A CWSRF Nonpoint Source Pilot

The Arizona CWSRF Forest Thinning and Restoration Program

Exploring Expanded Project Eligibilities for Watersheds in the CWSRF Program

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EPA United States Environmental Protection Agency

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

Clean Water State Revolving Fund

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Executive Summary

The Arizona Water Infrastructure Authority of Arizona (WIFA) administers the Clean Water State Revolving Fund (CWSRF) Program for the state and has provided $1.4 billion of financial assistance to Arizona communities to address their water quality needs. While the CWSRF program is widely known for supporting gray wastewater infrastructure projects for publicly owned treatment works, many are not aware of the vast array of activities that the program can support to prevent pollution of surface and groundwater resources from nonpoint sources. Arizona has a long history of savage wildfires that have burned millions of acres over the past 20 years and communities have seen their drinking water supply resources damaged, their forests decimated, and their homes and businesses destroyed. Arizona experiences an average of 1,500 wildfires every year and with the region amid an enduring megadrought, that trend is likely to continue.

WIFA has been promoting the use of the CWSRF program for projects that address watershed health, green infrastructure, and nonpoint source water quality challenges for many years and has been coordinating with its sister agency, the Arizona Department of Environmental Quality's Section 319 Program, to identify critical needs and opportunities for project funding. Their Nonpoint Source Management Plan specifically identifies wildfire as a source of water quality impairment. WIFA wanted to do more to help communities threatened by wildfires, so they worked with the City of Flagstaff to create The Forest Thinning and Wildfire Prevention Pilot.

In 2010, the Schultz Fire burned more than15,000 acres of steep, forested slopes of the Coconino National Forest surrounding Flagstaff. When the rains came, broad swathes of burn scar gave way to catastrophic flooding, which took the life of a child, destroyed neighborhoods, businesses, local water supply resources, and rendered a once thriving recreational resource to ash. The city spent the next ten years building the Flagstaff Watershed Protection Project, one of the most robust watershed partnerships the state has seen. A key strategy of the City's plas is to undertake preventive forest management through forest thinning to avoid another catastrophic wildfire event. This laid the perfect foundation for WIFA and Flagstaff to undertake the first forest thinning project funded in part by the CWSRF program in 2019 for $6 million.

Ensuring success of the new Forest Thinning and Fire Prevention Program meant developing a targeted education, outreach, and marketing strategy to help raise awareness of: the importance of pursuing such projects in Arizona communities; the importance of partnerships at the local, state, tribal and federal level; and how the CWSRF program can be used effectively to support these projects and the development of watershed financing partnerships.

Using Flagstaff's lessons learned, and comprehensive wildfire impacts and cost avoidance research, WIFA worked with EPA's consultant to create a Measurable Benefits Tool that estimates the environmental, financial, and social benefits associated with undertaking forest thinning projects. The tool uses specific metrics such as costs of wildfire suppression and rehabilitation, impacts on property values, lost recreational value and economic activity, job losses, impacts to drinking water treatment costs, public health, and local economic prosperity. The Measurable Benefits Tool produces customized results based on community and National Forest area. WIFA also developed fact sheets to accompany each metric in the tool. As part of a coordinated and strategic outreach effort, WIFA is ready to continue its long-standing commitment to serving Arizona's communities and tribal lands.

A History of Smoke and Flames

Twenty eight percent of Arizona's natural landscape is comprised of thick pine forests and about 2.6 million people live within 50 miles of one of six National Forest areas in the state.

The state's hot, dry climate, frequent lightning, and the dangers from human activity make wildfire a significant concern all year. Millions of acres have been burned over the last 20 years with the state averaging about 1,500 wildfires annually[1].

When fire encounters areas of heavy vegetation, it can quickly move from a ground fire into a catastrophic crown fire. Flash flooding and mud flows that follow in the wake of such fires carry debris, ash, chemicals, soil, and sediment to nearby surface waters. Wildfires have dealt heavy blows to surrounding communities and their economies and imperil critical watersheds that supply drinking water resources for 4.8 million people within the Phoenix metropolitan area and rural communities alike.

The frequency and intensity of wildland fires in Arizona has escalated in recent years, further exacerbating the threats to citizens, homes, and businesses that exist within the wildland-urban interface. According to the Center for Climate and Energy Solutions, for much of the U.S. West, projections show that an average annual 1-degree Celsius temperature increase would increase the median burned area per year as much as 600 percent in forests of the Southwestern US.[2] Given that this region is experiencing a megadrought, it is logical to conclude the Arizona will continue to be at risk for wildland fires and that preventative measures are critical to protecting the health and integrity of its communities and resources.

Assessing the Impacts of Wildfire

The Rodeo-Chedeski Fire (2002) and the Wallow Fire (2011) are the largest in Arizona's history. Together they destroyed more than a million acres, consumed nearly 500 structures and displaced thousands of people from their homes. Response and restoration costs for these two fires were measured in the billions of dollars, although the costs associated with battling and recovering from a wildfire are diverse and complex, and extend far beyond the perimeter of the burn scar. Connecting the dots between wildfires and their impacts is not always linear.

To better understand the impacts of wildfire holistically, it is necessary to assess them using a triple-bottom-line economic approach that examines the environment, social, and financial implications of these events to quantify impacts on Arizona communities, businesses, and natural resources.

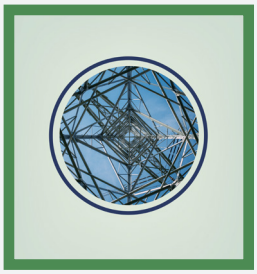
Impacts

Drinking Water Resources & Treatment Costs

Wildfire can have long-lasting impacts on drinking water resource supplies and can persist for 5-10 years following a wildfire. Post-fire impacts can often be more detrimental to drinking water supplies and treatment systems than the fire itself. This includes increased risk for flash flooding and mudslides in burn scar areas where there is no longer forest floor vegetation to effectively absorb rainwater and snowmelt. Specific impacts include increased sedimentation and turbidity, metals, ash, and toxic chemicals such as cyanide and mercury which can be found in fire retardants.

Responding to contamination can be as much as 200 times more expensive as preventing the pollution of drinking water resources. Implementing source water protection applications like forest thinning helps stabilize vegetation in the understory. Studies have shown that for every 10% increase in vegetation cover in the water source area, treatment and chemical costs decrease by about 20%.[5]

Utilities & Infrastructure



Natural capital of forests and surface waters have intrinsic and economic value. However, they are not the only assets in the line of a wildfire. Critical communication and utility assets are also located within these paths of destruction and a fire can easily disrupt or destroy communication towers and electrical transmission lines. Eash communication tower is estimated to cost between $3 and $8 million.[3] The replacement of high-voltage electric transmission lines cost between $174,000 (rural) and $11 million (urban) per mile.[4] The loss of these assets are often disastrous for fire-fighting efforts, emergency response, personal communication, and business operations.

Property Damage

Not only can wildfires destroy homes in the wildland-urban interface, but the aftermath can significantly impact the overall value of homes left in-tact within the vicinity of the burn scar. Studies have shown that homes and structures located within three miles of the wildfire perimeter declined 31 percent in value; and that homes as far away as 12 miles declined six percent in value.[6] The economic ripple effects of wildfires represent a significant loss of net worth to individual homeowners, sometimes in the hundreds of thousands of dollars.

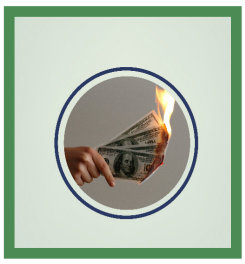
Recreational Value and Job Losses

Arizona's forests are good for local economies and generated $1.3 billion in revenues in 2019 alone. They support recreational opportunities such as hunting, fishing, hiking, camping for residents and attract tourism. Local communities and the state rely on such revenues for their economic health. Recent wildfires have closed recreational facilities for months, sometimes years. Such closures result in the loss of thousands of local jobs and millions in income and revenue. For example, the Coconino National Forest hosts about 4.7 million visitors every year and generates $260 million in local labor income, supporting more than 7,000 jobs. If a wildfire caused even 25 percent of the forest to close, local communities stand to lose $65 million in revenue.[8] [9]

Critical Habitat

The value of forests can be measured by the diversity of wildlife species they support. They are critical in the protection for endangered species such as the Mexican Spotted Owl; the federal government has established hundreds of protected activity centers (PACs) in Arizona's forests for this purpose. Each PAC is valued up to $4 million.[7] The cost of these critical habitats destroyed by wildfire could reach more than $1 billion.

Health and Economic Prosperity



Many of the impacts that hit communities hardest come after the fire. Studies have shown that the average out-of-pocket costs to treat injuries and illnesses sustained because of wildfires and post-fire impacts is about $2,000 per individual. This does not consider the emotional toll taken on families and businesses whose livelihoods and homes have been destroyed. The quality of life in communities that have been touched by wildfire is often forever changed.[10]

Proposed SRF Program Solution

The Arizona Water Infrastructure Authority (WIFA) implements the state's Clean Water State Revolving Fund (CWSRF) program and has been committed to providing valuable assistance to communities large and small to address all their water quality needs.

As the frequency and intensity of wildfires continues to grow across the state, the need for communities to focus on restoration and proactive forest management has become more apparent. Forest thinning is an effective practice for preventing the significant environmental, financial, and social impacts from wildfires that threaten Arizona communities. These projects are large in scale and expensive to undertake, which can make finding sufficient financing to undertake them a challenge. The Arizona CWSRF program is uniquely suited to meet this challenge. The program is well capitalized with over $300 million in lending capacity, some of which may be used to address forest thinning, restoration, and the prevention of catastrophic wildfires throughout the state.

Since the Green Project Reserve was first introduced under the American Recovery and Reinvestment Act in 2009, WIFA has promoted the use of CWSRF assistance for many types of water quality projects that include water and energy conservation, stormwater, and green infrastructure. As more of these types of projects have been funded, the positive impacts on water quality continue to be demonstrated. The importance of these projects has been further emphasized by Congress with an expansion of CWSRF project eligibilities under the Water Resources Reform and Redevelopment Act of 2014. This expansion includes a specific provision that allows the state CWSRF to pursue water quality projects on a watershed basis including forest thinning projects and watershed financing partnerships.

After providing $3.6 million in CWSRF assistance to green infrastructure projects, WIFA wanted to do more to help Arizona communities prone to wildfires use the expanded eligibilities of the program. Nonpoint source projects that benefit a Total Maximum Daily Load (TMDL) Implementation Plan or address an impaired water body receive additional points in Arizona's CWSRF scoring criteria, yet many communities remain unaware that these types of projects are eligible for CWSRF financing. WIFA saw this as an opportunity to address broader nonpoint source challenges to the state's water quality issues. The Forest Thinning and Fire Prevention Pilot will help to raise awareness of the need for such projects, and generate new interest and demand for nonpoint source funding from Arizona's CWSRF program.

Partnership and Coordination with Arizona's 319 Program

Successfully undertaking forest thinning projects that span tens of thousands of acres of forest requires a good strategy and a deep bench of partners from various stakeholder groups on the federal, state, tribal, and local levels that include public and private entities alike.

Engagement

At the state level, WIFA understood the importance of engaging its sister agency, the Arizona Department of Environmental Quality (ADEQ) whose Water Quality Improvement Grants program has provided $533,640 in funding for several watershed restoration projects resulting from wildfire using Section 319 grant dollars. This activity served as a good foundation for WIFA to build upon using the goals of Arizona's Nonpoint Source Management Plan as a guide.

Cooperation

The plan recognizes wildfires as a source of nonpoint source pollution and that wildfire impacts are exacerbated by drought, dense tree stands (i.e., heavy fuel loads), and bark beetle infestations. ADEQ understands that more can be done to address these impacts and that WIFA's proposed Forest Thinning and Fire Prevention Program helps them meet their program goals to protect and restore water resources.

How does WIFA incentivize nonpoint source project funding in the CWSRF program?

As the southwestern US continues to endure a historical megadrought, protecting water resources is more critical than ever.

WIFA offers up to 20% loan forgiveness to projects that include nonpoint source pollution reduction, riparian restoration, or reducing stormwater flows.

A $10 million loan for a forest thinning project may receive up to $2 million that does not need to be repaid.

Preferred Financing Mechanisms

Direct Loans

Across the many communities in Arizona affected by wildfires, WIFA's initial discussions regarding the use of the CWSRF program for forest thinning and vegetation management have been well-received. Historically, the Arizona CWSRF has always made loans directly to eligible public entities such as municipalities, counties, utility districts, and tribes and this has always worked well for gray wastewater infrastructure project activities. Public entities are generally more experienced with navigating capital budgets, complying with state and federal requirements, and managing loan administration. They also have various revenue streams to use as repayment sources. These include utility rates and fees, special assessments, and bond funds. Making direct loans to municipalities is the easiest and most common lending mechanism used by the CWSRF nationally.

To launch the forest thinning pilot, WIFA used a direct loan mechanism. They coordinated with the City of Flagstaff which had been badly impacted by the Schultz Fire in 2010 and were particularly motivated to work with WIFA based on their positive experience using the CWSRF program in the past. This made funding the pilot straightforward and simple for both parties; they closed a $6 million CWSRF loan in December 2019. However, the Flagstaff project was unique (see case study on page 13) and though it relied on direct loans, it may prove to be the exception for this type of project rather than the norm, if there is a paradigm shift in how watersheds are viewed as part of a broader definition of capital infrastructure.

In the context of providing financial assistance to facilitate nonpoint source projects such as forest thinning, it can sometimes be more difficult to use direct loans since these types of nonpoint source projects are typically undertaken by nonprofits or non-governmental organizations. In Arizona, such entities are not eligible to apply for CWRF assistance, and this restriction is common to other states, as well. Furthermore, many non-public borrowers are challenged to find a revenue stream that is sufficient to pay back a CWSRF loan, which must be secured by a dedicated repayment source.

Pooled Loans

Pooled loans are another variation of direct loans where a coalition of eligible borrowers come together under a single CWSRF project application and loan agreement to undertake a project that is of similar interest and benefit to the respective parties. This is a type of cost-share mechanism that could work well with watershed gateway communities that are in proximity to both each other and forested areas where forest thinning and vegetative management are needed, such as the Mogollon Rim. Total project costs are spread among the participating borrowers, making the

project much more affordable for each community to undertake. [represent graphically on map with pins and example of cost-share for a $10M loan shared among 3 communities, repaid over 20 years:

- Apache Junction
- Fountain Hills
- Gold Canyon
- Tolleson
- Carefree
- Sedona
- Payson
- Prescott
- Camp Verde
- Williams

If Camp Verde, Prescott and Sedona entered into a pooled loan arrangement for a 20-year $10 million loan:

3% Interest

✓ Annual payment would be $672,157

✓ $224,052 payment per community

2% Interest

✓ Annual payment would be $611,567

✓ $203,856 payment per community

Pass-Through Loans

Since these types of projects require a coalition of diverse partnerships to ensure success , using a pass-through lending mechanism is likely the best option for CWSRF financing. Pass-through loans are commonly used by the CWSRF program nationally to fund nonpoint source projects by taking advantage of existing relationships with public borrowers. This structure allows a municipality to act as a conduit through which CWSRF funding can flow through to watershed partners who are implementing the project, but who would not otherwise be eligible to apply . These watershed partners may include special districts, nonprofits, non-governmental organizations, or even private corporations. They are responsible for repaying the loan proceeds to the conduit municipality, who in turn repays the CWSRF program.

There are numerous advantages to using a pass-through mechanism. It allows CWSRF programs to circumvent some eligibility restrictions regarding what types of borrowers they may loan to, which is usually defined in state statute or administrative rule. Pass-through loans minimize risk to the CWSRF program since the conduit organization is the loan guarantor which provides increased security over making direct loans to small, inexperienced borrowers. One of the most attractive features of this approach is that the loan forgiveness offered by the CWSRF program may be passed along to the watershed partnership borrower(s), which represents a tremendous cost savings not found on the open market.

The right watershed partnership structure with eligible public entities applying for CWSRF assistance and acting as the conduit entity offers an elegant solution to successfully financing forest thinning projects on a watershed scale. It is logical to assume that communities in the Phoenix metropolitan area may wish to undertake conduit roles, given that they have vested interests in supporting such projects that ultimately protect the surface water resources that supply drinking water for 4.8 million people within the greater metropolitan service area.

Programmatic Financing

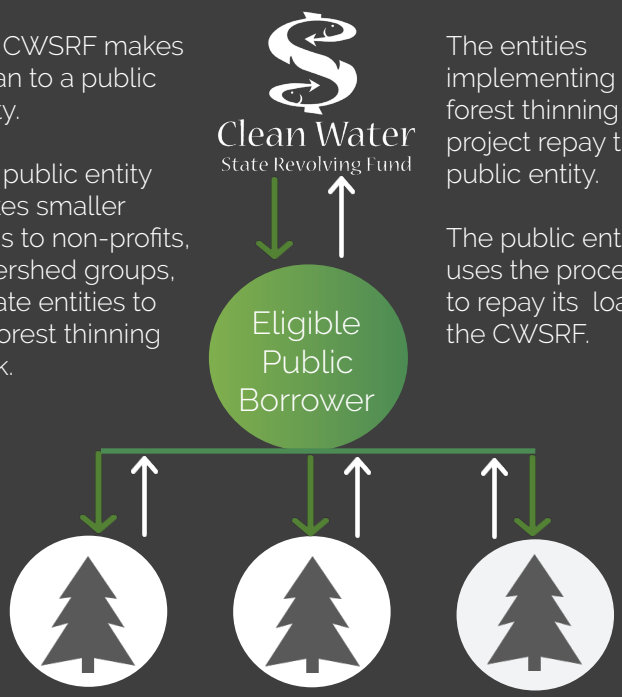
Another approach that may be considered if the forest thinning project is being undertaken by a public entity, such as a municipality, would be Programmatic Financing, or "ProFi". Many municipalities use the bond market to generate the needed revenues to implement wastewater and drinking water infrastructure projects identified in their comprehensive Capital Improvement Plans (CIPs). This approach funds a rolling cash flow as opposed to a single project. ProFi mirrors this process and allows the CWSRF program to fund any eligible project identified on a municipality's CIP, providing a multi-year cash flow for any manner of capital improvements. As more and more communities begin to recognize the watershed as part of their infrastructure, it is possible that projects like forest thinning and vegetative management could be included in the suite of projects that comprise a ProFi loan, so long as the activity is identified in the CIP budget. The flexibility of this approach could be especially advantageous since forest thinning projects can span multiple years and having the security of a rolling cash flow would make their implementation easier and more efficient. Another benefit of using the ProFi approach is that if, for any reason, the forest-thinning project is delayed then the municipality is free to use those CWSRF loan funds to implement other eligible infrastructure activities in their CIPs.

WIFA recently initiated a new funding program that implements this approach that is called Capital Improvement Program (CIP) Financing and they have executed several new loans using this model. Using CIP Financing for nonpoint source projects across a watershed would be an exciting new application of this model.

How do Pass-Through Loans Work?

The CWSRF makes a loan to a public entity.

The public entity makes smaller loans to non-profits, watershed groups, private entities to do forest thinning work.



The entities implementing the forest thinning project repay the public entity.

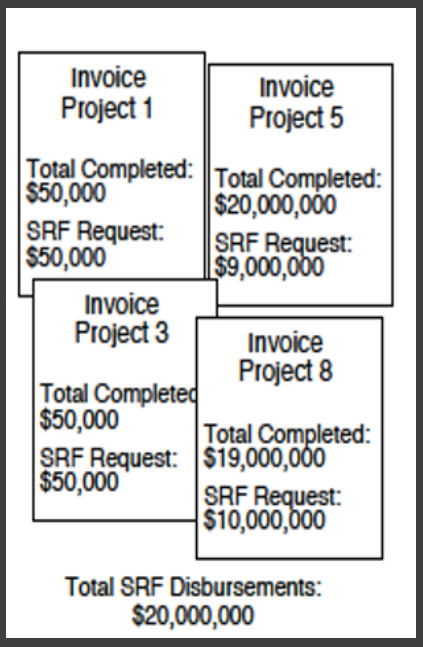
The public entity uses the proceeds to repay its loan to the CWSRF.

How does ProFi Work?

Public borrower signs a loan agreement encompassing all eligible activities on the current CIP. Borrower completes work on a variety of CIP activities and submits invoices on a regular basis until the full loan amount is disbursed (usually within one year).

CWSRF Loan Agreement

Planning Project 1
Planning Project 2
Design Project 3
Design Project 4
Construction Project 5
Construction Project 6
Construction Project 7
Forest Thinning 8
Forest Thinning 9
Watershed Project 10



"This is a great opportunity for the CWSRF to support our communities and with watershed protection projects, we're hopeful this project can set a model for similar work across the State."

Daniel Dialessi
Executive Director of WIFA

Flagstaff's Groundbreaking Watershed Partnership

In 2010, the Schultz Fire consumed over 15,000 acres of forest in the Coconino National Forest, Rio de Flag watersheds just outside the City of Flagstaff. In this mountainous region of Arizona, post-fire flooding wreaked havoc on the community below as heavy monsoon rains tore through the burn scar, giving way to swift floodwaters that carried dangerous debris, ripped through sloping neighborhoods, and resulted in nearly $147 million in damage. The impacts of the fire were far-reaching and the devastation to natural and economic resources endured for many years. Community leaders became compelled to take meaningful action in the hope of preventing such tragedy from striking again. The quest began with getting a better understanding of the diverse array of impacts. The University of Northern Arizona's Environmental Research Institute conducted a full cost accounting study of the triple-bottom-line economic impacts realized as a result of the Schultz Fire. The results were used to begin educating local and regional stakeholders on the importance of taking preventive measures and creating solutions through community partnerships.

This outreach along with the City's legacy of bad fires eventually led to city leaders, the U.S. Forest Service (USFS), and other partners strategizing a way to fund large-scale projects to thin the forests and undertake better vegetative management practices on city, state, tribal, and federal lands. This led to a ballot initiative in 2012 for a $10 million bond election framed as a critical measure for the protection of drinking water supplies and water infrastructure.

Named the "Forest Health and Water Supply Protection Project", the City began to grow its coalition of federal, state, and local partners, the lynchpin being the Flagstaff Fire Department. With strong backing from the City fire department, the City was able to effectively disseminate information and messaging to the public about the importance of forest thinning to protect their drinking water supply and avoid another catastrophic event such as the Schultz Fire.

In 2012 the voting public of Flagstaff supported the bond measure by an overwhelming 74 percent and the election created a heightened sense of awareness and ownership within the community. This has provided greater acceptance of the project and the initiative that had come to be known as the Flagstaff Water Protection Project (FWPP). This was the first time that the City considered a nonpoint source project to be part of a CIP and included in their water infrastructure budget. It is also the only known project of its kind in the country where forest restoration work in a national forest has been funded by a municipality.

To date the FWPP has completed:

Construction

- Constructed nearly three and a half miles of temporary roads
- Installed four hydrologic monitoring stations

Thinning

- Completed 3,285 acres of tree marking
- Hand-thinned or mechanically harvested 4,918 acres involving helicopter, steep-slope, and traditional processes.

Testing

- Performed field tests of the emerging tablet technology process on 1,000 acres
- Provided Salt River Project slash material for a mixed coal-green biomass generating test at the Coronado Generating Station.

Outreach

- Engaged AZ Dept of Forestry & Fire Management, The Nature Conservancy, Ecological Restoration Institute, Greater Flagstaff Forests Partnership, American Conservation Experience, and Navajo Nation.
- Hosted over 40 public events and field trips

Communicating the Triple-Bottom-Line Impacts of Wildfire to Arizona Communities

Forest thinning and fire prevention is an investment in a community's health, not unlike investments in a water or wastewater treatment facility. While there is no benchmark for the cost of forest restoration -- $500 to $1,000 per acre is typically cited – it is acknowledged to be well below the cost of suppressing, mitigating, and recovering from wildfire. The 2010 Schultz Fire outside Flagstaff had an estimated impact of $133 to $147 million; the same study estimated that an investment of $15 million could have helped avoid much of the damage associated with the fire and post-fire flooding.[11] Similarly, FWPP's 2014 cost avoidance study estimated that the potential cost of wildfire in the city's two watersheds would be in the range of $573 million to $1.2 billion; costs that would be mitigated by the $10 million investment approved by the voters.[12]

In light of Flagstaff's successful efforts to gain approval for forest thinning projects by demonstrating the avoided costs, WIFA chose to focus its marketing efforts for the CWSRF Forest Thinning & Restoration Program on the measurable benefits of prospective projects. The objective of the triple-bottom-line analysis was two-fold:

1. Provide real, actionable data for potential municipal and tribal borrowers on the investment and the potential benefits of borrowing through the SRF, and
2. Offer data and tools to prospective borrowers so they can gain approval from their leadership and voters (if necessary).

The measures selected for analysis are based on the common categories analyzed in wildfire cost studies. WIFA's assessment includes the ten metrics to demonstrate the economic value of pursuing forest thinning projects to mitigate catastrophic wildfires. The figures used in the measurable benefits analysis are based on actual cost data from fires (particularly in the U.S. Southwest), scientific studies, and other federal information resources.

Although these measures are not exhaustive, they provide a well-rounded picture of the potential benefits of forest restoration using available data. While a significant portion of the response and suppression costs is typically borne by the federal government, the remaining costs directly impact the local economy, employment, and tax revenues. An analysis of five large wildfires between 2002 and 2016 found that state and local government agencies, individuals, and businesses shoulder 64 percent of the costs of wildfire, with the majority of those being long-term expenses associated with the economic and physical recovery from wildfire.[13]

Metrics for Quantifying Measurable Benefits

Direct Costs

Response and suppression costs	How much does it cost to extinguish a wildfire?
Damage to structures and contents	What is the cost to homes and structures?
Damage to utilities	What is the cost of damage to utilities, such as transmission lines?

Indirect Costs

Impact on property values	What is the long-term cost to property owners?
Cost to wildlife habitat and timber	What is the value of habitat and timber lost to fire?
Lost recreational value and economic activity	How do healthy forests support the economy, including earnings and employment?

Long Term Costs (multi-year)

Additional drinking water treatment costs	How much does temporary drinking water treatment cost following a wildfire?
Source water protection	What are the cost savings to water treatment from healthy forests?
Health and economic prosperity	How do wildfires impact local communities, from economic stress to quality of life?
Wildland remediation costs	How much does it cost to recover from a wildfire?

Using Flagstaff's lessons learned, and comprehensive wildfire impacts and cost avoidance research, WIFA worked with EPA's consultant to create a Measurable Benefits Tool that estimates the environmental, financial, and social benefits associated with undertaking forest thinning projects. The tool uses specific metrics such as costs of wildfire suppression and rehabilitation, impacts on property values, lost recreational value and economic activity, job losses, impacts to drinking water treatment costs, public health, and local economic prosperity.

The Measurable Benefits Tool is customizable by city, county, or national forest. This allows WIFA to create targeted marketing and education packages customized by the location and characteristics of the community and stakeholders. Such targeted marketing is intended to increase the effectiveness of the effort, as it provides local citizens with a picture of the potential impact that wildfire can have on their wallets, health, and community.

The triple-bottom line tool developed for WIFA could be adapted to other states. USFS budgets are insufficient to implement the many forest thinning projects that are needed to protect people, property, and water quality. The CWSRF, with more than $140 billion in funds available nationwide, can be a key partner in funding these efforts. In many cases, Drinking Water State Revolving Fund (DWSRF) financing may also be leveraged for this purpose; this program had more than $40 billion in funds available in 2019.[14] By updating the Measurable Benefits Tool for use by other states, the CWSRF may become an important part of a comprehensive strategy to grow such programs across the western U.S.

> "In general, the federal government, insurance agencies, and relief agencies such as the Red Cross serve as the initial strike team that provides immediate fire suppression, emergency relief, and short-term financial help. However, the costs of longer-term damages are primarily borne by state and local entities, individuals, and the public at large across many years."

Source: Headwaters Economics, "The Full Community Cost of Wildfire." May 2018. Page 29.

Overcoming Obstacles

With the CWSRF as a viable source of financing for forest restoration projects, the next phase in successful implementation requires overcoming several key obstacles. In Arizona, the primary obstacles are ensuring borrower eligibility, identifying viable repayment sources, and securing sufficient demand for funding.

1 Eligible Borrowers

Arizona's CWSRF program is limited by statute to lending to political subdivisions, such as counties, cities, towns, special taxing districts, and tribal authorities. Arizona law requires that these entities must be authorized by law to construct wastewater or drinking water treatment facilities or must own the nonpoint source project.[15] As a result, direct loan funding of forest thinning projects is limited to political subdivisions and tribal authorities. Because the sponsoring municipality is a primary beneficiary of the work, forest thinning is an eligible expense regardless of whether the work takes place on state, local, federal, or tribal land. In the case of the Flagstaff project, the CWSRF loan will leverage the project with state and federal funding as available and expand other treatments in the City of Flagstaff watershed. The project covers roughly 15,000 acres: 5,000 acres owned by the city and 10,000 acres federally owned land.

A second eligibility factor in Arizona is an election requirement: communities larger than 150,000 people must obtain approval for a WIFA loan by a bond election (this was increased from 50,000 in 2019).[16] Municipalities that are bound by this requirement include Phoenix and many of its surrounding communities; their location in the Salt and Upper Gila River watersheds puts them at risk from wildfire in the Prescott, Kaibab, Tonto, Coconino, and Apache-Sitgreaves National Forests. A 2018 survey and 2019 focus group of potential WIFA borrowers confirmed that the election requirement is a significant impediment to participation. Below are a few quotes from municipal participants:

- **"Our community won't allow a WIFA vote."**
- **"[We] won't spend political will and capital on the question of the election requirement."**
- **"We haven't used WIFA because of the voting requirement…"**

Although the voting requirement is an impediment, it is not insurmountable. In pooled and pass-through loan structures with several communities participating, the community actually signing the SRF loan may be below this 150,000 threshold, allowing them to bypass the election requirement. Cost-benefit accounting efforts also show that the costs of wildfire vastly exceed the costs of forest thinning and restoration activities, and the Flagstaff case shows that it is possible to get overwhelming public approval for these activities. Other states have used triple bottom line economic tools to communicate project benefits and gain public support, indicating that gaining the majority vote for forest thinning project is a reachable goal.

2 Repayment Sources

The range of repayment options for a CWSRF loan is broad. CWSRF-funded forest restoration projects are no exception. While forest thinning projects have had a goal of paying for themselves through timber and biomass revenues, the reality is that, "in the best of places, [they] might offset the cost a little", according to FWPP leaders.[17] Borrowers have used a wide range of options to repay loans, particularly nonpoint source loans. These options are discussed extensively in the EPA report, "Financing Options for Nontraditional Eligibilities in the Clean Water State Revolving Fund Programs."[18] A few options are highlighted below:

Tax pledge:

A pledge of tax receipts, often property tax receipts, can be used to pay the bond. Flagstaff received approval for a $10 million general obligation (GO) bond from its electorate in 2012. The City's 2020 forest thinning loan from WIFA will be repaid using a portion of this bond pledge. Other potential options are county flood control taxes, sales taxes, tourist taxes, and more.

Water utility revenue pledge:

Water treatment costs can increase substantially in the months and years following a wildfire due to increases in sediment in surface waters. Water utilities for Denver, Santa Fe, and Little Rock have used fees on water bills to make investments in forest restoration. A Santa Fe public opinion poll in 2011 found that 82 percent of ratepayers were willing to pay $0.65 per month for source water protection.[19] Flagstaff approved a Water Resource and Infrastructure Protection Fee to be added to monthly utility bills to pay for ongoing maintenance and investments in forest restoration. This fee will add 52 cents per 1,000 gallons of water used starting in August 2020. In July 2022, the fee will increase to 53 cents per 1,000 gallons.[20]

Revenues from timber:

At least half of the material obtained in forest thinning is usable lumber. A 2017 study conducted for the U.S. Forest Service's Four Forest Restoration Initiative (4FRI) in Northern Arizona found that for each forest acre thinned, 19.4 tons of sawlogs and 12.3 tons of biomass were recovered.[21] At the same time, transporting the timber out of forests is a significant cost driver.[22] USFS expects to award a 20-year thinning contract for 4FRI in late 2020, which will give additional clarity on the revenue potential of this resource.

Revenues from lower-value slash:

About 40 percent of the material thinned is lower-value woody biomass. Several potential uses of this slash exist, and entrepreneurs and government agencies are seeking additional viable options. The conversion of biomass to biochar through burning is one of the most common uses. Biochar can be used as a soil amendment to increase soil carbon and improve water and fertilizer retention. Biochar has also been used in brownfield remediation and as an additive in asphalt and plastic.

Electricity generation:

Biomass may be used to generate electricity, with biochar as a potential byproduct. Novo Biopower runs a 27-megawatt biomass power plant in Arizona and holds power purchase agreements with Arizona Public Services and the Salt River Project, which utilizes wood waste from the 4FRI

> The US Forest Service's "Guide to Watershed Partnerships" (2019) features case studies of several additional repayment options.

project. In California, Phoenix Energy has co-located small biomass gasification plants at the site of biomass collection, powering nearby facilities and creating biochar as an additional product. An undated case study by the International Biochar Institute notes that power generation may provide enough economic returns to generate measurable loan repayment revenue streams. For example, a Phoenix Energy facility in California cost $4.5 million per megawatt (MW) to build. The retail cost of electricity to run the plant is 20 cents per kilowatt-hour (kWh) and 6 cents per kWh for operations. Any power generated beyond these needs is then sold back to the power grid for 11 cents per kWh.[23] By comparison, the average electric rate in Arizona was 12.8 cents per kWh in 2018.[24]

Fees on park concessions:

Recreation activities and lodging generate significant revenues in national forests, mainly through concessions. Outdoor recreation in Coconino National Forest is estimated to generate more than $600 million in expenditures each year.[25] A small percentage fee added to a bill could be a source of income for repayment of loans that benefit the forest area.

This list of repayment options is not exhaustive. Other options include foundation support, corporate sponsorship, non-profit fees, development impact fees, nutrient- and carbon-trading, and more.

Revenue Potential

While 60 percent of the slash from forest thinning consists of usable materials such as sawlogs, the revenues from this material has not been sufficient to pay for forest thinning activities. The true gap is currently not known, although the US Forest Service believes it will have a better picture of the funding gap in late 2020. Preliminarily, USFS believes that the gap between the cost to treat the forest and the revenues from sales of the thinned product will be $10 million to as much as $40 million annually if it achieves its goal of treating 50,000 acres per year (i.e., a gap of $800 per acre).[26]

The markets for products created from the remaining biomass are also small and underdeveloped. For example, an online search found a vast price range of $96 to $6,000 per ton of biochar.[27] The market for electricity generation from biomass is also unknown -- it remains more costly than other green energy sources, such as wind or solar power.

It therefore appears unlikely that the products from forest thinning will be sufficient to ensure repayment of a loan for the foreseeable future. As a result, CWSRF forest thinning loans will require additional sources of security to ensure repayment, such as taxes, utility revenues, corporate sponsorships, and more.

Demand for Funding

The CWSRF has an opportunity to play a key role in providing gap financing for forest thinning projects. The US Forest Service is bound by the Anti-Deficiency Act to proceed with projects only after they have been fully funded. With 4FRI predicting a funding gap of at least $10 million a year for 20 years, there is an ample role for CWSRF financing.

USFS is completing a national Watershed Condition Framework, which will characterize the funding needs for completing fire protection and resiliency projects in priority watersheds in National Forests throughout the US. This is expected to clarify the potential demand for financing in Arizona and nationally.

The SRF can also help fill in the gap for equipment needs. Air curtain burners may be an eligible cost as capital equipment needed to implement water quality projects. Air curtain burners are specialized modular incinerators that can burn biomass faster and with less pollution than conventional open pit burning. The product, biochar, can be used in various settings, including agriculture, where it can improve water and fertilizer retention and reduce leaching of nitrogen and phosphorus, thereby benefiting water quality. Some air curtain burners also generate electricity. Air curtain burners range in cost from $42,000 to more than $4 million.[28]

Another potential area of need is for forestry equipment. Loggers have difficulty obtaining financing for equipment and many do not qualify for traditional loans.[29] The State of Colorado has created the Forest Business Loan Fund, which provides loan capital to businesses that "harvest, remove, use, and market beetle-killed and other timber taken from private, federal, state, county, or municipal forestlands as part of wildfire risk reduction or fuels mitigation treatment."[30] Arizona could help support such loggers by creating a similar pass-through structure.

What can CWSRF funding be used for?

- ✓ Harvest, removal, and hauling of felled trees, slash, and biomass
- ✓ Purchase of equipment
- ✓ Retrofitting existing facilities to accommodate biomass conversion
- ✓ Tree marking and field testing
- ✓ Preliminary engineering, studies, surveys
- ✗ The CWSRF cannot be used for operations and maintenance activities.

Lessons Learned

1 Critical Partnerships

CWSRF financing typically requires collaboration between the program, the borrower, and their contractors. In forest restoration, CWSRF participation may require collaboration with a wider range of entities, including USFS, the local government, tribal entities, and citizen groups. The City of Flagstaff's CWSRF project is a case study in the range of partnerships that are critical to a successful forest restoration program, and involved:

- US Forest Service
- Residents
- State government
- Stakeholder groups
- NGOs, such as the National Forest Foundation
- Other funders

The City of Flagstaff has been implementing the Flagstaff Watershed Protection Project (FWPP) since 2012 but began laying the groundwork for the program in 1997. Over the course of time, it leveraged several partnerships that have proven essential to the success of the program. According to Flagstaff city leaders, "creating that partnership [with the US Forest Service] was key to the success of the program." Their partnership started off on the right foot when the City declined to charge the USFS for water used to fight the 2010 Schultz fire because they "saved our city."[31]

Flagstaff and USFS formalized this relationship with two Memorandums of Understanding (MOU), a Master Participating Agreement, and Supplemental Project Agreements. These agreements ensured that both entities understand their roles and decision spaces. For example, the City would make fiscal decisions while USFS managed the environmental planning process.[32]

The US Forest Service typically works with a third-party watershed implementation partner, such as the National Forest Foundation. They believe these partners help maximize the effectiveness of doing large-scale projects by providing additional flexibility and messaging assistance. They also rely on these partners to facilitate fundraising efforts.[33]

Another critical partnership is with city residents. FWPP's educational efforts and communications with community members helped ensure the approval of the $10 million bond by a wide margin. Their experience shows that a triple-bottom line analysis can be a key component toward successful financing of forest thinning and restoration projects.

At the time of the bond, Flagstaff committed to maximizing other grant and in-kind funding to match the community's investment. Flagstaff has leveraged its partnerships to access more

than $7 million in grant funding from USFS, the State of Arizona, and other partners (Figure A). In addition, it has received more than $1 million in in-kind contributions, such as hand-thinning operations provided by Americorps volunteers[34]. The City pledged to track the bond as though it was a federal grant, with regular audits and full transparency, to maintain the trust of its constituents.

Although WIFA was not a FWPP partner at the outset, it is now a key partner in the effort. In December 2019, Flagstaff signed a $6 million WIFA loan, receiving $1 million in principal forgiveness. The loan is being repaid using the remaining authority from the $10 million GO bond that was approved in 2012. Flagstaff has had several CWSRF loans for gray wastewater infrastructure projects, and WIFA staff remained in regular contact to discuss funding opportunities.

Paul Summerfelt, a former FWPP manager, noted that as a forester he had never heard of WIFA or the SRF, but that this loan is an example of "Team Flagstaff" as other city staff connected FWPP with WIFA. This is an example of both municipal partners and CWSRF programs reaching out beyond their typical contacts to identify more creative financing opportunities.

2 Strategic Engagement & Messaging

Successful forest restoration programs have framed their work in terms of an investment in the costs avoided by preventing a catastrophic wildfire. Several cost-avoidance studies have shown that the costs of recovering from wildfire significantly outweigh the costs of forest thinning and fire prevention. FWPP leaders found that tying the project to water quality was an effective strategy: it helped residents recognize that the forest was linked to their water supply system. The marketing campaign surrounding the 2012 bond vote emphasized the importance of the forest to the city's water supply using the "Yes on 405" campaign and sending postcards to voters.

Other cities, such as Santa Fe, New Mexico, and Denver, Colorado, have used a similar approach to

Figure A

FWPP LEVERAGE Summary: CY 2013-2019

Self-Reported by Organization on Semi-Annual Basis

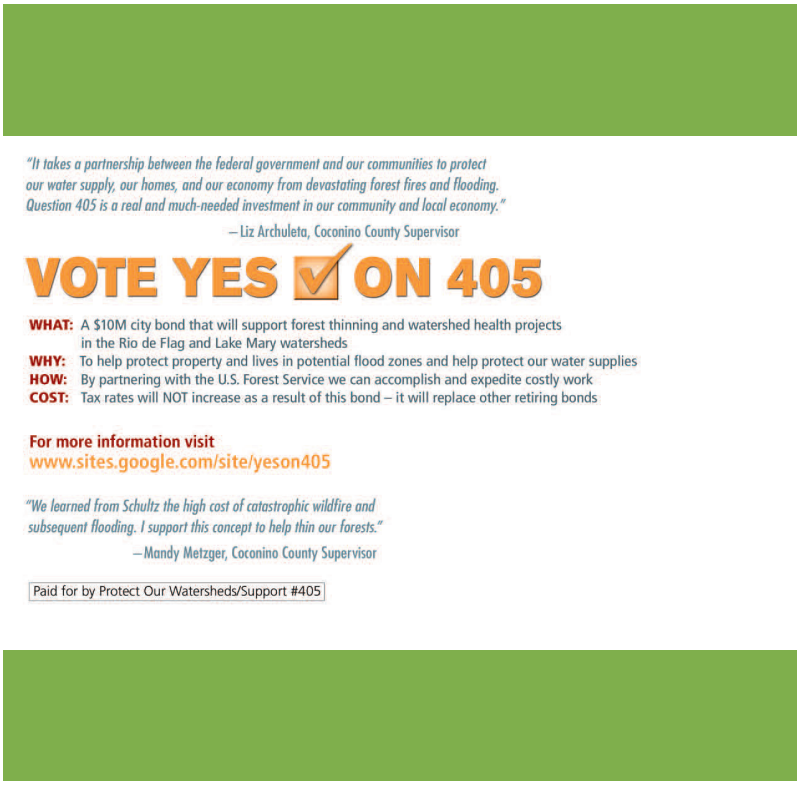
WHO	TYPE		TOTAL
	In-Kind	*Cash*	
City - Water Services	$0	$377,850	$377,850
City - Sustainability	$0	$122,500	$122,500
Coconino County	$38,261	$0	$38,261
State of AZ	$0	$1,008,172	$1,008,172
U.S. Forest Service	$0	$5,808,265	$5,808,265
Greater Flagstaff Forests Partnership	$74,177	$0	$74,177
NAU-Ecological Restoration Institute	$99,978	$25,000	$124,978
NAU-Rural Policy Institute	$5,000	$0	$5,000
NAU-School of Forestry	$174,000	$0	$174,000
U.S. Fish & Wildlife Service	$58,000	$0	$58,000
Walnut Canyon Technical Advisory Committee	$56,000	$12,000	$68,000
American Conservation Experience	$230,000	$0	$230,000
AZ Conservation Corps	$55,000	$0	$55,000
U.S. Geologic Survey	$12,200	$0	$12,200
Volunteers	$338,710	$0	$338,710
Solution Search	$0	$25,000	$25,000
Others	$19,740	$3,300	$23,040
	$1,161,066	$7,382,087	$8,543,153
	14%	86%	100%

tie together watershed health, forest health, and water quality. Santa Fe's watershed investment plan notes that a $5.1 million investment over 20 years could save between $92 and $288 million in wildfire suppression and rehabilitation costs, as well as dredging and disposal of ash from the City's reservoirs.[35] Denver's "From Forests to Faucets" program also highlights the cost savings of investing in watershed protection and forest restoration efforts. Both Santa Fe and Denver have added small fees to their water bills to help pay for these initiatives. Flagstaff's city leadership chose to finance FWPP with a bond rather than a utility fee, reasoning that the bond election would clarify public opinion about the project. In addition, it would require an educational campaign and empower voters.[36]

3 Replicability in States with Similar Challenges

Wildfires occur throughout the United States, with western states being particularly at risk. A 2019 analysis by insurance risk analyst Verisk listed primarily western states as those with the most properties at risk from wildfire (Figure B).[37]

The US Forest Service is developing a database that tracks NEPA-ready priority watershed restoration projects and characterizes them based on readiness to proceed, anticipated financing need, source water protection and hazard overlaps, and at-risk population density. Preliminary estimates from this database identify approximately $78 million in NEPA-approved projects that will need financing, with an additional $300 to $576 million in the project pipeline. Once the database undergoes final verification, it should identify additional avenues for the SRF programs to fund forest thinning projects on forest service lands.



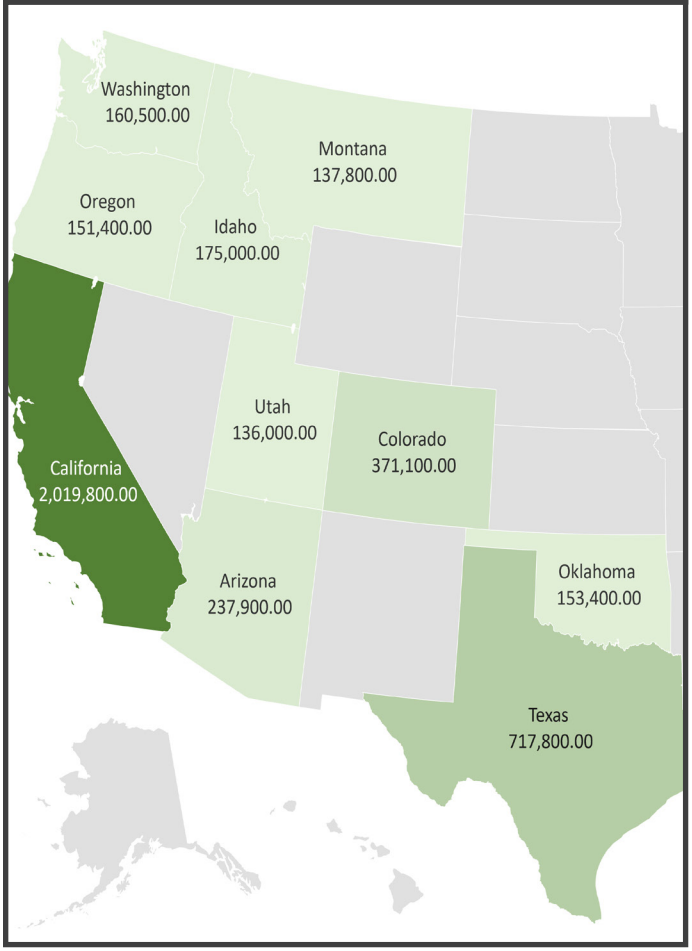
Third party watershed organizations are key players that can help bring projects to the CWSRF. These groups often play a significant role in securing financing and coordinating projects. In Oregon, the Deschutes Collaborative Project is composed of 19 representatives from the State, City of Bend, and special interest groups that collaborate with the Forest Service. The Sacramento River Watershed Program works with Butte County, California, and other stakeholders to promote forest restoration projects that benefit water quality. The Kootenai Valley Resource Initiative is a collaboration between the Kootenai Tribe, City of Bonners Ferry, state and local agencies, and special interest groups to restore and enhance the resources of the Kootenai Valley in Idaho. These are just a few of the many examples of watershed and forest restoration projects where there may be opportunities for CWSRF programs to play a role. States can establish watershed financing partnerships (see sidebar), where a borrower works with several partners to implement nonpoint source projects on a watershed basis, including forest restoration.[38]

A couple of the challenges with forest restoration projects are how to handle the biomass collected from thinning and ensuring the availability of sufficient equipment. Hauling costs are among the biggest expenses of forest thinning projects.[39] In some locations, there are no sawmills nearby to process the wood.[40] In addition to providing financing for thinning work, CWSRF programs could choose to finance certain pieces of equipment, such as air curtain burners and logging equipment, to help with implementation of forest restoration projects.

What is a Watershed Financing Partnership?

A watershed financing partnership (WFP) is an emerging concept in the CWSRF. In a WFP, the CWSRF works with a watershed partner to finance and implement a group of nonpoint source projects within a watershed. The partner can act as a broker, an intermediary, or implementer of a range of projects within a watershed.

Figure B: Estimated Properties at Risk in Top 10 States with Extreme or High Wildfire Threat (2019)



Feature: Four Forest Restoration Initiative (4FRI)

The 4FRI project is the largest forest restoration initiative undertaken by the US Forest Service. It covers 2.4 million acres on the Coconino, Kaibab, Tonto, and Apache-Sitgreaves National Forests. To date this project has not met its restoration goals due to lack of markets for the wood products and financing. 4FRI managers estimate there is a need for at least $10 million in financing each year for the next 20 years.

Communities throughout Arizona will benefit from 4FRI, particularly metropolitan Phoenix. This area's raw water comes from the Salt River Project (SRP), which draws from the Salt River, Cragin, and Verde River watersheds, located in the 4FRI project area.

A collaborative approach between the U.S. Forest Service, SRP, the watershed gateway communities, stakeholder organizations, and the CWSRF could result in a continuous source of financing. For example, a stakeholder community could agree to receive the loan, but pass it through to a third-party stakeholder group (e.g., the Northern Arizona Forest Fund) for implementation and oversight. MOUs between the stakeholder communities could be put in place to ensure that repayment is equitably distributed, while the stakeholder group can conduct the fiduciary duties.

Feature: Apache Nation

The Apache Nation has long been engaged in forest restoration. In fact, the 2011 Wallow Fire caused significantly less damage on the reservation than it did on USFS land. As a Coronado National Forest tribal relations specialist noted in a 2019 interview, "Apaches believe the health of their people is tied to the health of the land and proper management is not just about reducing fire fuels, but also protecting culturally-significant resources on their ancestral lands." The White Mountain Apache tribe refurbished and re-opened a sawmill in 2014 to process cuttings from forest thinning. Tribal entities are eligible borrowers in WIFA's statutes, and the authority has issued several loans to the Apache tribe specifically. Tribal entities are an opportunity for WIFA to expand its CWSRF forest restoration financing program.

4 Marketing, Outreach & Education

In order to expand fire prevention programs in a way that benefits water quality, communities must understand the value of the ecosystem services that the forests provide. Tools, such as the Measurable Benefits tool created for WIFA, can help convey these messages in ways that are approachable and easy to understand. As funders with significant resources, the SRF programs can play leading roles in educating communities about investments in their natural infrastructure.

EPA's contractor used the outputs from the Measurable Benefits Tool along with the underlying research to develop a full suite of fact sheets to accompany each metric which may be distributed electronically, printed for handout at conferences, workshops, and community meetings. They are suitable for use not only by WIFA but also any stakeholders interested in pursuing forest thinning and vegetative management efforts in their own communities and watersheds.

To help launch the new program, WIFA also developed an engaging tri-fold brochure to highlight the Flagstaff pilot project, their cost savings, the importance and benefits of undertaking such projects, a brief history of the Arizona CWSRF program and its financial offerings, as well as its continued commitment to serving Arizona communities and their water quality needs. The brochure and fact sheets are included as appendices to this report.

Appendices: Marketing Materials for use by Arizona WIFA

YOU BENEFIT FROM MORE THAN JUST BELOW-MARKET INTEREST RATES

- ✓ INTEREST RATE SAVINGS UP TO 30 PERCENT
- ✓ UP TO 20 PERCENT LOAN FORGIVENESS
- ✓ 30-YEAR REPAYMENT TERM
- ✓ FUNDING FOR SMALL AND LARGE PROJECTS
- ✓ YEAR-ROUND APPLICATIONS
- ✓ NO APPLICATION FEES OR CLOSING COSTS
- ✓ MOST PROJECTS EXEMPT FROM REQUIREMENTS (DAVIS-BACON WAGE RATES AND AMERICAN IRON AND STEEL)
- ✓ PLANNING GRANTS MAY BE AVAILABLE
- ✓ PERSONAL SERVICE & DEDICATED PROJECT MANAGER

MANY REPAYMENT OPTIONS WILL BE CONSIDERED

FINANCING FOREST RESTORATION PROJECTS CAN BE CHALLENGING. WITH WIFA, IT DOESN'T HAVE TO BE.

Have a viable project but not on this list? WIFA can fund projects on state and federal forestland, as long as the project is sponsored by an eligible jurisdiction. **Contact us to discuss your options.**

PUBLIC JURISDICTIONS & TRIBAL ENTITIES ARE ELIGIBLE

- Cities
- Towns
- Special districts
- County improvement districts
- Sanitary districts
- Native American Tribes & Tribal Authorities

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

100 N. 7th Avenue, Suite 130/Phoenix, AZ 85007
Phone: (602) 364-1310 • E-mail:ljones@azwifa.gov

WWW.AZWIFA.GOV

FOREST THINNING & RESTORATION PROGRAM

Below-market loans for your forest restoration projects.

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

FLAGSTAFF SAVES 20% FINANCING WITH WIFA

In 2019, the City of Flagstaff signed a $6 million WIFA loan, including $1 million in loan forgiveness, to support the Flagstaff Watershed Protection Project (FWPP). Funding will help reduce the risk of wildfire and post-wildfire flooding in key watersheds through restoration projects in Coconino National Forest.

THE CITY SAVED MORE THAN

$1.7 MILLION

BY FINACING ITS PROJECT WITH WIFA

HEALTHY FORESTS REDUCE WATER TREATMENT COSTS!

SAVE MONEY, PROTECT YOUR ASSETS

A $10 million loan from WIFA could help **prevent $25 – 51 million** in wildfire suppression and rehabilitation cost plus millions more in property losses, lost recreational values, and additional water treatment costs.

FOREST THINNING MAKES SENSE

The aftermath of wildfires can be devastating to water quality, with flooding, mudslides, erosion, and waste sediment straining water treatment facilities.

INVEST IN ARIZONA

YOUR REPAYMENTS STAY IN ARIZONA FOR FUNDING FUTURE PROJECTS!

CONTACT US WITH YOUR PROJECT IDEA!

WIFA IS THE PREMIER WATER QUALITY FINANCING AGENCY IN ARIZONA

Forest fires can cause millions of dollars in firefighting costs and devastating damage to homes, businesses, ecosystems, and water quality. A below-market loan from WIFA can help your community avoid these costs by accelerating forest restoration projects, including forest thinning, tree planting, and stream restoration.

The Water Infrastructure Finance Authority is dedicated to maintaining and improving water quality for all Arizonans. We provide financial and technical assistance for water quality and drinking water projects throughout the state. Forest restoration is just one of many eligible project types, from traditional infrastructure to innovative nonpoint source solutions to water quality impairment.

Since 1998, WIFA has re-invested almost $2.5 billion in Arizona's communities

How do healthy forests affect my water bill?

Healthy forests help protect drinking water sources like rivers and lakes from contamination.

Wildfires destroy a forest's ability to
Stabilize soil
Slow rain run-off

This results in
Flash floods
Mudslides
Debris flows

Cleaning polluted waters is
200 times more expensive
than preventing pollution of drinking water sources

For every 10% increase in vegetation there is a
20% reduction in treatment costs

There is a **direct link** between drinking water treatment costs and damaged watersheds.

The **more treatment that is** required to clean the water, the **higher your water bill!**

Forest thinning helps protect healthy soil and root systems, reduces erosion, and can save money.

Healthy forests = clean waters!

"If we talk utility infrastructure and water – we need to look at the source as important as anything. The forest we don't own is our infrastructure."

-Paul Summerfelt, City of Flagstaff

WIFA's Forest Thinning & Restoration Program

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

How can healthy forests save you money?

If your drinking water comes from a river, lake or reservoir then healthy trees and vegetative cover on the forest floor have a direct impact on your water bill. Forest thinning helps to protect healthy soil and root systems from the ravages of wildfire, reducing the likelihood of flash floods, mudslides, debris flows, and erosion. All of these contribute to the pollution of drinking water resources and increase the cost of treatment at your water treatment facility. Those costs are passed on to you, the consumer!

IF YOUR DRINKING WATER UTILITY SPENDS $250,000 A YEAR ON TREATMENT, A FOREST WITH

The damage caused by wildfire can persist for **5-10 years** and can be **more detrimental** to water supplies **than the fire itself**.

10% VEGETATIVE COVER
may reduce costs by
$50,000

30% VEGETATIVE COVER
may reduce costs by
$120,000

50% VEGETATIVE COVER
may reduce costs by
$160,000

How do wildfires impact our infrastructure?

Wildfire Damage to **Utilities & Infrastructure**

Drinking Water Supply

Post-fire runoff can pollute reservoirs **rendering the water supply unusable.**

Treatment & Distribution

Up to **$37 million** to restore local drinking water infrastructure from post-fire runoff.

Emergency Response

Disruptions to critical communication infrastructure impacts **first responders.**

The Value of Utilities

$84-224 million in communications assets on two vulnerable mountains.

Many communication towers are located on mountaintops, making them vulnerable to wildfire. Arizona's Mormon Mountain and Mount Elden each host numerous communication facilities used by:

- County Law Enforcement
- Cellular Phone Service Providers
- Internet Providers
- Telephone Providers
- Television Stations
- FM radio broadcasters

A fire would disrupt or destroy communications such as cell phone service, Internet, radio, and public safety including law enforcement, fire and emergency medical services. The impact would be disastrous for personal communications, business operations and fire suppression efforts.

WIFA's Forest Thinning & Restoration Program

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

How do wildfires impact our real estate and property?

The cost of wildfire **property damage &**

Property Values

Homes within 3 miles of a wildfire experience a 31% decline in value

Property Damage

Damages from flash floods and mudslides average $152,000

Wildfire Suppression and Rehabilitation

Up to $4,243 in recovery costs for every acre burned

High Risk Areas

More than 174,000 properties in Arizona are in "high and extreme wildfire risk" areas

Forest thinning is all about COST AVOIDANCE

Though it cannot completely eliminate wildfire risk, it can significantly reduce the severity of wildfire events.

Mitigating the range, intensity and velocity of wildfires is the best strategy to avoid substantial economic impacts to homeowners, businesses and communities.

An ounce of prevention is worth a pound of cure!

WIFA's Forest Thinning & Restoration Program

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

The Cost of Wildfire to Homes and Property

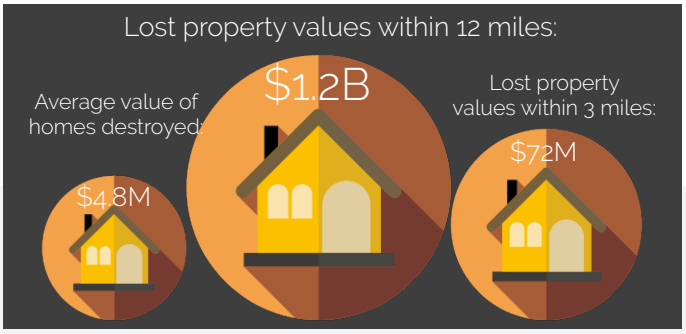
In addition to destroying homes and structures in forested areas and surrounding regions, wildfires can have long-lasting impacts on the values of homes and real estate in the vicinity of the burn.

Increased risk for **flash flooding & mudslides** can persist for

5 to 10 years

following a wildfire due to the lack of forest floor vegetation to absorb rain water and snow melt.

The costs are borne by property owners, either directly through repair and replacement or indirectly through insurance costs.



What county do you live in?	Coconino
How many homes could be destroyed by fire?	20
How many homes are within 3 miles of the Wildfire Perimeter?	300
How many homes are within 12 miles of the Wildfire Perimeter?	5,000

The economic ripple effects of wildfires represent a significant loss of wealth to individual homeowners. Forest thinning can be an effective preventative management option that helps homeowners protect the value of their properties.

Studies have shown that houses located within 3 miles of the wildfire perimeter had a 31% decline in value, while homes within 12 miles had a 6% decline in value.

Why should we fund forest thinning projects in Arizona?

It's good for the economy!

Here's what happened in Arizona's national forests in 2019...

6 million hikers generated

$541 Million

Healthy forests are a vital resource for Arizona's many outdoor recreation activities.

5.6 million lovers of wildlife, birds and nature viewing generated

$420 Million

Arizona has six national forests that hosted more than **13 million visitors in 2019!**

1.2 million anglers generated

$124 Million

A large wildfire means the closure of forest lands, trails, and access to rivers and lakes.

1 million campers generated

$110 Million

Some facilities may be closed up to 10 years after a wildfire.

726,000 hunters generated

$98 Million

Closure as the result of wildfires could **cost the Arizona economy BILLIONS of dollars in revenue!**

WIFA's Forest Thinning & Restoration Program

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

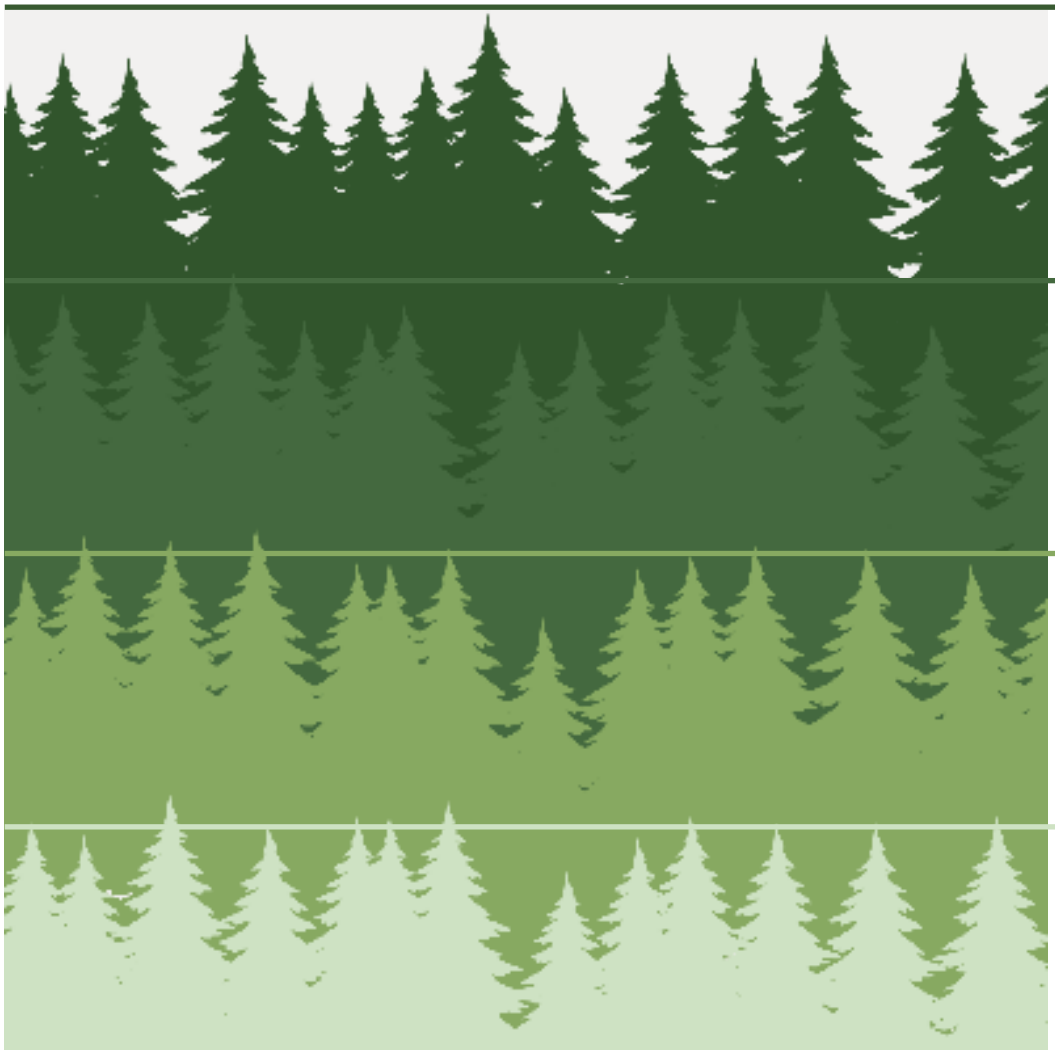
How do Healthy Forests Support Arizona's Economy?

Arizona's forests support environmental biodiversity and bountiful recreational opportunities for residents and visitors alike. They are also a vital source of income and tax revenues, create jobs, and support the livelihoods of millions of Arizona families. Taking proactive steps to ensure the future health and integrity of these lands through vegetative management and forest thinning practices is critical to protecting the environmental and economic resources they provide.

How are Arizona's forests supporting local economies? What would happen if these forests were damaged by a large wildfire and had to be closed?

Recent wildfilres in Arizona forests have closed recreational facilities for months -- some for years!

Recreational National Forest Area: **Coconino**



Healthy Forest

- **4.7 million** Annual Visitors
- **$260 million** Local Labor Income
- Jobs Supported

25% of Forest Closed

- **1.2 million** Visitors Lost
- **$65 million** Local Labor Income Lost
- **1,810** Jobs Lost

50% of Forest

- **2.4 million** Visitors Lost
- **$130 million** Local Labor Income Lost
- **3,620** Jobs Lost

75% of Forest Closed

- **3.5 million** Visitors Lost
- **$195 million** Local Labor Income Lost
- Jobs Lost

What's our home worth?

Meet the Mexican Spotted Owl, a threatened species that calls Arizona's forests home . . .

Arizona has

Hundreds of PACS

The federal government has established protected activity centers (PACs).

Each PAC is worth between

$100,000 and $4 Million

These are areas of at least **600 acres each that can breed and sustain the owls.**

Forests in the southwestern US have experienced larger and more severe wildland fires since

1995

LOSS OF HABITAT for these threatened species is one of the biggest wildfire concerns.

Wildfire could destroy this critical habitat valued in total at more than

$1 Billion

Intensifying drought cycles and climate variability could result in ever larger fires in owl habitat.

FOREST THINNING IS A SUSTAINABLE SOLUTION!

WIFA's Forest Thinning & Restoration Program

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

The Intersection of Habitat & Commerce

The value of forests can be measured in different ways: environmental, social, and economic. One method is to determine the value of endagered species like the Mexican Spotted Owl that make their homes in the forest. Wildfire can decimate hundreds of acres of critical habitat for these species. Another key cost of wildfire is the lost value of timber sales that keep local economies afloat. How can we quantify the environmental and economic impacts of wildfire on these resources?

If there are

120,000

acres at risk in the Tonto National Forest area

200 potential owl habitats may be impacted

What's the value of Mexican Spotted Owl habitat in the at-risk forest?

How does wildfire impact timber sales?

The potential loss in revenue and impact on local economies depends on the amount of forest utilized for a typical harvest.

20% of the forest

40% of the forest

50% of the forest

75% of the forest

How do wildfires impact local families?

It can take years for a community to recover from a wildfire and its aftermath.

Double Impact

Up to $700 Million

In financial damages from catastrophic fire and post-fire flooding

Healthcare Costs

$1,937

Average out-of-pocket costs to treat injuries and illnesses associated with post-wildfire impacts

Economic Stress

Up to $1.2 million in lost retail and tax

for each day a wildfire is not contained

Quality of Life

Charred landscapes, poor air quality, polluted water supplies

Flooding in a burn scar area following a wildfire can cause more catastrophic damage than the fire itself.

Destruction in the wake of a fire takes an **EMOTIONAL** and **PHYSICAL** toll on families and businesses.

Local economies can be ravaged over months or even days and may take a decade to recover.

The quality of life in communities touched by wildfire can be significantly diminished.

Forest thinning is an investment in the health of local communities!

WIFA's Forest Thinning & Restoration Program

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

The Cost of Wildfire to Health and Economic Prosperity

Wildfire and post-fire flooding can wreak havoc on the economic health of communities at ground zero as well as many miles away. Some communities have lost millions in retail sales, tourism, and tax revenues without actually being directly impacted by fire and flood at all. Even though it was more than ten miles away, the Slide Fire cost the city of Sedona **over $100 million in lost tourism revenue**.

SCHULTZ FIRE: CITY OF WILLIAMS RETAIL REVENUE AT RISK

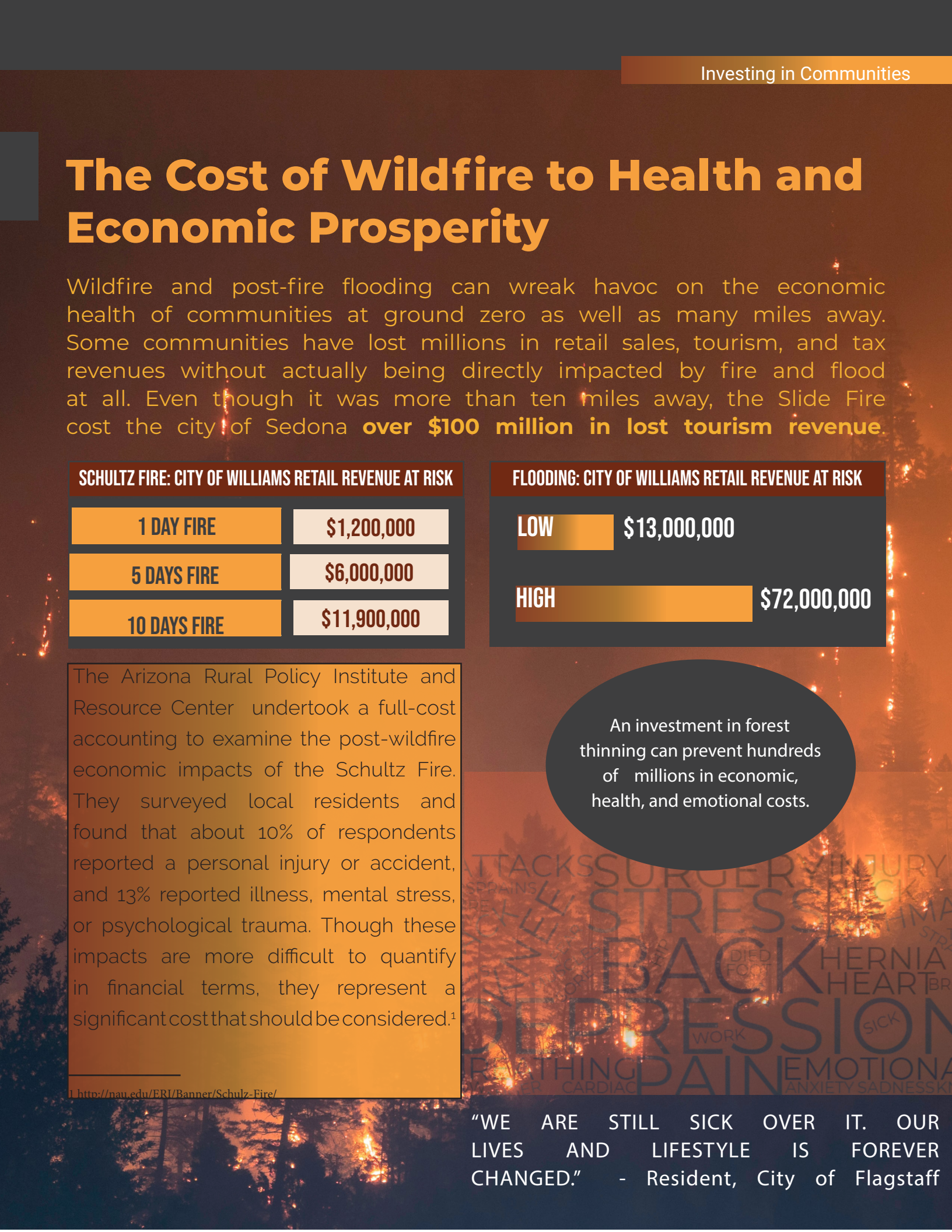
1 DAY FIRE	$1,200,000
5 DAYS FIRE	$6,000,000
10 DAYS FIRE	$11,900,000

FLOODING: CITY OF WILLIAMS RETAIL REVENUE AT RISK

The Arizona Rural Policy Institute and Resource Center undertook a full-cost accounting to examine the post-wildfire economic impacts of the Schultz Fire. They surveyed local residents and found that about 10% of respondents reported a personal injury or accident, and 13% reported illness, mental stress, or psychological trauma. Though these impacts are more difficult to quantify in financial terms, they represent a significant cost that should be considered.[1]

1 http://nau.edu/ERI/Banner/Schulz-Fire/

An investment in forest thinning can prevent hundreds of millions in economic, health, and emotional costs.



"WE ARE STILL SICK OVER IT. OUR LIVES AND LIFESTYLE IS FOREVER CHANGED." - Resident, City of Flagstaff

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source projects and other related water quality facilities and projects." Section 1201(9) defines a political subdivision as a "county, city, town or special taxing district authorized by law to construct wastewater treatment facilities, drinking water facilities, or nonpoint source projects. Section 1224 notes that a nonpoint source project must be owned by the political subdivision.

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