

Improved conservation and drought resilience: National Young Farmers Coalition (Colorado River Basin)

In Wyoming, ranchers Pat and Sharon O'Toole have always managed their land with conservation in mind. Increasingly, new technology plays a role in those efforts. A trailer with mounted solar panels allows the O'Tooles the flexibility to move their alternative energy source across their grazing lands to power up wells and pump stockwater for their roaming herds of cattle and sheep. Supplemental water for fisheries is provided by High Savery Reservoir.

The O'Tooles and other irrigators have also worked with conservation and government agency partners to modify every diversion structure on the Wyoming side of the Little Snake River 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. Fifteen irrigation diversion structures have been modified at a cost of over $8 million dollars. A decade 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.

The Family Farm Alliance report, "*Innovations in Agricultural Stewardship: Stories of Conservation & Drought Resilience in the Arid West*,"[2] focuses on this and four other 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 Alliance teamed up with the National Young Farmers Coalition on this report with the aim of elevating the voices of farmers and ranchers who are employing smart solutions to build drought resilience, steward water and grow good food.

Some of the farmers highlighted in the Alliance report 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 worked with the engineering firm Applegate Group to create a water balance for three of the case studies. 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 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.

Technology that improves water delivery and on-farm water conservation: Imperial Irrigation District (CALIFORNIA)

The Imperial Irrigation District (IID) Water Department has been serving the Imperial Valley's water needs for over 110 years. The district provides raw Colorado River water for irrigation and also for non-potable residential and industrial uses to the Imperial Valley. To facilitate its delivery, IID operates more than 230 miles of main canals, 1,438 miles of canals and laterals (of which 1,456 miles are concrete lined or pipelined) and 1,406 miles of drainage ditches in the Imperial Valley. Nearly a third of Imperial Valley's 442,600 acres are dedicated to alfalfa. Another nine crops – including three types of grasses, lettuce, wheat, sugar beets, carrots, broccoli and onions – account for over 50 percent of irrigated acreage within the district. A virtual cornucopia of produce, grains, herbs and nursery stock make up the remaining acreage, as nearly 80 different types of crops are grown by Imperial Valley's farmers.

IID Diversion and Water Delivery Features

IID is entitled to 3.1 million acre-feet each year from the Colorado River. Imperial Dam located north of Yuma, Arizona, serves as a diversion structure for water deliveries throughout southeastern California, Arizona and Mexico. The operations of IID's River Division Office at Imperial Dam, as well as system wide water distribution, all fall under the direction of Reclamation. Water diverted at Imperial Dam for use in the Imperial Valley first passes through one of three desilting basins, used to remove silt and

[2] https://www.youngfarmers.org/wp-content/uploads/2015/05/NYFC-template-FINAL_lowNew.pdf

clarify the water. Each desilting basin is 540 feet wide by 770 feet long and is equipped with 72 scrapers designed to remove 70,000 tons of silt per day. The silt is returned to the river by means of six sludge return pipes that deposit the silt into the California Sluiceway. From the desilting basins, water is then delivered to the Imperial Valley through the All-American Canal.

Three main canals, East Highline, Central Main and Westside Main, receive water from the 80-mile long All-American Canal and distribute water to smaller lateral canals throughout the Imperial Valley. Farmers receive water in private ditches from the lateral canals to irrigate nearly 500,000 acres of farmland within IID's water service boundaries. Another important component of IID's distribution system are the seven regulating reservoirs and four interceptor reservoirs that have a total storage capacity of more than 4,300 acre-feet of water.

IID serves water through approximately 5,600 delivery gates for irrigation purposes. IID also maintains over 1,450 miles of drainage ditches used to collect surface runoff and subsurface drainage from over 32,000 miles of tile drains underlying nearly 500,000 acres of farmland. Most of these drainage ditches ultimately discharge water into either the Alamo River or New River.

Quantification Settlement Agreement for the Colorado River

The 2003 Quantification Settlement Agreement (QSA) for the Colorado River authorized the nation's largest agricultural-to-urban water transfers, which were necessary for California to reduce its Colorado River diversions to within the state's 4.4 million acre-feet entitlement. IID is implementing efficiency-based water conservation programs that improve its water delivery system and provides funding for on-farm conservation measures to create approximately a half million acre-feet a year of conservation. Under the QSA and related Agreements, IID agreed to transfer this conserved water, over 15% of its annual share of Colorado River water, for 45 years to the San Diego County Water Authority, the Coachella Valley Water District and Metropolitan Water District of Southern California.

IID's Systems Conservation Program

New technology plays an important role in IID's systems conservation program. Electronic monitoring and automation of gates and spillways helps to reduce system spills and provide for more accurate deliveries in real-time. The use of laptops and a private broadband network allows ditch riders (zanjeros) mobile access to current readings and gate controls. A centralized command center was developed early in the process to capture and relay data, allowing IID to meet monitoring and reporting requirements. Computerized water order scheduling and billing system through TruePoint allows for centralized data management. IID recently embarked on a program to update its Water Information System (WIS). The new system – called WISKEY – will compile disparate systems of billing, monitoring, and controls.

To date, the IID has committed significant resources to system improvements ($50 million in system capital and millions annually in O&M) over the past 15 years since the implementation of the QSA. Also through an on-farm partnership, the district and farmers are conserving water and securing that water is put to beneficial use in each field. This promotes the use of sprinklers, drip, pump-backs, land leveling, and other methods. The on-farm program encourages significant economic development in the region, with $50 million scheduled for 2019 and $36 million budgeted for 2020. Being that the IID system is a

terminal system, any savings to enable more accurate deliveries and reduce spills allow a larger quantity of water to be available to its users and to meet conservation obligations. These programs enable water security for the region and economic development in a farming sector that is struggling with rising labor costs and foreign competition.

Results

IID generates conserved water to meet the needs of the QSA water transfers by making water efficiency improvements in its delivery system. Conservation targets started at 4,000 acre-feet in 2008 with the goal of capturing and reusing operational discharge. With the completion of the first system conservation project (the Main Canal Seepage Interception project and other system projects), the district conserved nearly 45,000 acre-feet in 2015 through system conservation. IID system conservation measures generated nearly 50,000 acre-feet in 2016, with the goal of reaching 103,000 acre-feet annually in 2026. Collectively, with all its conservation efforts, IID will ultimately conserve about 15 percent of its consumptive use entitlement each year – over 487,000 acre-feet when all conservation measures are at full implementation. IID's system conservation efforts clearly demonstrate that modern technology can be employed to improve the reliability and flexibility of water deliveries and facilitate future on-farm conservation efforts.

Tracking and capturing monsoon runoff for irrigation and groundwater recharge (Elephant Butte Irrigation District - NEW MEXICO)

With less snowpack 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 farmland and into a system of drains that allow the storm water to recharge the underground aquifer.

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 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.

The profound drought that the RGP has experienced for much of this century 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 two decades, 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.

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 U.S. 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.

Drought and the prospect of an increasingly arid climate have motivated EBID to rethink the management of storm water. 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.

Stormwater 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 better meet downstream demand as well as provide opportunities 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.

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 weather cells that may produce runoff within a timeframe of several hours. 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.

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.

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.

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.

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. Second, 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 has been truly a bright spot in an otherwise bleak drought.

How the Federal Government Can Help

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. Planning for water shortage in the West must look to the long-term in meeting the needs 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, water- sensitive land use planning, and water system improvements. New infrastructure and technologies can help stretch water for all uses and boost the economies of Western rural communities.

We offer the following observation and recommendations for the Subcommittee to consider as it further engages on water management innovation and technology matters. We urge Congress to:

1. Give high priority to authorizing and providing sufficient resources to maintain, restore, modernize, and upgrade federal water, weather and climate observation and research programs, with a primary focus on improving coordinated data collection and dissemination.

2. Include Irrigation Modernization and support for agricultural infrastructure in Congressionally authorized infrastructure packages.

3. Support robust and reliable funding for the Environmental Quality Incentives Program (EQIP), the Regional Conservation Partnership Program (RCPP), and the Watershed Protection and Flood Prevention program (P.L. 566). These programs help drive many of the success stories described in this testimony.

4. Encourage agricultural producers to work together with each other and with many applicable Federal and State agencies in a strategic, coordinated fashion. Compel all federal agencies to collaborate in a partnership-based manner with the farmers, ranchers and water managers who are tied to federal watersheds. 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.

5. Support incentive funding for land and water management activities on lands to provide flyway habitat benefits in support of activities like those in the Central Valley of California and the Intermountain West Joint Venture, especially multi-benefit flood control and/or water conservation projects.

6. Promote the coordination of regulatory agency permitting to improve the timing and cost of permitting habitat and water conservation projects.

7. Look for opportunities to improve the federal regulatory process by streamlining regulations, improving coordination, reducing duplication, and increasing transparency. Many of our members continue to face challenges with trying to figure out ways to work through and around the different agency processes associated with appraisals, NEPA compliance and other requirements. There are daunting bottlenecks and inefficiencies that occur when funds are coming from multiple federal agencies and are attached to differing mechanisms and approval processes. Clarity on rule development and better coordinated federal permitting processes would reduce permitting timelines and save taxpayer dollars without compromising environmental protections.

8. Expand Reclamation's Water SMART grants program to include a larger (up to $20 million) competitive 50-50 cost-shared grant for small water supply management projects integrated into a regional watershed plan – this could help fund larger water conveyance, storage and conservation infrastructure than currently supported.

9. Find ways to improve coordination of WaterSMART and other water management programs at

Reclamation with existing conservation programs at the USDA's NRCS. This would lead to more effective federal investments in on- and off-farm water management improvements.

10. Support and authorize adequate resources that would allow the USDA-ARS to continue to perform a critical role of translating ASO data into estimates of water supply and runoff in the Western U.S. Current estimates for this program need at USDA-ARS are approximately $2.2 million in additional funding annually for the next 10 years. Support federal funding, support, and cooperation for Reclamation to oversee the continued operation in California and the expansion of ASO technology application throughout the West. The federal sponsorship for additional ASO surveys should focus first on federal irrigation or flood control projects, as prioritized by Reclamation and the U.S. Army Corps of Engineers.

11. Direct Reclamation to make maximum use of existing financing tools for project beneficiaries, including direct loans for extraordinary and emergency maintenance at Reclamation projects, such as those authorized by the Aging Infrastructure title of P.L. 111-11. Efforts must continue to compel Reclamation and the Office of Management and Budget to implement this program, which has been authorized by Congress, and to investigate opportunities to develop similar loan programs that can also help fund new water storage infrastructure projects.

12. Create at Reclamation an affordable loan program, similar to the Water Infrastructure Finance and Innovation Act (WIFIA) included in the WRRDA 2014. New tools like this will be needed to assist in financing major improvements to aging water infrastructure in the coming years. This can help ensure that farmers and ranchers who benefit from these upgrades can afford repayment terms.

13. Direct the DOE to research, develop and demonstrate the value of irrigation modernization, specifically focused on developing new technologies, optimizing and integrating energy resources sited in irrigation districts, better understanding the nexus of water and energy security, and how the agency can utilize their resources to accelerate the pace and scale of irrigation modernization.

Conclusion

In the West, given the many challenges facing the future viability of the West's water supplies, water managers now must manage water as if every year is a drought year. In order for irrigated agriculture to exist into the future, we need to look to innovative technology to enhance management of water supplies and delivery and we must maximize the benefits from the water we have available to meet multiple needs. It is surprisingly easy to use innovation and technology in water management to improve both food production and fish and wildlife habitat.

It is our hope that this testimony delivers the clear message that water managers, ranchers and farmers are technologically-savvy, innovative, resourceful and creative individuals. These innovators should be actively solicited by federal water policy makers to participate in resolving the water conflicts of the West. Irrigators and their local water agencies have responded to the recent Western droughts 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 these water resource challenges, the result would likely be better management of water for both economic purposes and environmental uses. We hope the examples highlighted in this testimony will provide your Committee with a more nuanced understanding of the diversity and complexity of western agricultural water management, and the prominent role that technology and innovation will play in finding solutions for the future of the West.