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The Energy Boom and Rural Communities of the Intermountain West
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Mapping Mine Waste Impoundments in the Western U.S.
Understanding Community Context and Risk

Irrigation Alternatives Lead to Reduced Water Use While Maintaining Crop Yields
Sustainable Water Use for Processing Tomatoes

ON THE COVER:
Making Every Dollar Count
Leveraging Federal Investments in Land Management to Benefit Local Communities
The Western Rural Development Center (WRDC) compiles this magazine with submissions from university faculty, researchers, agencies, and organizations from throughout the Western region and nation. We make every attempt to provide valuable and informative items of interest to our stakeholders. The views and opinions expressed by these agencies/organizations are not necessarily those of the WRDC. The WRDC is not responsible for the content of these submitted materials or their respective websites and their inclusion in the magazine does not imply WRDC endorsement of that agency/organization/program.

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ON THE COVER:
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Leveraging Federal Investments in Land Management to Benefit Local Communities
Chelsea P. McIver, Alexander Metcalf, and Elizabeth Dodson, University of Montana-Missoula

This article presents two case studies that use federal contracting data to understand: 1) the value and types of activities being procured by the US Forest Service to accomplish forest maintenance and restoration objectives, and 2) assess the degree to which forest communities are currently benefiting from this work. We then discuss the potential of existing legislative authorities to encourage utilization of local businesses, thereby reducing leakage and helping struggling rural communities build the capacity to retain more of the dollars invested by land management agencies within their local economy. --Page 21.

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INTRODUCTION

By Don E. Albrecht
Director, Western Rural Development Center

The issues and problems confronting the residents and communities of rural America are severe. A partial list of these concerns includes health care provision, the availability of a quality education, the creation of more and better jobs, and coping with significant resource and environmental issues.

In my opinion, the best way to address these issues is to share ideas and learn from one another. Sharing and learning from each other is made possible because throughout the country there are capable, dedicated professionals developing innovative and effective programs that help rural residents tackle difficult problems. These individuals represent a number of agencies and organizations. The primary objective of Rural Connections is to enable these ideas to be shared more efficiently. This issue of Rural Connections presents nine articles that we are convinced will be of assistance to others as they seek to cope with troubling problems in their own community.

The articles in this issue of Rural Connections discuss a number of the more critical concerns confronting rural areas including rural health care, funding for rural schools, coping with growth associated with rapid energy development, rural tourism, wealth creation, coping with problems associated with irrigation and scarce water supplies, mapping mine waste impoundments, and making the best of federal investments. The ideas and programs described are exceptional and I am convinced can benefit others. The author’s of these articles come from a wide range of organizations that work with rural areas including USDA Rural Development, NACo (National Association of Counties), Extension professionals at Land Grant Universities, and grassroots local organizations. As always, I am so impressed with the rural development work being conducted in the West and my hope is that each of you can benefit.

I again extend my utmost appreciation to Rural Connections Editor Betsy Newman. Her skills are next level and it is a great pleasure to be her colleague.
Wyoming is the least populated state in the nation, and second only to Alaska in its low population density. Long distances between towns and remote locations without healthcare are detrimental to the sustainability of rural communities. Considering these geographic obstacles, it is important that Wyoming is able to attract rural health practitioners and provide quality healthcare to its rural residents. Aspen Mountain Medical Center in Rock Springs is an excellent example of how U.S. Department of Agriculture (USDA) Rural Development is meeting these needs through its Business and Industry Loan Guarantee Program.

In 2014, MidFirst Bank’s Healthcare Lending Division contacted Rural Development’s State Office in Casper regarding financing for a physician-owned surgical hospital in Rock Springs, Wyoming. Aspen Mountain Real Estate LLC and Aspen Mountain Medical Center LLC had contacted the bank about building the 51,000 square foot facility. MidFirst Bank is located in Oklahoma City and while they have built a variety of healthcare facilities across the nation using both Rural Development’s Business and Industry (B&I) Loan Guarantee Program and Rural Development’s Community Facilities Program, this was MidFirst’s initial project in Wyoming.

Surgical hospitals have gained in popularity in recent years and as of early 2016, there were approximately 130 such hospitals in the United States. These facilities focus on providing surgical services and they normally have 50 beds or fewer. Surgical hospitals focus on customer satisfaction, turnover time, and efficiency.

Surgical hospitals appeal to a wide range of users as physicians benefit from improved management of the clinical staff, increased operating room access, ease of scheduling, and alignment of economic incentives. These, in turn, enhance accountability, responsibility, and result in cost benefits to their customers (Meridian Surgical Partners, 2015).

Patients experience a better healthcare environment with all inpatient, outpatient, and ancillary services available with greater scheduling flexibility in one user-friendly facility. The result is that surgical hospitals provide affordable, high-quality care in a way that achieves sustainable and measurable long-term savings.

This brand new, state-of-the-art facility includes 16 private patient rooms and four fully-equipped surgical suites. The surgical hospital is privately owned by a group of physicians located in Wyoming and Colorado, along with Nueterra Healthcare. Nueterra is a global company that specializes in owning and managing healthcare facilities.

The owning physicians have a wide range of specialties, including family medicine,
gastroenterology, internal medicine, general surgery, pediatrics, pain management, ophthalmology, anesthesiology, gynecology, spine, podiatry, interventional radiology, ear, nose and throat, and orthopedics. Physicians are expected to bring their own specialty caseload to the facility. Since Aspen Mountain Medical Center began operations in July, several local physicians not originally associated with the facility are now scheduling their surgeries at the facility.

As part of the “one-stop shopping concept” in surgical care, Aspen Mountain Medical Center has their own pharmacy, laboratory, pathology, rehabilitation, and imaging departments.

Initially projected to create 32 jobs, at their grand opening Aspen Mountain Medical Center announced that total employment had grown to 60 full-time positions. This did not include the positions for construction of the facility over the 16-month period.

While there is a similar surgical hospital located in Casper, Wyoming; that facility is over 225 miles away and is located in a much more metropolitan area than Rock Springs. Aspen Mountain Medical Center services a much larger geographic area with a much more dispersed population across the region. This surgical hospital allows the rural residents of southwestern Wyoming, Utah, and Idaho, to get needed surgical care locally without having to travel to Casper, Cheyenne, Salt Lake City, or Denver.

Because some of the physicians owning the surgical hospital are located outside of Rock Springs, the hospital allows them to travel closer to where their clients live to conduct procedures. This reduces traveling long distances to visit the physicians’ home offices.

In times of economic downturn as we are facing in Wyoming, it is extremely beneficial to be able to diversify into other segments and help sustain the local economy and community. Jobs in the health care industry are often well paying and highly sought after. As a result, the new surgical hospital is already a major employer in Rock Springs.

The initial loan for the medical center was for $19.17 million with a 50% guarantee to MidFirst Bank through the Business and Industry Loan Guarantee Program from USDA Rural Development. This guarantee provides protection for the lender with the underwriting from the U.S. Government, and is a way for USDA to say they believe the success of this medical center will benefit the rural community greatly, and the guarantee supports that faith.

The Business and Industry Loan Guarantee Program provides support to the private credit structure by guaranteeing loans for rural lenders, which in turn, allows these private lenders to extend more credit than they could typically provide to rural small businesses. To be eligible, projects must be located in cities or towns with a population of 50,000 or fewer. Under the program, the lender works with USDA Rural Development instead of the ultimate borrower of the funding. Essentially, the lender is the USDA customer, not the small business itself.

Eligible lenders include federal or state chartered banks, savings and loans, farm credit banks, and credit unions. For-profit businesses, nonprofits, cooperatives, federally recognized tribes, and public bodies can all be considered eligible borrowers under the guidelines of the program.

With certain restrictions, the loan receiving the guarantee can be for construction, equipment, refinancing and debt restructuring, working capital, and even outright purchasing of existing operations if it will save or create jobs. Loans of up to $25 million can be guaranteed on a sliding scale percentage from 80% down to 60%. Interest rates are negotiated between the lender and the borrower, and with the support of the guarantee, lower rates can often be secured. Additionally, with the guarantee, the loan can be sold on the secondary market by the lender and extending their lending capabilities even more.

USDA Rural Development is pleased to have played a significant role in this outstanding accomplishment for Rock Springs, Sweetwater County, and the State of Wyoming as a whole. It is sometimes difficult for individuals outside of Wyoming to visualize the long distances one must travel to find medical care of this caliber. As a result of this project, the residents of Rock Springs and neighboring states now have easier access to a wide range of high quality, specialized health care options, and the community has gained a valuable employer and rural small business in the process.
Enjoyed recreationally by many and economically utilized by others, federal lands such as the National Forest System present unique challenges to the state and local relationship with the federal government. This is particularly apparent in the West (defined as the 13-state region covered by the Western Rural Development Center), containing the bulk of federal lands. Ninety-eight percent of Western rural counties (with less than 50,000 residents) have federal land within their boundaries, and 74% have National Forest land (NACo analysis of U.S. Department of Interior data, 2015). Counties and states cannot constitutionally tax federal landholdings. This is a major opportunity cost for Western counties, given that property taxes are the main general revenue source for counties overall.
Congressional resolutions to this revenue disadvantage span more than a century. The Payments to States Act of 1908 mandated 25% of the funds generated by National Forest lands be transmitted to the state in which the commercial activity occurs and shared with county governments. Over the years, the federal government implemented additional revenue sharing arrangements related to timber, mining, recreational, geothermal energy production, and other land uses on federal holdings. In 1976, Congress authorized the Payments in Lieu of Taxation (PILT) to compensate counties on a formula basis with a minimum amount of dollars per each federally-owned acre. Western rural counties use PILT dollars to fund essential services, such as transportation infrastructure, schools, forest management, ecosystem protection, wildfire protection, search and rescue, and emergency services. Currently, funding for the Payments in Lieu of Taxes program is provided through annual Congressional appropriations.

Beginning in the late 1980s, payments associated with the Payments to States Act became volatile and also trended lower due to a reduction in logging activity on federal lands. In 2000, Congress enacted the Secure Rural Schools (SRS) program (as part of the U.S. Department of Agriculture grants) that sought to alleviate this payment uncertainty and decline. The SRS enabling legislation offered states one of two options for payments from National Forest land holdings: 1) either continue to accept the current 25% annual payout based on the 1908 Payments to States Act, or 2) receive a federal payment each year based on the average of the three highest payouts from the years 1986-1999. Although the new program does not provide a long-term, active forest management solution, the second option based on historically high forest production proved more beneficial for the vast majority of states.

This analysis of estimates provided by the Department of the Interior and U.S. Forest Service examines the fiscal impact of a potential termination of the SRS program on Western rural counties, assuming the PILT program remains subject to annual discretionary appropriations by Congress.

For FY 2015, the SRS program provided $278 million for roads and schools and other critical services in 732 mostly rural counties. These funds were especially critical, as many of the western rural counties have fragile economies, still reeling from the effects of the latest economic downturn. By 2015, only 45% of small western county economies had recovered to their pre-recession levels on economic output (GDP); and only six percent of all small western county economies had recovered on four economic indicators: economic output, unemployment rate, jobs, and home prices (Istrate and Knudsen, 2015).

Without the Secure Rural Schools program, federal compensation for National Forest land would be based once again on the Payments to States Act of 1908—the 25% share of federal revenue from these lands. This amount will rarely match the SRS funding per acre. Estimates from the U.S. Forest Service indicate county payments under the 1908 Act would have been 86% less than funding under the SRS program in 2014. As such, locales with National Forest acreage will be forced to rely more heavily on funding from the PILT program as the mechanism through which the Federal government upholds its commitment to public lands counties. But, unless Congress drastically increases funding for the PILT program by providing long-term mandatory finding for PILT (an unlikely outcome in the current budget environment) these PILT funds will cover just five percent of the drop in Western counties’ SRS funding.

“On a statewide basis, every Western state would have seen a drop in aggregate Payment In Lieu of Taxes and Secure Rural Schools funding, for a combined loss of more than $216 million. Oregon’s loss of nearly $72 million would have been the highest. But Idaho, California, Utah, Alaska, Arizona, Montana, New Mexico, Washington, and Colorado, all stood to lose in excess of $10 million each.”
In addition, the increased use of the Payment in Lieu of Taxes program means that even counties not reliant on SRS funding will suffer financial consequences.

The PILT formula determines the maximum amount of PILT funds the federal government can provide to a county based on numerous factors, including county population and total federal acres. The amount received in the prior year by a county for federal lands payments under programs other than PILT (such as SRS) is deducted to varying extents from the amount of federal funds to be paid under PILT. If SRS were to terminate, many counties that used to receive SRS funds would then be entitled to an increase in PILT funds under the formula. However, Congress is under no obligation to fund this authorized amount and is unlikely to do so in the current fiscal climate. When funding falls short of the amount authorized to be paid under the formula, each county is paid just a prorated share of the full amount authorized—affected SRS and non-SRS counties alike.

The NACo Research Department estimated the changes to the PILT (federal FY 2015) and SRS (federal FY 2014) payments to counties if the SRS program had not been reauthorized for FY 2014 and PILT payments were adjusted accordingly based on the congressionally appropriated amount of $452 million for FY 2015. In aggregate, the total impact of SRS elimination and PILT changes would have exceeded $235 million in annual funding cuts, or nearly a 33% drop. In many counties, however, the funding decline would have been far more severe.

The termination of the SRS program would have resulted in less federal funding for more than 95% of Western counties as a whole along with Western rural counties specifically. Nationally, nearly 88% (1,677) of the more than 1,900 counties with federal lands would have witnessed reductions in PILT and SRS federal funding combined. In 64 Western rural counties, the annual fiscal hit would have exceeded $500,000; and in 26 of those counties, the annual fiscal decline would have exceeded $1 million. Nationally, 27 counties would have lost amounts of at least $1,000,000 and in excess of 50% of current funding. Of those, 26 are Western counties of which 17 are rural. (See Figure 1.)

Of special note, rural counties in the 13 Western states would have borne nearly $107 million of those cuts. For instance, Saguache County, Colorado, would have lost nearly $1 million, and Nye County, Nevada, would have lost just shy of $2 million. (See Figure 1.)

Figure 1. Estimated Effects of Potential SRS Termination on PILT Funding to Counties, Using 2014 Funding Levels.

[Notes: The receipts year reflects when the U.S. Forest Service (USFS) collects revenues from national forest lands. Without the SRS reauthorization, states revert to the Payments of States Act of 1908 as amended, receiving a 25 percent payment from national forest receipts. USFS estimates FY 2015 county 25 percent payments based on county shares of the national forest receipts. These estimates do not reflect the application of a 6.8 percent sequester to state payments. Sixteen Oregon counties receive SRS payments from both the U.S. Forest Service and the Bureau of Land Management. Two Oregon counties only receive SRS payments from the Bureau of Land Management.]

[Source: NACo Analysis of data from the U.S. Forest Service and Bureau of Land Management and Headwaters Economics analysis of the U.S. Geological Survey, Protected Areas database, 2015.]
On a statewide basis, every Western state would have seen a drop in aggregate PILT and SRS funding, for a combined loss of more than $216 million. Oregon’s loss of nearly $72 million would have been the highest. But Idaho, California, Utah, Alaska, Arizona, Montana, New Mexico, Washington, and Colorado, all stood to lose in excess of $10 million each. (See Figure 2.) Overall, only two states in the nation (Louisiana and South Carolina) would have avoided a loss and realized just $800,000 positive upside in total—less than eight cents per resident. (See Figure 2.)

Examples of counties which traditionally receive little or no SRS funds but which would have experienced aggregate funding cuts nonetheless are abundant. For instance, the negative SRS impact in Natrona County, Washington, would have been a miniscule $288. But the combined SRS/PILT impact would have exceeded $656,000. Malheur County, Oregon, would have experienced no SRS funding impact because they already opt to receive 25% payments under the 1908 Act; yet, the PILT reductions would have exceeded $454,000. Likewise, Elko County, Nevada, would have suffered more than a $646,000 reduction. Of the 104 Western counties that currently qualify for PILT funds but that do not receive SRS funds, all would see a reduction in federal funding if SRS is terminated, for a total reduction of more than $7.84 million annually.

Over the past 15 years, the Secure Rural Schools program has supported rural economies in the West, funding rural schools, roads, and other essential services. Based on NACo’s estimates of changes to federal payments to counties with National Forest land in absence of the SRS program, Western rural counties would be the most affected if authorization for the SRS program were allowed to lapse. The effects would not be limited to counties receiving SRS funding currently, it would affect states and counties with federal lands around the country. This analysis shows the importance of federal-local revenue sharing through active forest management and the role of Secure Rural Schools as a critical safety-net funding while Congress works toward a long-term forest management solution.

[Notes: The receipts year reflects when the U.S. Forest Service (USFS) collects revenues from national forest lands. Without the SRS reauthorization, states revert to the Payments of States Act of 1908 as amended, receiving a 25 percent payment from national forest receipts. USFS estimates FY 2015 county 25 percent payments based on county shares of the national forest receipts. These estimates do not reflect the application of a 6.8 percent sequester to state payments. Sixteen Oregon counties receive SRS payments from both the U.S. Forest Service and the Bureau of Land Management. Two Oregon counties only receive SRS payments from the Bureau of Land Management.]

[Source: NACo Analysis of data from the U.S. Forest Service and Bureau of Land Management and Headwaters Economics analysis of the U.S. Geological Survey, Protected Areas database, 2015.]
Wealth creation is a relatively new but growing approach to economic and community development (Pender et al., 2012b). Rural wealth creation has been practiced in a number of regions through work funded by the Ford Foundation under the program title WealthWorks. Building on this work, Rural Development Initiatives, Oregon State University Extension, and other partners launched a wealth creation program in Oregon in 2014 that was funded by three different foundations in the state. Eighteen rural regions across Oregon submitted proposals and six regions were chosen to participate in a pilot program to explore applying these concepts to their regional economy.

**RURAL WEALTH CREATION**

In the wealth creation framework, wealth is defined through eight forms of capital stocks: Individual, Intellectual, Natural, Built, Financial, Political, Social, and Cultural. These capital stocks, or forms of wealth, are defined in Figure 1. Creating an inventory of multiple forms of capital and considering how they can be improved forms the basis of asset-based community development approaches. The rural wealth creation framework builds upon this understanding and hypothesizes that overall development outcomes will be enhanced if decision makers consider the potential impact of any investment or policy on all forms of wealth (Pender et al., 2012b).
et al., 2012a). Decision makers should: 1) Choose decisions that create the most benefit across all of the forms of capital stocks; and 2) Seek to minimize investments that damage one form of capital stock in order to grow another.

WealthWorks has used the principals of rural wealth creation to create a systems-thinking approach to economic development (Lyons et al., 2014; Ratner et al., 2014) that has been implemented in regions across the country. The WealthWorks model has three core elements that guide development decisions: 1) enhance the eight capitals; 2) consider local ownership and local control opportunities; and 3) consciously improve the lives of disadvantaged people in the region (Ratner et al., 2014). To accomplish these elements and build wealth that is retained in rural areas, WealthWorks seeks to create wealth-building value chains, a set of interrelated businesses within a region that are oriented towards market demand. Figure 2 summarizes the key principles in this approach.

Figure 2. Key Principles in Rural Wealth Creation/B.Newman
Regions are more likely to find more success by building on the existing business assets that are already in their community rather than trying to build a value chain from scratch. This can require working with existing businesses to seek out forms of market demand that support not just financial profit but production practices and product qualities that build multiple forms of wealth. Rising incomes, environmental awareness, and cultural shifts have created market demand that often offers a premium for goods and services that satisfy a variety of preferences including local, sustainable, organic, handmade, and socially responsible production practices.

For example, to apply this principle, producers could shift from selling raw products in the open commodity market at a lower price to selling a more processed product that is distinguished by certain quality and consumer preferences at a higher price. As producers work to meet this new market demand, a value chain coordinator works to partner existing businesses in the region and/or create new business opportunities (Lyons et al., 2014). WealthWorks assumes that participating businesses will grow their financial capital while also building additional forms of capital. For example, by improving the natural capital in the community by being good stewards of the land and water resources, developing stronger social capital among the business community, and building additional intellectual capital in the community’s workforce. (More information can be found at wealthworks.org.)

OREGON’S PROGRAM
WealthWorks Northwest adapted this program to meet the needs of rural Oregon communities. (For more information visit http://wealthworksnw.org.) The initial pilot program provided technical assistance by connecting regional teams to other resources and by offering coaching directly to the team leaders in a way that builds on-the-ground capacity within the region, as well as a $10,000 grant for each participating community to cover market demand research, participant travel, staff time, and other expenses incurred during the program.

In the program, communities select a value chain, convene existing businesses within the identified value chain, and develop an understanding of existing market demand and the region’s collective ability to meet this demand. The group also determines how each capital stock can be enhanced through efforts to grow businesses within the value chain. This pursuit of developing multiple forms of capital is the basis of the group’s collective interest and will influence which market opportunities are pursued and who the group chooses as partners. A majority of the components of the program are already in the basic economic developer’s toolbox, but the ways they are combined and the intentionality to pursue multiple forms of capital at once are new. Creating a set of indicators to monitor ongoing progress across the eight forms of capital stocks is also a part of the program.

When rural communities in Oregon were asked to rate capital stocks in their own communities, they perceived social and natural capital to be their two strongest forms of wealth, while built and financial capital were often the weakest. Starting with an understanding of the community’s assets across the eight forms of wealth and the strengths of existing businesses, many groups determined that there was

“Producers could shift from selling raw products in the open commodity market at a lower price to selling a more processed product that is distinguished by certain quality and consumer preferences at a higher price.”
potential to explore a value chain among agricultural producers and processors.

LESSONS LEARNED FROM THIS WEALTH CREATION APPROACH
Participant surveys and interviews were used to assess the impact of interventions across the six participating communities. In the short term, of the eight forms of capital stocks, communities were most likely to build new social capital among businesses and participants. This program encouraged business owners to convene and discuss collective interests and explore potential areas to collaborate, often for the first time. Increased social capital sometimes led to increased political capital. For example, two regions formed connections which led to successful grant writing efforts attracting additional financial capital to the project. All six regions continued to work on the project after the initial four-month pilot period, and the most active groups developed intellectual capital as they learned more about the businesses within the chain and existing market demand, and the region’s ability to be competitive in these new markets.

Building a stronger communal knowledge base of these concepts to permanently improve the way a region approaches local economic development is one goal of the wealth creation program. However, mastering these concepts requires continual practice and deliberate intent of a core group of leaders. After the program ended, many regions lacked the resources to lead this process without support. Regions particularly struggled with using market demand research to identify business opportunities, articulating shared interests to potential partners, and conceptualizing what inclusivity could mean within the approach.

The advantage of the systems approach is that the big picture appealed to a lot of stakeholders, and participants readily agreed that investing in the region’s natural capital and built capital were just as important as realizing financial gains. However, for some regions there were simply too many concepts to absorb and incorporate into their thinking and action plans, which led some individuals to tire of the process and return to their individual businesses. Regions realized that pursuing the goal of improving the food system as a whole was too ambitious; there were too many partners to manage and too many barriers to address. Some regions then attempted to narrow their focus but struggled to identify which market opportunities to pursue.

CONCLUSION
WealthWorks Northwest is a unique collaboration between an Extension Service and a non-profit organization seeking to build on leadership development efforts in the state by engaging more communities in local economic development using a wealth creation framework. In Oregon, a majority of regions identified a local food system as the region’s most promising value chain opportunity that would allow the development of multiple forms of wealth. As a comprehensive approach to economic development, WealthWorks aims to provide tools that support locally-led development efforts that respond to changing market conditions and competing priorities, while emphasizing the retention of profits and benefits locally and positively impacting low income individuals.

After participating in a four-month pilot, communities gained important skills and new knowledge about their economies through WealthWorks, and this program sought to tie together recently-built leadership capacity with economic development resources at a regional level. There is evidence that this approach can transform rural economies, but as we have learned there is a significant learning curve for rural regions to embrace value chains, multiple forms of wealth, market demand analysis, evaluation tools, and expanding existing capacity to include new partners. Furthermore, this pilot offered implementation funding, more than many other programs. However, additional follow-up has shown more resources need to be spent developing and supporting institutions that can champion this work and keep a complex view of the economy active and evolving.

“Regions are more likely to find more success by building on the existing business assets that are already in their community rather than trying to build a value chain from scratch.”
Silver City, Nevada
A Linchpin in a Wheel of Arts and Culture Economies

By Quest Lakes, Healthy Communities Coalition

The tiny mountain community of Silver City, located in Northern Nevada a few miles from Virginia City and about 30 miles from both Lake Tahoe and Reno, is an unusual case study in “Recreational Economies.” Unlike the nearby towns that offer full schedules of outdoor recreation possibilities and tourist attractions, Silver City is a linchpin in the region’s production of arts and cultural resources.

Situated in one of the country’s largest federally designated historic districts, Silver City has its roots in the mining boom of the 1860s. Historians estimate that by 1861, Silver City had at least a dozen stores, four hotels, three blacksmith shops, two butcher shops, and a post office, serving a population of more than 1,000 people. However, by the 1940s, the town had become a very quiet place that passing tourists saw as a ghost town.

But by the mid 1960s, a new wave of residents from other states began to arrive and Silver City experienced a “cultural re-population” that continued for the next 50 years. As former Silver City resident and University of Nevada, Reno Professor Emeritus Jim McCormick describes it, the new residents infused the community with fresh ideas and energy. In his 1987 Nevada Historical Quarterly essay, “Silver City-Reminiscences, Facts and a Little Gossip,” McCormick recalled that the new residents repaired the dilapidated community center; voted themselves onto the town council and instituted a rare participatory democracy system; expanded the town park adding new playground equipment, trees and a lawn; restored and remodeled historic structures to create unique homes; and re-invigorated the volunteer fire department (which
then became one of the first in the U.S. to welcome
women as firefighters).

Over the course of these 50 years, the community
of less than 200 people produced a remarkable
body of work that has contributed to recreational
economies in a way that is unique. They’ve produced
regionally and nationally recognized work in
archaeology; anthropology; visual art; theater; music;
photography; and historic preservation; as well as
academic research and projects on the Great Basin,
the historic Comstock region, and other parts of
Nevada and the world. Many created hand-crafted
items in silver, wood, gemstones, clay, etc., and
examples can be found in diverse places, from the
Smithsonian American Art Museum to the region’s
historic cemeteries, homes, and buildings.

And although the residents enjoy their privacy, most
of the year, over the last decade, they’ve expanded
local public programming that reflects the unique
“Arts and Cultural Resources Production Center”
character of the community. Since 2003, the town
has offered a free arts and science events program
each summer. And throughout the year, public
events including pop-up art shows, poetry readings,
and monthly acoustic music events are hosted by a
local arts group. The Resident Artist Program hosts
both U.S. and international artists, musicians, and
writers who stay at “McCormick House,” an artist’s
residence designed by Professor McCormick, while
they offer public programming in Silver City and
Northern Nevada. This summer the town kicked off
its 2016-2017 music season with a public concert
featuring more than a dozen local musicians and
bands performing on a new outdoor stage dubbed
the “Silver Pavilion.”

In 2014, the Silver City Advisory Board recognized
the existing character of Silver City as an “Arts and
Cultural Resources Production Center,” and formally
recognized the considerable work residents have
contributed, and continue to contribute, to the
production of important work in the areas of arts
and cultural resources. The Board also formally
recognized the extraordinary support the entire
community has given and continues to give to local
arts and cultural resources production, events, and
programming.
Addressing Water Management Issues in the Drought-Stricken Great Basin

TOOLS AND TRAINING TACKLE THE CHALLENGE OF REMAINING PROFITABLE WITH LESS WATER

By Stacie Clary, Western SARE

"According to Carol Bishop, Extension Educator with the University of Nevada Cooperative Extension, policies that have been used in arid climates in the West to enforce water conservation on agricultural producers utilizing irrigation are not always effective (Wilson and Needham, 2006)."
In addition to the environmental impacts, farmers and ranchers in the Great Basin of the western region find it challenging to remain profitable with less water, as more water is allocated to residential, municipal, and industrial uses.

According to Carol Bishop, Extension Educator with the University of Nevada Cooperative Extension, policies that have been used in arid climates in the West to enforce water conservation on agricultural producers utilizing irrigation are not always effective (Wilson and Needham, 2006). Changes in water management are an alternative to imposing policies such as laws and taxes. To address water management problems, producers can reduce the amount of water applied to crops, change water delivery methods, or switch to alternative crops that use less water.

Bishop designed a curriculum for producers and agricultural professionals in the Great Basin about such alternative, low-water use crops, and the continuing severe drought has created a high demand for these materials.

**SEARCHING FOR A SOLUTION**

Bishop created the Western SARE Professional Development Program project, Economic Evaluation of Alternative (low-water use) Crops for the Great Basin, to “educate producers with pertinent information about alternative low-water use crops and the associated decision-making tools developed to implement them.” She anticipated disseminating the information through seminars, with all major learning methods covered, for ag professionals. The goal was that by the end of the project program participants would have an enhanced ability to effectively deliver knowledge and skills to farmers and ranchers.

The project’s specific objectives were for the participants to:

- Understand the economic, political, and environmental benefits of reducing water use in agriculture
- Understand the basic agronomy of alternative crops available to producers in the Great Basin
- Understand the components of evaluating the economic feasibility of low water use crops

In Nevada’s Walker River Basin, agricultural water rights have been over allocated. At Walker Lake, a rare freshwater terminal lake in northern Nevada, water has been diverted from the lake’s inflows for irrigation purposes at five major agricultural areas along the tributary rivers for over 150 years (Partners, 2007). Results from these diversions include a 145-feet drop in lake level and increases in lake salinity. These outcomes are reducing the habitat and populations of various threatened and endangered species.

**PICTURED:** Low water levels at Walker Lake, Nevada/shutterstock.com
• Have the ability to use the IRRIG-AID spreadsheet (an irrigation strategy and decision-making tool)
• Create plans to introduce seminar curriculum and other SARE resources into producer programming
• Work one-on-one with producers to evaluate the economic feasibility of alternative low-water use crops on their farm/ranch
• Have the ability to provide an overview of the benefits of utilizing the IRRIG-AID spreadsheet tool and demonstrate its use to producers
• Assist agricultural producers in implementing low-water use crops on their farm/ranch
• Assist producers with the measurement of changes in water use and resulting environmental improvements such as water and soil quality
• Assist producers with the measurement of changes in profitability and economic sustainability of alternative crop use

Bishop and her team created a handbook of the curricula, a user manual for IRRIG-AID, and a CD containing the IRRIG-AID spreadsheet, copies of the PowerPoint presentations for the five modules, and a document with links to all websites cited in the curricula and links to further assistance. These were distributed to all participating educators. Workshops were held in various locations and were conducted by video in addition to the in-person workshops.

WHAT WAS LEARNED
According to Bishop:
• Ninety-seven percent of workshop attendees would attend future workshops on agricultural water management and/or alternative crops.
• On a scale of 1 to 5, the average rating for curriculum content was 3.84.
• The average increase in knowledge gained over all curriculum subjects was 44%.

Of those responding to the six-month follow-up survey:
• 43% have introduced workshop curriculum and other SARE resources into producer programming;
• 39% have worked one-on-one with producers to evaluate the economic feasibility of alternative low water use crops on their farm/ranch;
• 35% assisted agricultural producers in implementing low-water use crops on their farm/ranch;
• 35% assisted producers with the measurement of changes in water use and resulting environmental improvements such as water and soil quality;
35% assisted producers with the measurement of changes in profitability and economic sustainability of alternative crop use; 82% have incorporated some of the material presented in the workshop into their operation/job.

During the project, 1,250 copies of the curriculum were distributed. Eighty-six ag professionals participated in the project’s official workshops. In addition, program summaries and posters were presented at events for educators, USDA agencies, and private businesses, among other audiences.

**IMPACTS**

The Evaluating Alternative Low-Water-Use Crops for the Great Basin curriculum was selected as a national communication award finalist for a bound book by the National Association of County Agricultural Agents.

Testimonials from participants include:

- “I am better prepared to answer questions from producers and provide educational programs to help producers with water deficits.”
- “I am more knowledgeable about alternative crops that may be planted instead of alfalfa in low water years and how they may fit into FSA programs.”
- “The course helped me with crop selection and pricing.”
- “Alternative low H2O use crops will strongly be considered for my alfalfa operation.”
- “I can help to implement growing crops to use less water through pipes, sprinklers, and drip, depending on the crop.”

**POST-PROJECT ACTIVITIES**

Since the completion of her project, the severe drought has continued in the region, and there has been such high demand for the curriculum that Bishop published another 250 copies. CDs have been distributed at regional workshops, especially those sponsored by beginning farmer/rancher and risk management programs, and on reservations in multiple states. The information has proven to be very useful. To reach out to even more ag professionals and producers, the publications have been posted to the University of Nevada’s Extension web page (unce.unr.edu/programs/sites/drought/) on “Living with Drought.”

Spin-off products include additional fact sheets, such as determining profitability. Bishop is assisting with a $4.5 million USDA-NIFA project, led by University of Nevada Cooperative Extension’s Staci Emm, entitled, “Native Waters on Arid Lands,” which brings together scientists, 1862 and 1994 land-grant institutions, and tribal communities of Great Basin and Southwest to address agricultural water challenges. All of these efforts have helped lead to an increasing amount of low-water use crops being planted in place of higher-water use crops, such as alfalfa, especially in northern Nevada.

PICTURED: Dry canal in Nevada/C. Bishop
MAKING EVERY DOLLAR COUNT
Leveraging Federal Investments in Land Management to Benefit Local Communities

By Chelsea P. McIver, Alexander Metcalf, and Elizabeth Dodson, University of Montana-Missoula
INTRODUCTION
In many parts of the forested western United States, rural communities—as compared to their urban counterparts—have been disproportionately impacted by forest industry restructuring, federal land policy changes, and more recently the Great Recession (Abrams et al., 2015; Istrate, 2015). Timber harvest volumes have declined, and catastrophic wildfires and insect outbreaks are increasing the need to manage our forests while changing the types of businesses needed to do the work (Vaughan and Mackes, 2015). Public land managers rely on private sector forestry contractors to conduct needed fuels reduction, insect mitigation, and other restoration and maintenance activities. Unlike traditional forestry work, these activities are not tied to volatile commodity markets, and have become a focus of management on public lands. Many rural forest communities traditionally dependent upon commodities such as lumber and plywood are struggling to find new ways to maintain or build their communities and economies in the wake of mill closures and curtailments (Woodall et al., 2011).

As Lurie and Hibbard explain in their 2011 article on “The New Natural Resource Economy,” restoration and maintenance of our forest resources require firms, workers, material, and supplies while potentially providing biomass and other products with commercial uses. In addition, all of these activities are dependent upon projects which need to be planned, managed, and monitored. The combination of all required inputs and possible products have great potential to contribute to the economic vitality of nearby forest communities.

Meanwhile, buy local programs have also been growing in popularity across the United States, encouraging communities to “grow their own” by investing their consumer dollars in local businesses as a means of stimulating even more local economic activity.

WHAT DOES ‘BUY LOCAL’ MEAN FOR FORESTRY BUSINESSES?
Efforts to stimulate the local economy through ‘buy local’ programs generally focus on the replacement of imports with local substitutes, thereby reducing the leakage of money out of the local economy (Sandro, 1995). As documented by Nielson-Pincus and Moseley (2013), every $1 million invested in forest and watershed restoration in Oregon returned an additional $0.7 to $1.6 million to the local economy as the dollars flowed to local firms and workers, supplies and services were purchased from local vendors, and as workers spent their earnings in the community.

Implementing an import substitution program often means creating policies that direct more contract dollars to local vendors (Persky et al., 1993). In the case of federal land management agencies, procurement contracts—used to purchase goods and services from the private sector—are the most commonly used tool for accomplishing forest restoration and maintenance activities. While often overlooked, procurement contracting is one way in which rural communities can work with federal agencies, such as the Forest Service, to leverage federal investments to support rural businesses by focusing on import substitution where capacity exists.
DEFINING LOCAL
Perhaps the most important step in establishing an import substitution program is defining the geographic and social criteria with which to focus economic development efforts. Because we were interested in the well-being of rural communities located adjacent to national forests, we defined local businesses as those located within two hours of the study areas and located in communities with a population of 10,000 or less as of the 2010 census. Two hours was chosen because it represents a reasonable distance for workers to commute to project sites and still return home at night—an indicator of higher job quality and job status (Goldstein et al., 2005; Moseley and Reyes, 2007). A two-hour radius is also assumed to ensure sufficient competition (Figure 1).

METHODS
Our research analyzed federal procurement records from the Federal Procurement Data System (FPDS) to understand the type and value of activities being procured by the Forest Service and the degree of opportunity to replace imported labor with local labor.

To do this, project sites within the study areas were compared with the business address of contractors doing the work. This comparison resulted in distance values in road miles and travel time. Contracts were also organized by type of work using the following categories: labor-intensive, equipment-intensive, technical, professional, and supplies.

Finally, contracts were coded to identify whether or not they were awarded to local businesses (as defined above).

RURAL COMMUNITIES STRUGGLE TO RETAIN BENEFITS OF RESTORATION
From 2004 to 2013, the US Forest Service procured $54.4 million in restoration activities in a five-county region of northwest Montana. Over these ten years, 18% of the total contract value was awarded to local businesses. In total, 87 local businesses were awarded $9.6 million in contracts.

In contrast, in northeast Washington, between 2008 and 2015, the Colville National Forest invested $17.3 million in restoration activities, of which approximately 30% was awarded to local businesses (Figure 2). In total, 42 local businesses were awarded $5.1 million in contracts.

In both case studies, the average value of a contract awarded to a local business was roughly half the value of a contract awarded to a non-local business.

DOES TYPE OF WORK MATTER?
The types of activities procured by land management agencies dictate the kinds of opportunities available and the skills needed to capitalize on those opportunities. It also provides a way for communities to assess how well their local business capacity matches the demand for work, and highlights possible areas to focus an import substitution program.

In Montana, equipment-intensive and technical work accounted for the majority of Forest Service restoration investments (44% and 37%, respectively). Labor-intensive work made up the remaining 19%. Of this, local businesses captured roughly 15% of equipment-intensive work ($3.7 million) and technical work ($3.2 million), and 26% of labor-intensive work ($2.7 million). In Washington, labor-intensive activities were the most common activity by value, accounting for 45% of total investments, followed by equipment-intensive...
work with 40%. Most of the remaining contract value was technical work, which accounted for 14% of investments. Supplies constituted the remaining one percent. Local businesses successfully captured 38% of equipment-intensive work ($2.6 million), 24% of labor-intensive work ($1.9 million) and 21% of technical work ($0.5 million).

CONCLUSION: IT TAKES MORE THAN GOOD INTENTIONS

As these two case studies demonstrate, well over half of the value of federal investments in forest restoration and maintenance activities are being lost due to leakage out of local forest communities. Along with those dollars is the lost potential for that money to circulate and “multiply” in the local economy. So what can rural forest communities do to better leverage federal investments in forest management and restoration on public lands?

New programs and authorities are in place providing an opportunity for land management agencies

and communities to work together to increase the utilization of local businesses. The Collaborative Forest Landscape Restoration Program (CFLRP), established in 2009 has made job creation in local communities an explicit objective. Through 10 years of dedicated investments in restoration combined with active monitoring, the program hopes to increase the economic benefits of restoration activities accruing to local communities.

Nonetheless, research by McIver (2013; 2016) and others (Moseley and Toth, 2004; Charnley et al., 2008) has shown that legislative intent alone is not enough to change the procurement contracting trends on the ground. As stated previously, government agencies need specific authorities that allow greater consideration of local contractors when awarding procurement contracts. In 2012, Congress implemented such an authority. The fiscal year 2012 Consolidated Appropriations Act included language providing the Secretaries of Agriculture and Interior authority to consider the benefit to local communities in the awarding of contracts for forest hazardous fuels reduction and other forest and watershed restoration activities. The authority has been extended through FY17.

Finally, as Abrams et al. (2015) and Pensky (1993) point out, the engagement of non-federal entities, such as community-based organizations or other non-profits, are critical for implementing import substitution programs due to their in-depth knowledge of a place, experience securing financial resources, and their ability to leverage networks to support their efforts. Careful analysis of federal contracting trends combined with local knowledge can create the foundation for a public-private effort to leveraging federal investments in forest maintenance and restoration to create wealth and build capacity in rural forest communities.

“...The fiscal year 2012 Consolidated Appropriations Act included language providing the Secretaries of Agriculture and Interior authority to consider the benefit to local communities in the awarding of contracts for forest hazardous fuels reduction and other forest and watershed restoration activities. The authority has been extended through FY17.”

Figure 2. Value of contracts awarded to local and non-local businesses.
THE ENERGY BOOM & RURAL COMMUNITIES OF THE INTERMOUNTAIN WEST

Economic Trends in Nonmetropolitan Counties in Colorado, Utah, and Wyoming

By Shawn K. Olson-Hazboun, Utah State University, and Douglas Jackson-Smith, Ohio State University
INTRODUCTION

In the mid-2000s, communities across the US West experienced a significant “boom” in a variety of energy extraction activities (Downen et al., 2009), including natural gas, oil, coal, and renewable energy. Advances in technology, such as hydraulic fracturing and directional drilling, spurred the boom in gas and oil development by allowing previously unavailable resources to be extracted in a more cost-effective manner. Coal extraction also witnessed modest growth over this decade. In Utah, Colorado, and Wyoming (the focus of this article), natural gas production rose by 101% from 2000 to 2011, while oil production rose 27%, and coal production rose 20%. Over the same time period, renewable energy – especially wind energy – also saw a significant expansion. Between 2000 and 2011, the installed capacity for wind energy production across Utah, Wyoming, and Colorado grew from 202 to 3542 Megawatts, a 16-fold increase, (US DOE, 2012).

Local governments and rural residents often welcome heightened energy development (particularly traditional fossil fuels extraction) with open arms, seeing opportunity for jobs and prosperity for residents of economically depressed areas. However, energy booms can also place stress on local schools, roads, and social networks, and rapid population growth associated with the in-migration of workers can bring social problems and sharp increases in the cost of living (Jacquet, 2009). Additionally, new energy extraction activities can generate concerns about environmental impacts on local air and water resources among members of the local community or the region at large.

Interestingly, while energy development is widely celebrated by local leaders and residents for bringing economic benefits to rural communities, academic researchers have been more skeptical about the short- and long-term benefits of relying on energy extraction for economic development. Scholars have argued that there is a ‘resource curse’ in which regions or countries rich in natural resources actually tend to experience slower rates of economic growth than places without natural resources (Van der Ploeg, 2011). The resource curse is believed to reflect several factors, including volatility in commodity markets (especially a boom-bust cycle), capture of jobs and income from non-local actors, the displacement of other forms of economic development, and the inability of local institutions to convert gains from extractive industry booms into ‘spin-off’ sectors that are not tied to extraction (Venables, 2016). Similar patterns have been observed at the county level in the United States (Haggerty et al., 2012; James et al., 2011), though some researchers find contrary evidence (Betz et al., 2015; Weber, 2014). Sociological research has also documented strong associations between natural resource dependence and persistent poverty (Freudenburg et al., 2004).

To assess the impacts of the most recent energy boom on rural communities in the Intermountain West, this study examines economic trends in nonmetropolitan counties in Colorado, Utah, and Wyoming, between 2000 and 2011. We used multivariate models to explore whether or not counties with rapid growth in energy production experienced more positive population growth and economic outcomes compared to similar rural counties with no energy production.

Figure 1 illustrates the spatial distribution of energy development in Colorado, Utah, and Wyoming.
which is concentrated in nonmetropolitan counties. There is significant overlap between growth in natural gas and oil extraction (since many of the same geologic formations produce both) though the footprint of the natural gas boom extends into many parts of the region that have no recent history of oil production. Coal production in the region is dominated by one county (Campbell, Wyoming) and tends to occur in places that have less oil and gas production. Most wind energy production is also located in rural counties, but it is concentrated in places with little or no fossil fuel extraction activity.

**SOCIOECONOMIC CHANGES IN COLORADO, UTAH, AND WYOMING: 2000-2011**

The Intermountain West has been one of the most rapidly growing regions in the United States over the last 30 years. Over the last two decades, population growth in Colorado, Utah, and Wyoming, overall was double that of the nation as a whole. Though metropolitan areas in both areas grew more quickly than rural areas, the rates of growth in nonmetropolitan counties in our study area were over five times the national average between 1990 and 2000, and over three times as high between 2000 and 2010.

During the 2000s, nonmetropolitan counties in the region also saw more economic growth than rural counties in the U.S. as a whole, despite the recession that began in 2008. Specifically, the nonmetro poverty rate in Colorado, Utah, and Wyoming, climbed just 0.5% to 12.5% between 2000-2011. By comparison, the U.S. nonmetro poverty rate rose 3.5% to 16.0% during the same period. Meanwhile, the unemployment rate in the study counties decreased over a percentage point (from 5.0 to 3.9), while the nation’s rural unemployment rate rose 2.5% to almost 9%.

**FINDINGS**

How much of the relative economic resilience in these rural counties can be attributed to oil, gas, coal, and wind energy development? To answer this question, we used multivariate regression models (a technique that estimates a single regression model with more than one outcome variable) to examine the relationship between trends in energy production and changes in five socioeconomic outcomes between 2000 and 2011 across 87 rural counties: county-level population, per-capita income, median household income, poverty, and unemployment. We calculated rates of change variables for each

<table>
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<tr>
<th>CHANGE IN COUNTY-LEVEL INDICATOR, 2000-2011</th>
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<tr>
<td>Per-Capita Income</td>
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<tr>
<td><strong>CONTROL VARIABLES</strong></td>
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<tr>
<td>Percent non-Hispanic white</td>
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<td>Education Level</td>
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<td>Retirement Destination</td>
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<td>Government Employment Dependent</td>
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<td>Mining Dependent</td>
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<td>Level of outcome indicator in 2000</td>
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<td><strong>CHANGE IN ENERGY PRODUCTION</strong></td>
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<td>Wind</td>
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<td>Percent of Variance Explained by Model</td>
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*Only statistically significant predictors are shown. “n.s.” means that predictor variable was not significant. ”+” means that higher levels of the predictor is associated with an increase in the indicator; and “—” means that the predictor is associated with smaller increases, or even decreases.*

Figure 2. Highlights of Model Results.
indicator (using 2010 inflation-adjusted dollars for the two income variables). County-level data were taken from the U.S. Census for the year 2000 and from the American Community Study five-year estimate (2007 to 2011). By using a multivariate modeling approach, we were able to account for the effects of other potential drivers of demographic and economic change, such as urban proximity, natural amenities, economic diversity, and other population characteristics (education and race/ethnic makeup). Highlights of the results are shown in Figure 2. We found that the rural counties with increases in both natural gas and oil production experienced overall higher rates of income growth than other rural counties. Additionally, counties with heightened oil production saw a decline in the poverty rate, and rural counties with increased natural gas production had higher population growth. Neither coal nor wind energy were found to have any relationship with economic well-being or population change. Additionally, no types of energy development were found to reduce the unemployment rate.

Other important factors in our models included ethnic makeup, education, and whether or not the county was a retirement destination. Counties with a higher percent of non-Hispanic white individuals and more individuals with a bachelor’s degree experienced higher rates of population growth and income growth, and those that were a retirement destination saw population growth and a decrease in the unemployment rate over this period.

DISCUSSION AND CONCLUSION
Overall, energy development during the most recent boom period had an economically buoying effect for rural communities in Colorado, Utah, and Wyoming, in terms of growth in per capita and median household income, compared to rural counties in the region that did not experience energy development. However, oil and natural gas development activities did not have a similar beneficial impact on unemployment rates, and natural gas production increases had no impact on the poverty rate. This suggests that the benefits of growth in energy production have not been shared equally among all residents in the community, particularly those who were economically struggling prior to the boom. Neither coal extraction nor the construction of major new wind energy facilities was systematically associated with any trends in county-level socioeconomic well-being in the region.

Our findings provide insights into the systematic demographic and economic effects of different forms of energy development in this region, and support the idea that the regional oil and gas boom has translated into net gains in employment and income for many local residents and businesses. However, experience from previous booms in this region suggests that economic gains can be lost during a following bust if efforts to promote the non-energy sectors of the local economy are not successful (Jacobsen et al., 2016). We have already seen a decline in extraction of oil, gas, and coal in this region since 2011. Thus, “communities should prepare for the volatile nature of energy development and design long-term strategies that produce both short-term mitigations and long-term investments” (Jacquet, 2009:3).

Additionally, economic trends are not the only valid measures of community well-being. Rapid population growth associated with an energy boom can disrupt social ties and strain local schools, roads, and social services, and there can be significant environmental impacts associated with fossil fuels extraction that (if not addressed) can adversely affect local quality of life and opportunities for future economic growth.

“Neither coal extraction nor the construction of major new wind energy facilities was systematically associated with any trends in county-level socioeconomic well-being in the region.”
On the afternoon of November 5, 2015, a dam failure at an iron ore mine in Brazil flooded a small mining town with a catastrophic wave of chemical-laden sludge. The orange mud killed more than a dozen people and polluted hundreds of miles of rivers and streams before depositing into the Atlantic Ocean (Hudson-Edwards, 2016). The disaster brought renewed attention to the human and environmental risks associated with storing mine waste in large earthen dams—a practice that also occurs across the Western U.S. An engineer told the Wall Street Journal earlier this year that mine waste impoundments are among the highest-risk and largest man-made structures on Earth (Kiernan, 2016).

Overall, impoundment failures are rare—and they have become rarer in recent decades. But the disasters that have occurred recently are more likely to be categorized as “serious” or “very serious” (Bowker et al., 2015). Bowker et al. (2015) predict that 11 “very serious” and 12 “serious” impoundment failures would likely occur in mining regions throughout the world between 2010-2020, resulting in a public liability of $6 billion.
This decade has already seen massive environmental disasters related to impoundment failures. In addition to the tragedy in Brazil, a dam break at the Mount Polley copper and gold mine in Canada released more than 1.3 billion gallons of waste into surrounding streams, lakes, and drinking water sources.

The U.S. has also had notable impoundment failures, primarily at coal mining operations. The Buffalo Creek disaster in West Virginia killed 125 people in 1972 (Erikson, 1976). More recently, a coal impoundment failure in Martin County, Kentucky, polluted local waterways with more than 300 million gallons of toxic slurry in 2000 (McSpirit et al., 2007).

Natural resource extraction often involves a cleaning or preparation process that separates “impurities” from the core mineral. The waste material, often called “tailings,” are pumped into large holding ponds or dams known as “impoundments.” The waste can sometimes include concentrations of toxic chemicals used in the washing process, as well as trace amounts of heavy metals.

Concerns about mine waste are also mounting within the scientific community. Many of the earth’s high-grade resources have already been extracted. Therefore, companies must now extract lower-quality ores that are comprised of more waste materials (Hudson-Edwards, 2016). Mine waste production is projected to increase tenfold every 33 years—while the risk of an impoundment failure is expected to increase twentyfold over the same time period (Robertson, 2011).

Despite the potential risks posed by mine waste impoundments, few sources provide an accounting of impoundments across the West.

MINE WASTE IMPOUNDMENTS IN THE WEST
Mining companies operate more than 200 mine waste impoundments in 52 counties across the West, according to data obtained from the federal Mine Safety and Health Administration (MSHA). This count only includes active impoundments related to metal and coal mining that are large enough to fall under MSHA’s regulation.

Impoundments are most commonly found at coal (83), copper (73), gold (37), and molybdenum (18) mining operations in the Western U.S. Other impoundments are related to zinc (2), platinum (3), silver (5), and uranium (4) mining. Figure 1 highlights counties with impoundments, and the type of mining operation that accompanies them. (If counties had impoundments related to two types of mining, they were categorized based on which type of mining was more prevalent.)
The data in Figure 1 shows that mine waste impoundments are found primarily in rural counties. The United States Department of Agriculture (USDA) classifies 41 of the 52 counties with impoundments as nonmetropolitan. The most common classification is nonmetropolitan and non-adjacent to metropolitan areas (29 out of 52 counties). Mining operations often require large swaths of land, so it’s unsurprising that they would be located in rural areas.

The remote location of impoundments may suggest that only sparsely populated areas are at-risk from environmental impacts, but impoundment failures—or even tailings leaks—can impact populations hundreds of miles away and damage environmental resources. Concentrations of heavy metals contamination have been documented in trout more than 200 miles downstream from certain mining operations (Moore et al., 1990).

Many of the West’s impoundments are located at prominent mining operations. For example, the Kennecott Copper Mine outside of Salt Lake City—the largest man-made excavation in the world—operates a 9,200-acre (or 14-square mile) impoundment north of Magna, Utah. The company completed a $500 million update of their impoundment operation in 2001, according to an educational brochure (Kennecott Copper Utah, 2007).

However, mining experts are more concerned with impoundments operated by smaller companies who may not have the financial resources to invest in the latest impoundment technology (Bowker et al., 2015).

Ultimately, it is difficult to determine the exact risks that impoundments pose to rural communities and environments in the West. The chemical characteristics of mine tailings, the design of impoundments, and geophysical factors could all play a role in determining the risk associated with specific impoundments (Vick, 1990). Further, the potential of natural disasters such as earthquakes or floods could impact impoundment stability.

NEGOTIATING EXTRACTIVE LEGACIES AND MODERN HAZARDS

In addition to the technical and scientific risks, it’s important for regulators, Extension agents, and other community leaders to understand the social dynamics that may impact risk perceptions of mine waste in resource-dependent communities.

Many communities throughout the West are proud of their resource extraction legacies—despite the environmental harms left behind. In some cases, residents advocate for mining industry renewal, even in the wake of major health problems.

For example, communities in Colorado and Utah champion the return of uranium extraction—even while dealing with numerous health problems caused by mine waste (Malin, 2015). Other research has found that residents with ties to extractive industries are slightly more likely to downplay the risks associated with waste impoundments (McSpirit et al., 2007).

Therefore, it is important to understand the social context of resource-dependent communities in the West in order to increase awareness of the risks associated with mine waste.

For example, communities may also feel frustration towards environmental regulations—as in the case of Idaho’s Silver Valley.

A manhole cover at the intersection of Bank Street and Sixth Street in Wallace, Idaho, conspicuously marks the “Center of the Universe.” The cover depicts a miner surrounded by arrows pointing to the area’s most prominent silver mines. The “center of the universe” claim pokes fun—and frustration—at
the EPA's decision to expand a Superfund site related to historic mining operations.

Many of the Silver Valley’s prominent mines shuttered in the early 1980s—and left behind millions of tons of toxic waste from decades of resource extraction (National Academy of Sciences, 2005). The EPA identified a 21 square-mile Superfund site around the Bunker Hill mine for remediation in 1983 (Aiken, 2005). The agency later proposed a major 1,500 square-mile expansion of the site in 1998 that called for 30 more years of clean up at a cost of more than $300 million (NAS, 2005).

Former mayor Ron Gartione claimed that if the EPA could declare that Wallace was not a “good and healthy place to live” with scant evidence to the contrary, then Wallace could declare itself the center of the universe under the same logic (Marsh, 2016).

Many residents perceive the EPA’s presence in Silver Valley as a “Superfund stigma” that can damage the region’s economic prospects (NAS, 2005). Like many former mining towns, the region has attempted to capitalize on its natural amenities by transitioning to a tourism-based economy with ski resorts and biking trails.

While most of the attention in the Silver Valley centers on past extraction practices, the few mining operations left in the region continue to operate large waste facilities near communities.

A scenic overlook off of Interstate 90 outside of Mullan, Idaho, now features a tailings impoundment nestled among the majestic Rocky Mountains. According to an informational placard at the site, the impoundment was built to hold more than 2.6 million tons of waste tailings from the nearby Lucky Friday silver mine.

Data from Idaho’s Department of Water Resources (IDWR) shows that the impoundment is 120-feet high and has been classified as a “high hazard”—meaning that a breach or failure would likely lead to a loss of life and property. (The hazard classification does not account for the construction or stability of the impoundment, but it requires dam operators to file Emergency Action Plans and meet other regulatory requirements.)

In addition to the Lucky Friday impoundment, there are seven impoundments in the Silver Valley that are actively being regulated by the IDWR. The largest of those is a tailings impoundment in Osburn, Idaho, that has a normal storage capacity of 580 million gallons of mine tailings and wastewater.

While an impoundment failure is a rare event, the potential impacts may be too severe for Western communities—like those in the Silver Valley—to ignore.

Therefore, greater attention should be paid to both the past and present environmental and human risks associated with resource extraction. Extension agents, researchers, regulators, and citizens could collaborate to increase awareness of mining hazards, while addressing community concerns about local economic prospects.

“In addition to the technical and scientific risks, it’s important for regulators, Extension agents, and other community leaders to understand the social dynamics that may impact risk perceptions of mine waste in resource-dependent communities.”
In an average year, California agriculture irrigates 9.6 million acres using roughly 34 million acre-feet of water (California Department of Water Resources, 2014). The conventional belief is that agriculture accounts for 80% of human water use in the state. Furrow irrigation is the principal irrigation method in California, representing about 50% of all irrigated acreage in the state. California’s tomato growers, who produce more than 90% of the nation’s processed tomatoes (those used for pastes, sauces, and canned tomato products) and nearly half of the world’s total processed tomato tonnage (California Tomato Growers Association), rely on furrow irrigation, and according to UCCE it is the largest before-harvest cost of field operations in processing tomato production.

As competition for limited water increases, improving water-use efficiency will become ever more critical to farmers’ long-term productivity.

University of California, Davis graduate student Felipe Barrios-Masias saw promise in alternative irrigation methods that could use less water but still produce high yields, leading to increased agricultural sustainability and efficiency. One such method is partial root drying (PRD). According to Barrios-Masias, at the time he received his Western SARE graduate student grant for Irrigation Alternatives for Sustainable Water Use of Processing Tomatoes, information was available on general crop physiological responses to the PRD technique, but strategies for reliable management needed to be tested for individual crops.

His findings were striking–farmers could use 25% less water while maintaining yields.

SEARCHING FOR A SOLUTION
To improve crop water economy, Barrios-Masias’ project looked at using the PRD technique to reduce the amount of water supplied and increase crop water use efficiency (yield/water applied) on tomatoes. The trials evaluated yield and cultivar response to alternate furrow irrigation (irrigating every other furrow instead of all furrows). The project’s specific objectives were to:

- Conduct an on-farm case study to obtain data on a typical soil water budget and cultivar responses with alternate furrow irrigation
- Evaluate water use and physiological, phonological, and morphological responses of different processing tomato cultivars to controlled full- or alternate-furrow irrigation regimes.
- Increase understanding of PRD and alternate furrow irrigation management among producers as a means of reducing total applied water, potential pollution, and production costs.
Campbell Research and Development was a project collaborator and they, along with the Jackson Lab at UC Davis, assisted Barrios-Masias in outreach to producers. Field trials were held at the Campbell Research and Development Station and also on four farms in adjacent fields with three different field types. Having such an industry partner helped the project because “they know tomatoes and they were interested in reducing their water use,” says Louise Jackson, Barrio-Masias’ major professor.

WHAT WAS LEARNED
Barrios-Masias was pleased with the results, saying he was surprised by how much reduction in water use they saw. The solid data demonstrated that increased water use efficiency is possible with water use reductions of at least 25% in on-farm trials, with no effect on yields and fruit quality. This reduction could help keep agricultural land in production providing food for people, especially in drought years.

Some tomato growers were previously using the irrigation technique to manage disease. Barrios-Masias presented the results from his project at tomato growers’ meetings to good reception.

“It is apparent to me that processing tomatoes have a great potential to perform well under lower water availability. This is one of the main outcomes of the SARE project,” says Barrios-Masias.

POST-PROJECT ACTIVITIES
Barrios-Masias and Jackson say that due to the potential shown by the research results and the data collected, they were able to leverage the SARE funds in the form of a specialty crop grant and expand to conduct more research.

Right after the project’s completion, most growers did not think they had to implement the practice in regard to water use as they had access to water. However, now that California is facing a severe drought, with the data they have a choice; they can choose to plant less area or they can opt to reduce their water use. According to Jackson, “There was more use of alternate furrow irrigation last summer on furrow irrigated fields.”

WESTERN SARE
The Sustainable Agriculture Research and Education program (SARE) is a program of the National Institute of Food and Agriculture, U.S. Department of Agriculture that functions through competitive grants conducted cooperatively by farmers, ranchers, researchers, and agricultural professionals to advance farm and ranch systems that are profitable, environmentally sound, and good for communities.

Western SARE annually awards grants to help sustain agriculture, the environment, and rural communities. Producers are actively involved in every funded project. In addition to involving farmers and ranchers at all levels of decision-making and encouraging on-farm research, Western SARE encourages projects that involve partnerships among scientists, landowners, Extension professionals, rural communities, and environmental interest groups. The Western region includes 13 states and four Pacific Island protectorates. It manages five grants programs:

- Research and Education
- Ag Professional + Producer
- Farmer/Rancher
- Professional Development
- Graduate Student

INFORMATION ABOUT THE GRANTS PROGRAMS AS WELL AS AN EXTENSIVE LEARNING CENTER AND SEARCHABLE DATABASE CAN BE FOUND AT WESTERNSARE.ORG.
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MAKING EVERY DOLLAR COUNT


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“WealthWorks Northwest is a unique collaboration between an Extension Service and a non-profit organization seeking to build on leadership development efforts in the state by engaging more communities in local economic development using a wealth creation framework.” --Page 11