Arizona Water Protection Fund
Application Cover Page
FY 2019

Title of Project: Bill Williams Mountain Forest and Watershed Restoration Project

Type of Project:
- ☒ Capital or Other
- ☐ Water Conservation
- ☐ Research

Stream Type:
- ☐ Perennial
- ☐ Intermittent
- ☒ Ephemeral

Your level of commitment to maintenance of project benefits and capital improvements:
☒ < 5 years ☐ 5-10 years ☐ 11-15 years ☐ 16-20 years

Applicant Information:

Name/Organization: National Forest Foundation
Address 1: 7324 E. Sixth Avenue
Address 2:
City: Scottsdale
State: AZ
ZIP Code: 85251
Phone: 720-749-9008
Fax:
Tax ID No.: [redacted]

Inside an AMA: Yes ☐ No ☒

If yes, which AMA:
- ☐ Phoenix
- ☐ Tucson
- ☐ Prescott
- ☐ Pinal
- ☐ Santa Cruz

Type of Application:
- ☒ New
- ☐ Continuation

Contact Person:

Name: Rebecca Davidson
Title: Southern Rockies Director
Phone: 720-749-9008
Fax:
e-mail: rdavidson@nationalforests.org

Any Previous AWPF Grants:
☐ Yes ☒ No

If yes, please provide Grant #(s):

Arizona Water Protection Fund Grant Amount Requested:

$315,000.00

If the application is funded, will the Grantee intend to request an advance:
☐ **Yes** ☒ **No**

Matching Funds Obtained and Secured:

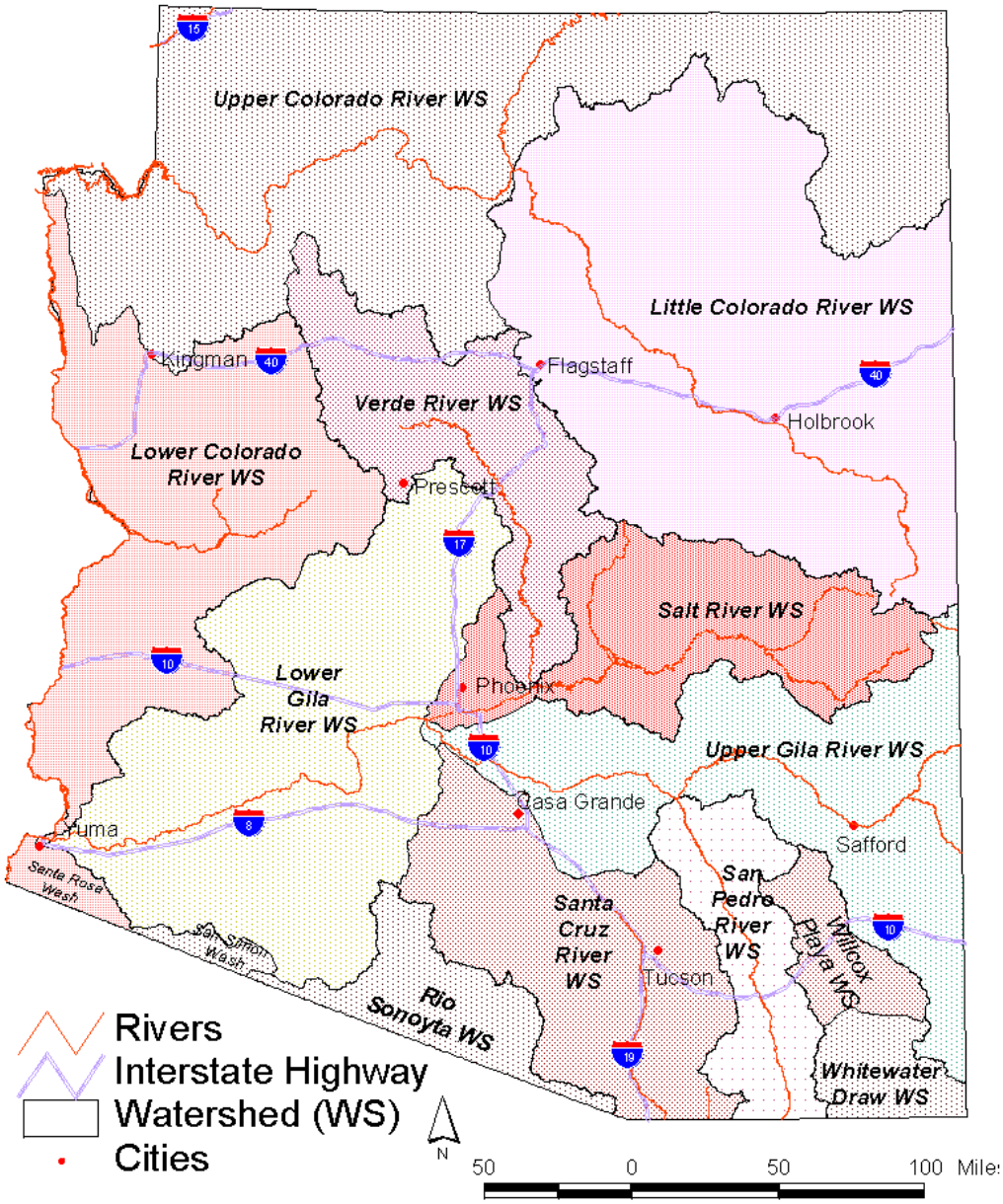
Applicant/Agency/Organization:	Amount ($):
1. Applicant	172,500.00
2. Kaibab National Forest(in-kind)	21,425.00
3.	
Total:	193,925.00

Has your legal counsel or contracting authority reviewed and accepted the Grant Award Contract General Provisions?
☒Yes ☐No ☐N/A

Signature of the undersigned certifies understanding and compliance with all terms, conditions and specifications in the attached application. Additionally, signature certifies that all information provided by the applicant is true and accurate. The undersigned acknowledges that intentional presentation of any false or fraudulent information, or knowingly concealing a material fact regarding this application is subject to criminal penalties as provided in A.R.S. Title 13. The Arizona Water Protection Fund Commission may approve Grant Awards with modifications to scope items, methodology, schedule, final products and/or budget.

Mary Mitsos	National Forest Foundation, President, Phone:406-542-2805
Typed Name of Applicant or Applicant's Authorized Representative	**Title and Telephone Number**
Signature	**Date Signed**

Arizona Watershed Map
FY 2019



Title of Project: **<u>Bill Williams Mountain Forest and Watershed Restoration Project</u>**

Location (include UTM's & Township/Range/Section)**:**
<u>UTM Coordinates : 35.1995019, -112.2035934</u>
<u>Township/Range/Section T21N/ R2E /S17</u>
<u>Meridian Gila-Salt River</u>

Bill Williams Mountain Forest and Watershed Restoration Project
National Forest Foundation

The decline in forest health on our National Forests has led to an increase in the number of large-scale, high-severity fires. In some places wildfires pose tremendous risk to our communities and our watersheds. Forest restoration treatments that reduces fire risk are costly but are much less expensive than the cost of fire suppression and recovery from post fire flooding that would affect nearby communities and the downstream watershed. To strategically address this issue we propose paying for forest treatments in forests that face high fire risk at the top of the watersheds that are close communities and infrastructure. **The National Forest Foundation (NFF), Coconino County, and the Kaibab National Forest are working together to complete the Bill Williams Mountain Forest and Watershed Restoration Project (the BW Project).** Support from the Arizona Water Protection Fund will jump start the effort to thin some of the most critical acres at the top of the watershed and overlooking the Town of Williams.

The BW Project is located on the Williams Ranger District of the Kaibab National Forest. Watersheds originating on Bill Williams Mountain drain to the Verde River to the south and the Little Colorado to the north. These watersheds also feed four municipal reservoirs that provide water for the Town of Williams. In 2016 the Kaibab National Forest approved the Bill Williams Mountain Restoration NEPA due to high risk of catastrophic wildfire. This plan calls for restoration treatments on 15,000 acres on Bill Williams Mountain to protect watershed and forest health, and the local community.

In this important phase of the BW Project, the NFF will focus on 200 of the highest priority acres on Bill Williams Mountain, located at the very top of the watershed, on the steepest slopes with extremely dense forest cover. If these areas burn they pose the greatest post-fire flooding risk to the watershed and the Town of Williams. While these NEPA approved restoration prescriptions represent the most costly to treat within the watershed, they are specifically located to reduce high severity fire on the highest in elevation and steepest slopes and thereby will help prevent post-fire floods.

Forest thinning work will consist of steep-slope mechanical thinning, which uses specialized equipment to cut and remove trees from areas with greater than 25 degree slopes. Marketable logs and woody biomass will be removed from these slopes and either stacked in log decks or piled for future burning at locations designated by the Forest Service. These NEPA approved restoration prescriptions are expected reduce the risk of high-severity fire by 30%-50%.

The benefits of this work will be realized for decades to come, and with regular maintenance by the Forest Service, will save hundreds of millions of dollars in avoided costs, protect the Town of Williams, and protect and improve watershed health and water supplies in both the Verde Watershed and Little Colorado River Watershed.

Bill Williams Mountain Forest and Watershed Restoration Project
National Forest Foundation

Background, Problem, and Goal

The decline of forest health in our National Forests has led to larger, more destructive wildfires. The increase in size and severity of these fires makes fire suppression and recovery exponentially more costly. Often, the destruction caused by wildfire is not over when the flames are out. The worst damage can come with the arrival of monsoon or winter rain that causes flooding and debris flows that carry whole trees, boulders, and tons of sediment and ash downstream clogging rivers and reservoirs. These events impair watersheds by overwhelming and wiping out aquatic systems, decreasing water quality and quantity, altering sediment and flow regimes, and changing water temperatures for years after the fire event. The flood events that followed fires like the Schultz Fire near Flagstaff[1], the Wallow Fire in eastern Arizona, and the Highline Fire near Payson are painful reminders that the impacts of fire and post-fire flooding extend beyond the watershed; these catastrophes have cost our communities hundreds of millions of dollars and have taken numerous human lives.[2]

The good news is that the high-severity fires that trigger these watershed impacts are largely preventable with forest restoration treatments. While forest treatments are costly they can be targeted to treat areas that face the highest risk of severe fires and that pose the highest risk to downstream communities, watersheds, and water infrastructure.[3] It is for these reasons the National Forest Foundation (NFF), Coconino County, and the Kaibab National Forest are working together to complete the Bill Williams Mountain Forest and Watershed Restoration Project (the BW Project). **The goal of the BW Project is to protect the watershed, improve forest health, and to minimize risk to local and downstream communities.**

The Bill Williams Mountain Forest and Watershed Restoration Project Solution and Objectives

The BW Project is located on the Williams Ranger District of the Kaibab National Forest. Watersheds originating on Bill Williams Mountain drain to the Verde River to the south and the Little Colorado to the north. These watersheds also feed four municipal reservoirs that provide water for the Town of Williams. In 2016, the Kaibab National Forest approved the Bill Williams Mountain Restoration NEPA that calls for restoration treatments on 15,000 acres of extremely dense, overgrown forests on National Forest lands.[4] **This NEPA decision provides a solution to avoid high severity fire on Bill Williams Mountain. The only piece that is missing is the funding to pay for implementation of prescriptions for thinning and for reducing severe fire risk on steep slopes and dense forest of Bill Williams mountain.**

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[1] A Full Cost Accounting of the 2010 Schultz Fire. Northern Arizona University. Ecological Restoration Institute. May 2013. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/276/rec/1

[2] The True Cost of Wildfire in the Western US. Western Forestry Leadership Coalition. 2010. https://www.blm.gov/or/districts/roseburg/plans/collab_forestry/files/TrueCostOfWilfire.pdf

[3] NEW MODELS FOR FUNDING PUBLIC LANDS MANAGEMENT: A Case Study of the Northern Arizona Forest Fund, Rebecca Davidson, Spencer Plumb & Marcus Selig http://arizonastatelawjournal.org/wp-content/uploads/2016/04/Davidson_Final.pdf

[4] Bill Williams Mountain Restoration Project Record of Decision Kaibab National Forest, Coconino County, Arizona https://www.fs.usda.gov/nfs/11558/www/nepa/75077_FSPLT3_2610206.pdf

The NFF is working to raise funds necessary to achieve the stated goal and implement the solution put forward by the Forest Service. To this end this project will accomplish the following objectives: **Objective one: the NFF will thin 200 of the highest priority acres on Bill Williams Mountain, located at the very top of the watershed, on the steepest slopes.** While these acres represent the most costly to treat within the watershed, they are specifically located to reduce high severity fire on the highest in elevation and steepest slopes and thereby will help prevent post-fire floods.
Objective two: The NFF will reduce the risk of high-severity fire on the steep slopes by approximately 30%. Forest thinning work will consist of steep slope mechanical thinning, which uses specialized equipment to cut and remove trees from areas with greater than 25 degree slopes.[5] Marketable logs and woody biomass will be removed from these slopes and either stacked in log decks or piled for future burning at locations designated by the Forest Service.

Reduced Flooding Risk and Avoided Cost

Results from a recent post-wildfire debris-flow and flooding study[6] indicate that post-fire floods in the Williams area pose a risk to the watershed and the local community, largely due to the close proximity of the watershed and its drainages to developed areas and drinking water reservoirs. While it is unlikely that the city reservoirs will overfill, the drinking water supply for Williams could be compromised and extremely expensive to mitigate. In fact, potential damage from a catastrophic wildfire and the post-fire flooding in the watershed are estimated to be between $379 and $694 million.[7] Yet, by treating the watershed, through NFF's work on the steeper and harder to access acres, in combination with the Forest Service's timber contract operations, the flooding assessment anticipates that overall risk of post-fire flood discharges and sediment-laden flows can be reduced by 27% to 49% across the watershed.

Project-Related Watershed Benefits

The reduction of tree densities and biomass fuels on steep slopes at the top of Bill Williams Mountain will help minimize risk from catastrophic wildfire, as well as prevent post-fire flooding and subsequent debris flows. Through proactive restoration of overgrown forests through mechanical thinning, we can anticipate benefits lasting between 15-30 years.[8] However, the Kaibab National Forest also intends to reintroduce prescribed fire on many of the treated acres prescribed in the Bill Williams NEPA, a far less costly management tool, moving from fire suppression into a fire-adapted maintenance regime. **As such, the project-related benefits would improve ecosystem processes, protect watershed health and function, and would last decades beyond the anticipated results using mechanical treatment alone.**

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[5] Steep-slope logging equipment most suited for this work includes Ponsse harvesters or similar machinery. https://www.ponsse.com/

[6] Post-Wildfire Debris-Flow & Flooding Assessment: Coconino County, Arizona. Arizona Geological Survey http://repository.azgs.az.gov/sites/default/files/dlio/files/nid1727/ofr-17-06_v1_cococty_0.pdf

[7] The Economic Impact of Post Fire Flooding: Bill Williams Mountain Thomas Combrink and Wade Rousse The W.A. Franke College of Business, Northern Arizona University http://coconino.az.gov/DocumentCenter/View/21682/The-Economic-Impact-of-Post-Wildfire-Flooding-Bill-Williams-Mountain?bidId=

[8] Using Fire to Increase the Scale, Benefits, and Future Maintenance of Fuels Treatments. *J. For*. 110(7):392–401. 2012. https://www.fs.fed.us/psw/publications/north/psw_2013_north004.pdf

Bill Williams Mountain Forest and Watershed Restoration Project
National Forest Foundation
Scope of Work

Project Goals and Objectives
The Bill Williams Mountain Restoration NEPA issued by the Kaibab National Forest (KNF) in 2016 provides the necessary clearance to restore 15,000 acres of forest on Bill Williams Mountain. The KNF has issued timber sales where commercially valuable trees are available and easy to access with standard logging machinery. In places where thinning is difficult due to steep or rocky conditions, and/or where no commercial values exist, the KNF has sought assistance from the National Forest Foundation (NFF) to help fund and conduct priority treatments. In total there are approximately 2,000 acres near the top of Bill Williams Mountain covered in dense forest on steep slopes that are not commercially viable for timber sales. In an effort to achieve the goals of restoring forest health, protecting the watersheds that originate on Bill Williams Mountain and minimizing risk to local and downstream communities the NFF is working with a variety of funding partners to begin treatments on the highest priority acres.

In this phase of the work, the NFF will focus efforts on 200 of the 2,000 priority acres at the highest parts of the watershed. These acres will be treated with specialized, mechanical equipment, and represents the most cost effective methods to achieve the restoration goals (Appendix A). However, because of the technical complexity of thinning on steep slopes the cost to treat is higher than traditional mechanical thinning methods. Where we are able to use mechanical equipment (versus hand-thinning), we can also deck logs and pile woody biomass in places designated by the Forest Service for highest and best use of the material.

The two objectives of this project are to:

1. Thin 200 of the highest priority acres on Bill Williams Mountain, located at the very top of the watershed, on the steepest slopes.
2. Reduce the risk of high-severity fire on the steep slopes by approximately 30%.

<u>Task 1 : Agreements/Archeological and SHPO clearances</u>
Description: The NFF and KNF will modify the existing Twin Springs agreement, which allows NFF to perform work on Bill Williams Mountain. The modification will provide any additional allowances needed for NFF to work on steep slopes with mechanical equipment. In addition, the KNF will perform document reviews and on-site surveys to determine where, if any, archeological sites exist within the 200-acre project boundary. If archeological sites do exist the KNF will propose mitigation activities to avoid or minimize disturbances. All findings will be submitted to the State Historical Preservation Office for consultation.

Purpose/Objective: The purpose is modify the existing agreement with the KNF and to obtain archeological clearances necessary before on-the-ground work begins.

Personnel: Susan Brown, KNF Grants and Agreements Administrator will assist as needed with the NFF-KNF Agreement 18-CS-11030701-010 to modify the specific acres to be treated. Neil Weintraub, KNF Archeologist; is the primary person responsible for Archaeological Clearances. Spencer Plumb, NFF will help facilitate these processes as necessary.
Deliverable: Updated Agreement, and/or written notice of SHPO consultation and findings.
Due Date: April 1, 2019
Task Cost: $7,425 in-kind support from the KNF

Task 2: Request for Proposal and Contractor Selection
Description: This process involves compiling a list of eligible contractors to invite to submit competitive bids for the steep slope thinning work. NFF and KNF will work closely to write detailed prescriptions and expectations of work to be shared with contractors before bidding on the project. KNF will also layout thinning unit boundaries. Contractors will be invited to a show-me trip to visit the worksite with the NFF and KNF present to answer questions and provide additional details. After receiving bids the NFF and KNF will review the bids and select a contractor based on price, experience, and availability. NFF will work with the selected contractor to enter into a contract for the work.

Purpose/Objective: The purpose of this process is to hire an experienced, reliable contractor capable of performing the work at a competitive price.
Personnel: Spencer Plumb, NFF; Josh Giles, KNF; Rebecca Davidson, NFF; Marcus Selig, NFF Vice President for contract review
Deliverable: Written notice to AWPF of contractor selection with the delivery of the RFP and all competitive bids received. Copy of contract between NFF and contractor available upon request.
Due Date: May 1, 2019
Task Cost: $4,400 of NFF Project Management; $7,000 In-kind KNF for thinning prescriptions and site layout. Total: $11,400

Task 3: Thinning 200 acres on steep slopes
Description: The contractor selected by the NFF will start thinning work in early May 2019. Mechanical thinning requires cutting trees and moving (also known as skidding) tree to a site where they can be piled. Piled trees will be stacked for processing at later date. NFF will provide on-site management of daily operations. KNF will conduct regular inspections and approvals as thinning units are completed. KNF will perform a final inspection and provide approval of project completion

Purpose/Objective: The purpose of this work is cut and remove densely grown trees per Forest Service boundaries and prescriptions. The objective is to reduce fire risk by 30% on 200 acres.
Personnel: NFF selected thinning contractor; Spencer Plumb, NFF; Josh Giles, KNF
Deliverable: Report to AWPF verifying the completion of the project, including written description of accomplishments, photos of work occurring, photos of pre- and post-treatment.
Due Date: December 31, 2019
Task Cost: $400,000 for project implementation; $35,200 for Project Management by NFF; $7,000 In-kind KNF match for final inspections. Total: $442,200

Task 4: Post-Thinning Monitoring

Description: Remote sensing analysis will be used to monitor effectiveness of thinning on 200 acres for this project. Analysis of multi-temporal satellite imagery will be performed to compare pre- and post-treatment fuel load conditions. Quantitative estimates of fuel loads from pre- and post-images will be used to calculate changes in fuel load and forest structure. Spatially explicit fire modeling software will be used to model expected fire behavior in pre- and post-treatment stand conditions and provide estimates of changes in high-severity fire behavior.

Purpose/Objective: Monitor effects of thinning treatments and quantify reduction in high severity fire risk as a means of verification that the project objectives were achieved by the proposed treatments.
Personnel: Remote sensing analysis contractor; Spencer Plumb, NFF
Deliverables: Report to AWPF that includes remote sensing analysis methods and results. Synthesis of findings and statement explaining of achievements with regards to targeted objectives.
Due Date: September 30, 2020 (remote sensing imagery necessary to make comparison will take at least 4 months post treatment to acquire)
Task Cost: $6,000 remote sensing analysis contractor; $2,200 NFF report writing and synthesis. Total: $10,400

Task 4: Final Summary Report and AWPF Presentation of Project and Results

Description: The NFF will compile all the information collected through the extent of the project, including results, photos, lessons learned, and next steps. The NFF will present this report and an oral presentation to AWPF staff and commission.

Purpose/Objective: Report final results of project implementation and share in accomplishments and next steps.
Personnel: Rebecca Davidson NFF; Spencer Plumb, NFF
Deliverables: Summary Report and Oral Presentation.
Due Date: September 30, 2020
Task Cost: $2,200 NFF report writing and presentation. Total: $2,200

Bill Williams Mountain Forest and Watershed Restoration Project
National Forest Foundation
Scope of Work

Appendix A

Thinning Activities

Thinning work on steep slopes requires specialized equipment because most mechanical thinning equipment cannot safely cut trees on slopes greater than 25 degrees. Feller bunchers like the one pictured on the right, often weighing over one-ton, risk tipping over as they are cutting on steep slopes.

Fortunately, some logging equipment manufacturers, like Ponsse[1], have been specially made to allow loggers to operate safely on steep slopes.

Ponsse equipment are often equipped with winches that are hooked to large trees to stabilize the machinery as it cuts. The arm of the feller buncher is also specially designed to have a greater range of motion allowing the machine to stay teathered in one location while it cuts trees in all directions around it.

Ponsse equipment is significantly more costly than regular feller bunchers and still poses more risk than cutting on flat ground. Operators must be specially trained to work on steep slopes. Thinning on steep

[1] Steep-slope logging equipment most suited for this work includes Ponsse harvesters or similar machinery. https://www.ponsse.com/

slopes also takes longer because the winching mechanism must be detatched and reattached each time it is relocated. Ponsse equipment is primarily used in Canada and the Pacific Northwest. Thus a contractor bidding on this project is likely to need to move equipment to the southwest for th duration of the project. Due to the technical complexity of the work needed, we anticipate the steep slope thinning on Bill Williams Mountain will cost an estimated $2,000 per acre (standard mechanical thinning typically costs between $500-$600 per acre), however once complete, the Forest Service can maintain the restored arcres through prescribed fire, a far less costly tool.

With respect to the intensity of treatment, the Forest Service estimates that the priority treatment acres hold around 500 trees per acre. Prescriptions call for removing 300 to 400 trees per acre to minimize fire risk and to bring the number of trees-per-acre to a level closer to that of the historic structure, and where low-intensity ground fire can be safely reintroduced. However, this will be a significant amount of biomass to remove from the mountain. Any useable timber will be decked by machinery and offered for sale or as firewood to the community. This requires decking wood in an area that is easily accessible and has room to allow timber to be processed, and transported on the highway.

Thinning and processing logs will also create large amounts of non-usable woody biomass. Biomass will be piled and burned in future years once the piles have dried and conditions safely allow burning without risking ignition of a wildfire.

Successful completion of this project, using innovative techniques and novel equipment, will help raise the profile of this work and create some economies of scale for the high per-acre cost across the forest. The NFF will demonstrate the work on the Bill Williams, where benefits are so immediately realized, and where value can be added to ongoing work accomplishments.

Bill Williams Mountain Forest and Watershed Restoration Project
National Forest Foundation

	Cost Sharing Categories			
Budget Line Items	AWPF	NFF Match	Kaibab National Forest : In-kind Match	*Line Item Totals*
NFF Project Management: 100 days x $440/day for contracting and on-site contractor management.	$ 22,000.00	$ 22,000.00	$ -	*$ 44,000.00*
Project Prep: SHPO Clearance, Archeological Clearances, Project Layout, prescriptions, inspecitons and final approval	$ -	$ -	$ 21,425.00	*$ 21,425.00*
Project Implementation: 200 acres x $2,000/acres for steep slope mechancial thinning	$ 275,000.00	$ 125,000.00	$ -	*$ 400,000.00*
Monitoring: Remote sensing analysis to detect changes in fuel loading and fire behavior pre/post treatment	$ 3,000.00	$ 3,000.00	$ -	*$ 6,000.00*
NFF Indirect: AWPF =5%, all other NFF funds = 15%	$ 15,000.00	$ 22,500.00	$ -	*$ 37,500.00*
Cost Share Totals:	*$ 315,000.00*	*$ 172,500.00*	*$ 21,425.00*	
			Total Project Cost:	***$ 508,925.00***

Project Location & Environmental Contaminant Information
FY 2019

Project Location Information

1. County: Coconino	2. Section(s): 17	3. Township: 21N	4. Range: 2E

5. Watershed: Verde and Upper Colorado Watersheds
6. 8 or 10 Digit Hydrologic Unit Code (HUC): 150602
7. Name of USGS Topographic Map where project area is located: AZ Williams South
8. State Legislative District: 6

   (Information available at: http://azredistricting.org/districtlocator/

9. Land ownership of project area: USDA Forest Service, Kaibab National Forest
10. Current land use of project area: Federal
11. Size of project area (in acres): 200 DIRECT
12. Stream Name: Verde and Upper Colorado Rivers
13. Length of stream through project area: _____
14. Miles of stream benefited: _____ miles
15. Acres of riparian habitat: _____ acres will be:

    ☐ Enhanced
    ☐ Maintained
    ☐ Restored
    ☐ Created

16. General description and/or delineation for the area of impact of the project within the watershed.
Project is located near the top of Bill Williams Mountain. Watersheds that flow south from Bill Williams Mountain drain into the Verde. Watersheds on the north side drain to the Little Colorado.

17. Provide directions to the project site from the nearest city or town. List any special access requirements:
From Williams, AZ- Travel 4.4 miles south on Perkinsville Rd (County Rd 73), turn left on FS Rd 111, continue 6.2 miles up FS Rd 111

Environmental Contaminant Location Information

1. Does your project site contain known environmental contaminants? ☐ **YES** ☒ **NO** If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants: _____

2. Are there known environmental contaminants in the project vicinity? ☐ **YES** ☒ **NO** If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants: _____

3. Are you asking for Arizona Water Protection Fund monies to identify whether or not environmental contaminants are present? ☐ **YES** ☒ **NO**

STATE HISTORIC PRESERVATION OFFICE
Review Form

In accordance with the State Historic Preservation Act (SHPO), A.R.S. 41-861 *et seq*, effective July 24, 1982, each State agency must consider the potential of activities or projects to impact significant cultural resources. Also, each State agency is required to consult with the State Historic Preservation Officer with regard to those activities or projects that may impact cultural resources. Therefore, it is understood that **recipients of state funds are required to comply with this law** throughout the project period. All projects that affect the ground-surface that are funded by AWPF require SHPO clearance, **including those on private and federal lands.**

The State Historic Preservation Office (SHPO) must review each grant application recommended for funding in order to determine the effect, if any, a proposed project may have on archaeological or cultural resources. To assist the SHPO in this review, the following information MUST be submitted with each application for funding assistance:

- A completed copy of this form, and
- A United States Geological Survey (USGS) 7.5 minute map
- A copy of the cultural resources survey report if a survey of the property has been conducted, and
- A copy of any comments of the land managing agency/landowner (i.e., state, federal, county, municipal) on potential impacts of the project on historic properties.
  NOTE: If a federal agency is involved, the agency must consult with SHPO pursuant to the National Historic Preservation Act (NHPA); a state agency must consult with SHPO pursuant to the State Historic Preservation Act (SHPA),
  OR
- A copy of SHPO comments if the survey report has already been reviewed by SHPO.

Please answer the following questions:

1. Grant Program: Arizona Water Protection Fund

2. Project Title: Bill Williams Mountain Forest and Watershed Restoration Project

3. Applicant Name and Address: Rebecca Davidson| 7324 E 6th Ave., Scottsdale AZ 85251

4. Current Land Owner/Manager(s): Kaibab National Forest, U.S. Forest Service

5. Project Location, including Township, Range, Section: UTM Coordinates : 35.1995019, -112.2035934
   Township/Range/Section T21N/ R2E /S17

6. Total Project Area in Acres (or total miles if trail): 200 Acres

7. Does the proposed project have the potential to disturb the surface and/or subsurface of the ground?
   ☒ YES ☐ NO

8. Please provide a brief description of the proposed project and specifically identify any surface or subsurface impacts that are expected: Project involves mechanicnally cutting trees with a type of steep slope feller buncher. Cut trees will be dragged on designated skid trails to landings marked by the Forest Service. Mechanical equipment and dragging tress can disturb surface. Distrubance should be limited to skid trails and landings.

9. Describe the condition of the current ground surface within the entire project boundary area (for example, is the ground in a natural undisturbed condition, or has it been bladed, paved, graded, etc.). Estimate horizontal and vertical extent of existing disturbance. Also, attach photographs of project area to document condition: Ground surface is undisturbed, covered with trees, brush and grasses,

10. Are there any known prehistoric and/or historic archaeological sites in or near the project area? ☐ YES ☒ NO

11. Has the project area been previously surveyed for cultural resources by a qualified archaeologist? ☐ YES ☐ NO ☒ UNKOWN

    If YES, submit a copy of the survey report. Please attach any comments on the survey report made by the managing agency and/or SHPO

12. Are there any buildings or structures (including mines, bridges, dams, canals, etc.), which are 50-years or older in or adjacent to the project area? ☐ YES ☒ NO

    If YES, complete an Arizona Historic Property Inventory Form for each building or structure, attach it to this form and submit it with your application.

13. Is your project area within or near a historic district? ☐YES ☒ NO

    If YES, name of the district:

Please sign on the line below certifying all information provided for this application is accurate to the best of your knowledge.

_____ / _____ _____

Applicant Signature /Date Applicant Printed Name

FOR SHPO USE ONLY
SHPO Finding: ☐ Funding this project will not affect historic properties. ☐ Survey necessary – further GRANTS/SHPO consultation required (*grant funds will not be released until consultation has been completed*) ☐ Cultural resources present – further GRANTS/SHPO consultation required (*grant funds will not be released until consultation has been completed*)
SHPO Comments:
For State Historic Preservation Office: Date:

STATE OF ARIZONA
HISTORIC PROPERTY INVENTORY FORM

Please type or print clearly. Fill out each applicable space accurately and with as much information as is known about the property.

PROPERTY IDENTIFICATION

For properties identified through survey: Site No. _____ Survey Area: _____

Historic Names (e*nter the name(s), if any that best reflect the property's historic importance*): No Historical Properties are present within project boundaries

Address: _____

City or Town: _____ ☐ Vicinity County: _____ Tax Parcel No.: _____

Township: _____ Range: _____ Section: _____ Quarters: _____ Acreage: _____

Block: _____ Lot(s): _____ Plat (Addition): _____ Year of plat (addition): _____

UTM Reference – Zone: _____ Easting: _ Northing: _____

USGS 7.5' quadrangle map: _____

ARCHITECT: _____ ☐ not determined ☐ known Source: _____

BUILDER: _____ ☐ not determined ☐ known Source: _____

CONSTRUCTION DATE: _____ ☐ known ☐ estimated Source: _____

STRUCTURAL CONDITION

☐ Good (*well maintained; no serious problems apparent*)
☐ Fair (*some problems apparent*) Describe: _____
☐ Poor (*major problems; imminent threat*) Describe: _____
☐ Ruin/Uninhabitable

USES/FUNCTIONS

Describe how the property has been used over time, beginning with the original use: _____

Sources: _____

PHOTO INFORMATION

Date of photo: _____
View Direction (looking towards): _____

Attach a recent photograph of property in this space. Additional photographs may be appended.

SIGNIFICANCE
To be eligible for the National Register, a property must represent an important part of the history or architecture of an area. The significance of a property is evaluated within its historic context, which are those patterns, themes, or trends in history by which a property occurred or gained importance. Describe the historic and architectural contexts of the property that may make it worthy of preservation.

A. HISTORIC EVENTS/TRENDS – *Describe any historic events/trends associated with the property:* _____

B. PERSONS – *List and describe persons with an important association with the building:* _____

C. ARCHITECTURE – Style: _____ ☐ no style

Stories: _____ ☐ Basement Roof Form: _____

Describe other character-defining features of its massing, size and scale: _____

INTEGRITY
To be eligible for the National Register, a property must have integrity (i.e. it must be able to visually convey its importance). The outline below lists some important aspects of integrity. Fill in the blanks with as detailed a description of the property as possible.

Location - ☐ Original Site ☐ Moved: Date: _____ Original Site: _____

DESIGN
Describe alterations from the original design, including dates: _____

MATERIALS
Describe the materials used in the following elements of the property:

Walls (structure): _____

Walls (sheathing): _____

Windows: _____

Roof: _____

Foundation: _____

SETTING
Describe the natural and/or built environment around the property: _____

How has the environment changed since the property was constructed? _____

WORKMANSHIP
Describe the distinctive elements, if any, of craftsmanship or method of construction: _____

NATIONAL REGISTER STATUS (*if listed, check the appropriate box*)
☐ Individually Listed; ☐ Contributor; ☐ Non-contributor to _____ Historic District

Date Listed: _____ ☐ Determined eligible by Keeper of National Register (date: _____)

RECOMMENDATIONS ON NATIONAL REGISTER ELIGIBILITY (opinion of SHPO staff or survey consultant)

Property ☐ is ☐ is not eligible individually.

Property ☐ is ☐ is not eligible as a contributor to a listed or potential historic district.

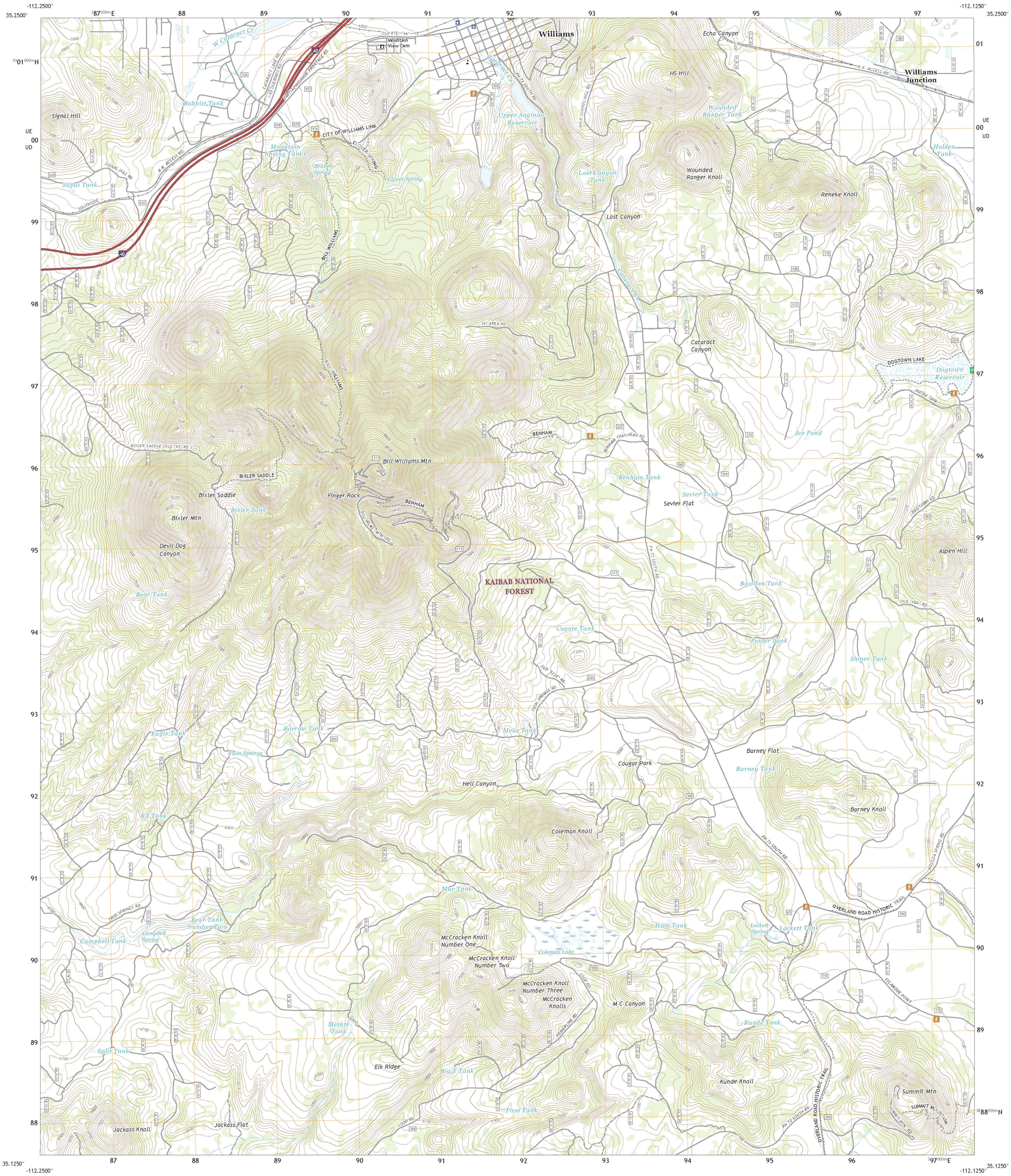
☐ More information needed to evaluate.

If not considered eligible, state reason: _____

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

WILLIAMS SOUTH QUADRANGLE
ARIZONA - COCONINO COUNTY
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 12S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....NAIP, June 2015 - August 2015
Roads.... U.S. Census Bureau, 2014 - 2018
Roads within US Forest Service Lands....FSTopo Data with limited Forest Service updates, 2014 - 2018
Names....GNIS, 1980 - 2017
Hydrography....National Hydrography Dataset, 2004 - 2017
Contours....National Elevation Dataset, 2000
Boundaries....Multiple sources; see metadata file 2016 - 2017
Public Land Survey System....BLM, 2017
Wetlands....FWS National Wetlands Inventory 1980

MN
GN
10°41'
190 MILS
0°41'
12 MILS
UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
UE
UD
Grid Zone Designation 12S

SCALE 1:24 000
KILOMETERS
METERS
MILES
FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

ARIZONA
QUADRANGLE LOCATION

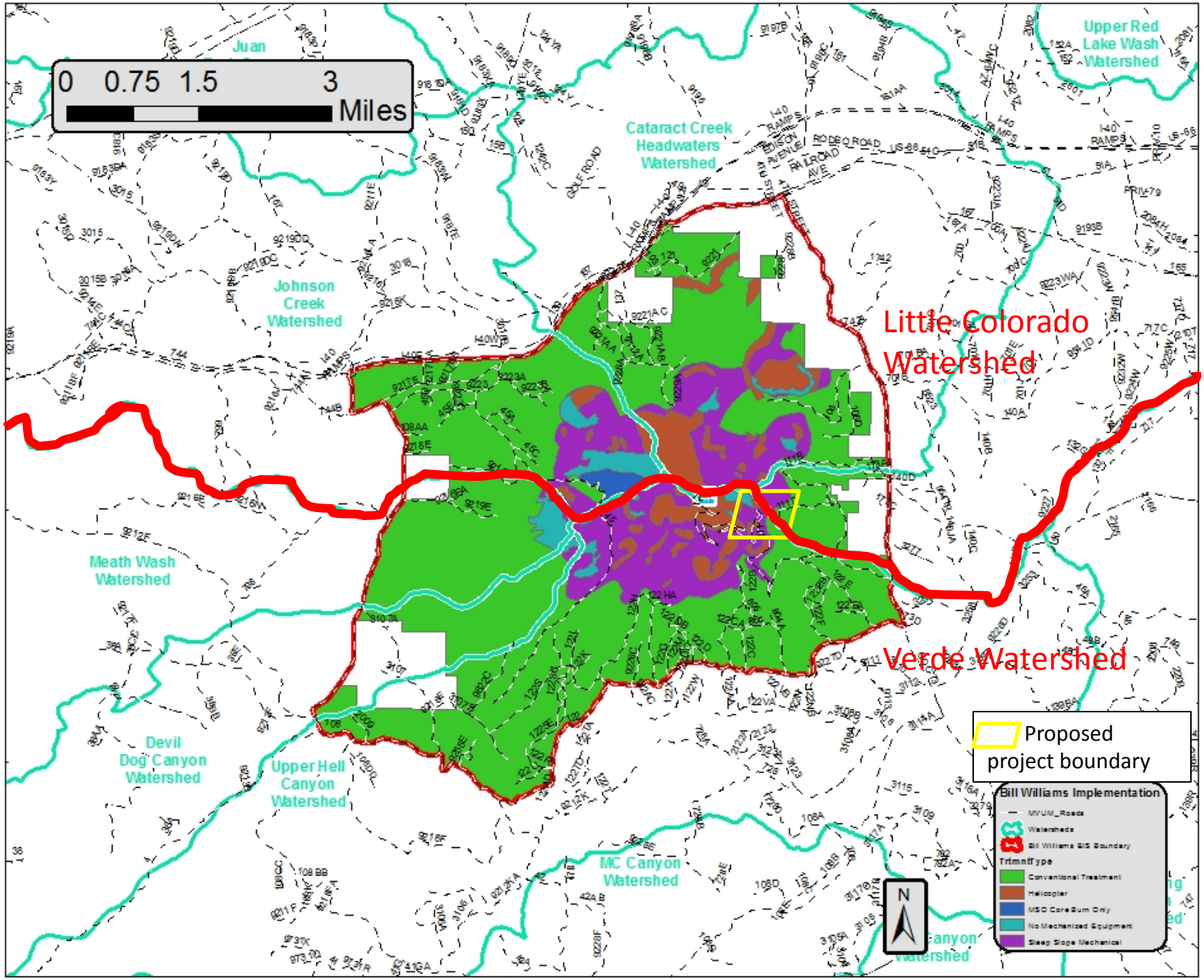
1 Hearst Mountain
2 Williams North
3 Sitgreaves Mountain
4 McLellan Reservoir
5 Davenport Hill
6 Matterhorn
7 May Tank Pocket
8 White Horse Lake
ADJOINING QUADRANGLES

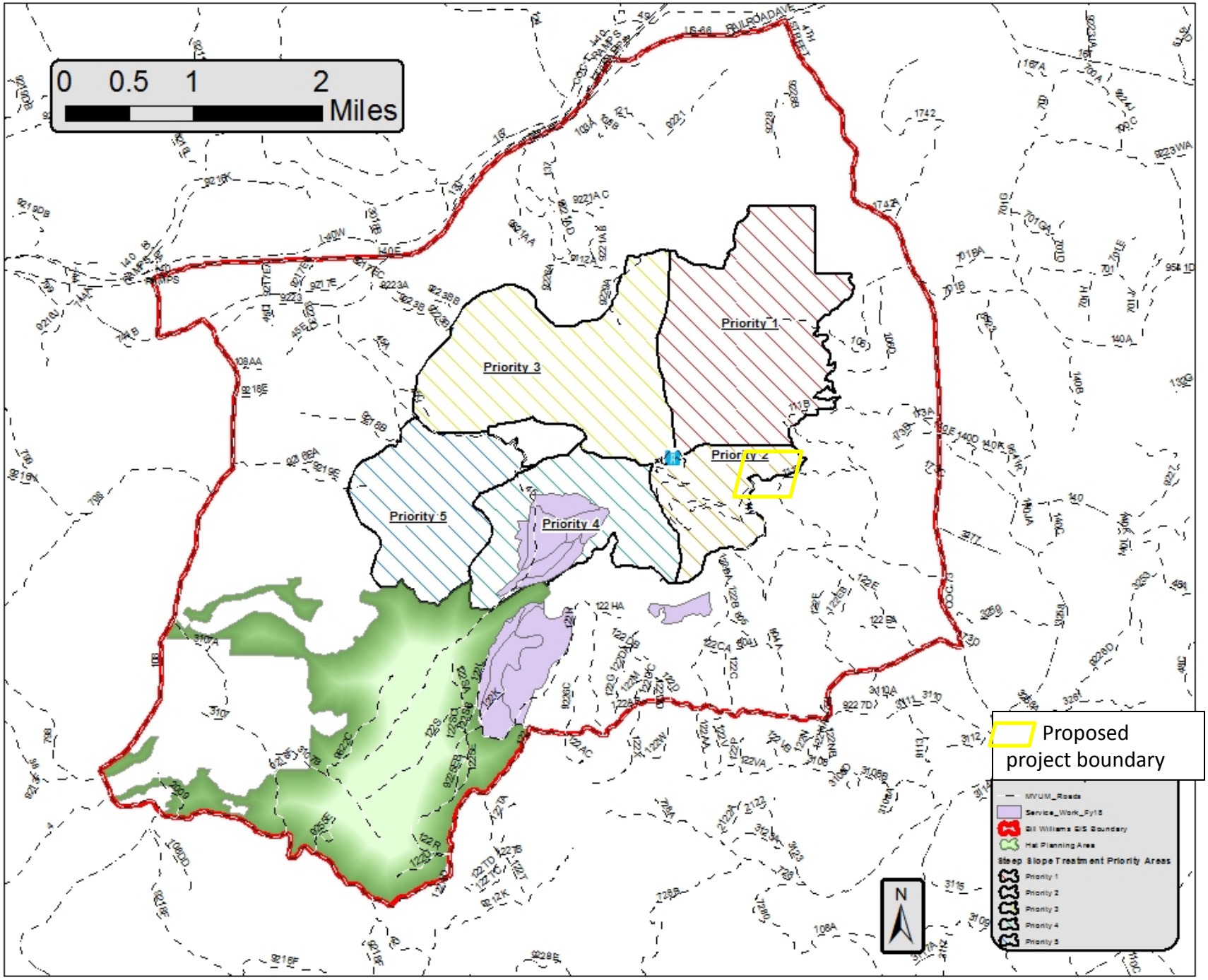
ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route
FS Primary Route
FS Passenger Route
FS High Clearance Route

Check with local Forest Service unit for current travel conditions and restrictions.

WILLIAMS SOUTH, AZ
2018

NSN 7643016355434
NGA REF NO. USGSX24K49160


0 0.75 1.5 3
Miles
Juan
Upper Red Lake Wash Watershed
Cataract Creek Headwaters Watershed
Johnson Creek Watershed
Little Colorado Watershed
Meath Wash Watershed
Verde Watershed
Devil Dog Canyon Watershed
Upper Hell Canyon Watershed
MC Canyon Watershed
Proposed project boundary
Bill Williams Implementation
MVUM_Roads
Watersheds
Bill Williams GIS Boundary
TrtmntType
Conventional Treatment
Helicopter
MSO Core Burn Only
No Mechanized Equipment
Steep Slope Mechanical
N


0 0.5 1 2
Miles
Priority 1
Priority 2
Priority 3
Priority 4
Priority 5
Proposed project boundary
MVUM_Roads
Service_Work_Fy15
Bill Williams GIS Boundary
Hat Planning Area
Steep Slope Treatment Priority Areas
Priority 1
Priority 2
Priority 3
Priority 4
Priority 5
N

Bill Williams Mountain Forest and Watershed Restoration Project
Key Personnel, Roles and Responsibilities

The National Forest Foundation (NFF) is the congressionally chartered, official nonprofit partner to the US Forest Service. The NFF works to bring local communities together to restore and enhance our National Forests and Grasslands by strategically implementing priority restoration projects in partnership with the Forest Service. The Bill Williams Mountain Forest and Watershed Restoration Project (BW Project) is part of the NFF's larger efforts across the Salt and Verde Watersheds to protect forests and water supplies, and to bring together municipal, business and state sector partners to support these landscape scale efforts.

NFF will perform all project management tasks associated with the BW Project. The primary responsibilities will include hiring forest-thinning contractors through a competitive bid process and overseeing forest thinning work.

- Spencer Plumb, NFF's Arizona Program Manager, has managed thinning contracts on more than 1,500 acres across Arizona in the last 3 years, of which ~800 acres have been on initial fire break work on the Bill Williams Mountain. Spencer has experience managing and working with thinning contractors and the Forest Service to ensure that projects are completed to the specifications provided, on-time and within budget. Perform due diligence on contracting standards for Ponsse thinning[1] and work with Forest Service to ensure all work is performed to Forest Service specification. Will act as Contracting Officer of Record on site during operations.
- Rebecca Davidson, NFF's Southern Rockies Program Director, oversees the Northern Arizona Forest Fund and connects with businesses, municipalities, and other funders to elevate the importance of watershed protection. Through this work Rebecca has already raised $172,500 from supporting partners, like City of Phoenix and SRP, in match for the BW Project, and will identify and manage additional opportunities to continue to partner, leverage and match funds.

The Kaibab National Forest (KNF) will provide forest treatment prescriptions and final inspections to ensure that thinning treatments achieve desired fuels reduction targets, as per the Bill Williams Mountain Restoration approved NEPA decision.[2] The KNF will ensure that the project is in compliance with all state and federal regulations, and conduct any final archaeological clearances needed prior to thinning work. They will provide an additional level of project oversight and will be responsible for selling the wood or otherwise disposing of the wood once work is complete.

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[1] Steep-slope logging equipment most suited for this work includes Ponsse harvesters or similar machinery. Operators in the Pacific Northwest will be contacted about this work because this is predominantly where this type of machinery is used. https://www.ponsse.com/

[2] Bill Williams Mountain Restoration Project Record of Decision Kaibab National Forest, Coconino County, Arizona https://www.fs.usda.gov/nfs/11558/www/nepa/75077_FSPLT3_2610206.pdf

- Danelle Harrison, Williams District Ranger, lead proponent for implementation of KNF's Bill Williams Mountain Restoration NEPA. Provides direction to staff to prioritize and complete this work because of its importance to community safety and watershed health.
- Joshua Giles, KNF Supervisory Forester, will act as the point of contact and work directly with NFF to ensure thinning treatments meet the NEPA prescriptions outlined, and that any additional thinning criteria is established up front, and collaboratively as part of the pre-implementation coordination.
- Neil Weintraub, KNF Zone Archaeologist, will provide final archaeological clearances prior to mechanical thinning.

Coconino County recognizes that wildfire and post-wildfire flooding are the greatest public safety threats to its residents, businesses, economy and financial solvency. Because the Williams area has been identified as the County's highest risk area for post-wildfire debris flows and flooding, the County is taking steps to develop a Pre-Disaster Plan for Williams in the event of a wildfire on the north side of Bill Williams Mountain. As part of the BW Project, the NFF and the KNF will coordinate with Coconino County to identify opportunities to leverage funds and resources and to determine where the County may provide additional logistical support.

- Jay Smith, Coconino County's Forest Restoration Director, will be NFF's main point of contact for the BW Project.

Bill Williams Mountain Forest and Watershed Restoration Project

Photos of Bill Williams Mountain and Treatment Areas

View of Bill Williams Mountain from the Southwest. The Town of Williams lies to over the ridge in the upper right

Dense mixed conifer forest stands on the steep slope of Bill Williams in proposed treatment area.

Looking northeast from the lookout tower at the top of the Bill Williams Mountain the Town of Williams is visible on the left side of the image.

The steep slopes leading to the top of Bill Williams Mountain. A portion of the 200 acres proposed is visible on the left side of this photo.

Mechanical thinning operation in process: cut trees are piled as they are cut and will later be skidded to landings.

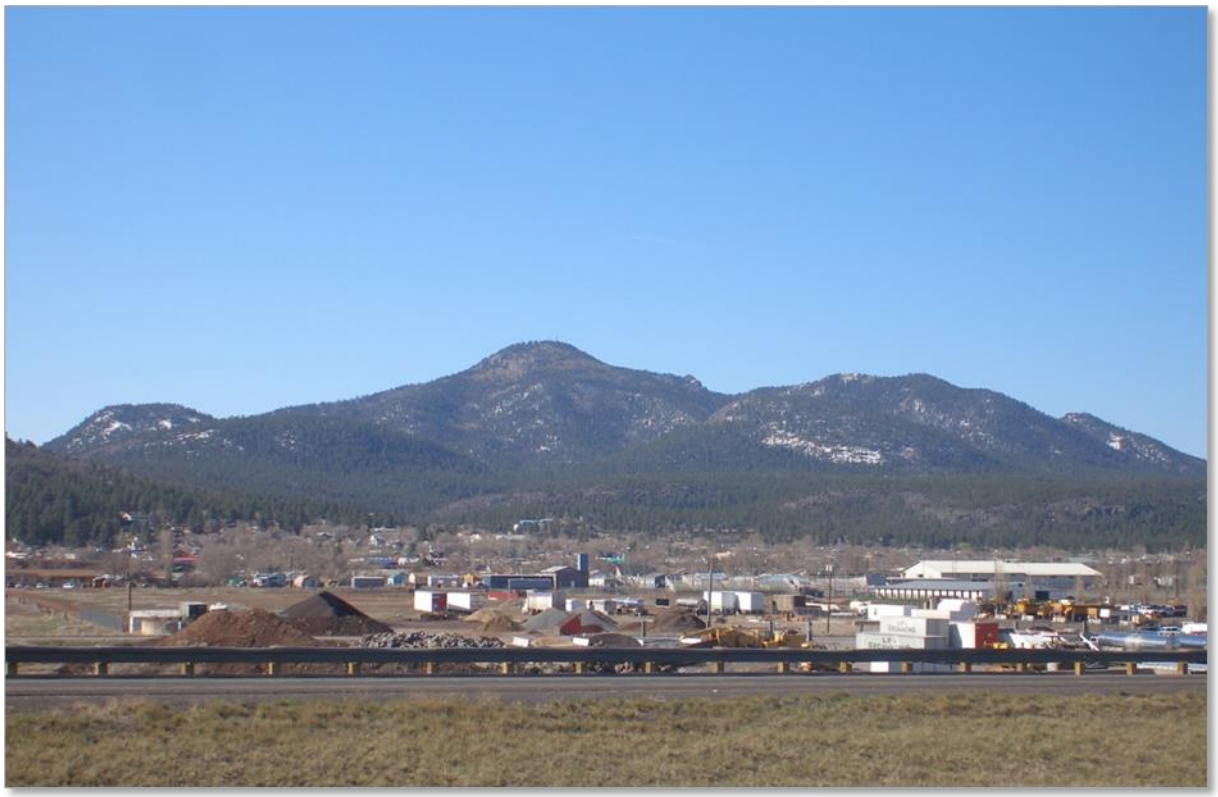
Landings serve as central locations where cut logs are piled to be processed at a later date. Piles can be made very tall, upwards of 20 ft, to minimize the land area used for the landing.

United States Department of Agriculture

Bill Williams Mountain Restoration Project

Record of Decision

Kaibab National Forest
Coconino County, Arizona



Forest Service Southwest Region MB-R3-07-21 December 2015

USDA Non-Discrimination Policy Statement

DR 4300.003 USDA Equal Opportunity Public Notification Policy (June 2, 2015)

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Record of Decision for the Bill Williams Mountain Restoration Project

Kaibab National Forest
Coconino County, Arizona

All or portions of Sections 1-3, 10-15, 22-27, & 34-36, T21N R1E; Sections 4-10, 15-22, & 27-31, T21N R2E; and Sections 31-33, T22N R2E, Gila & Salt River Meridian

Lead Agency: U.S. Forest Service

Responsible Official:
Danelle D. Harrison
District Ranger
Williams Ranger District
742 South Clover Road
Williams, AZ 86046

For Information Contact:
Marcos A. Roybal
Project Leader
Williams Ranger District
742 South Clover Road
Williams, AZ 86046.

Contents

Introduction

The Bill Williams Mountain Restoration Project is designed to reduce the risk of high intensity stand replacing wildfire and improve both forest health and the watershed for the City of Williams, Arizona. An environmental impact statement (EIS) was developed to analyze the potential effects of the Bill Williams Mountain Restoration Project. Four alternatives were considered and analyzed. This Record of Decision (ROD) documents the alternative I have selected to implement the project and the rationale for my decision.

Background

The Bill Williams Mountain Restoration Project area is approximately 15,200 acres (Figure 1) located adjacent and up to approximately 4 miles south-southwest of the City of Williams, Arizona and includes Bill Williams Mountain, which is the primary watershed and municipal water supply for the City of Williams. The project area has historic and cultural value, and has an important communication site for Northern Arizona located at the top of the mountain. Action - reducing hazardous fuels and moving vegetative conditions toward the desired conditions - is needed to reduce the risk of a high intensity wildfire and improve the health and sustainability of forested conditions on and surrounding Bill Williams Mountain. Work will be done to directly and indirectly improve the condition of the watershed which contributes to the City of Williams water supply.

The recent Schultz, Eagle Rock, and Slide Fires in northern Arizona and, in some cases, the ensuing flooding, have highlighted the values-at-risk in the project area and the need for treatments on Bill Williams Mountain. A high intensity, stand replacing wildfire on Bill Williams Mountain could result in the loss of critical emergency communications systems in a multi-million dollar communication site at the top of the mountain; the silting in of reservoirs that act as municipal water sources; reductions in water quality; severe flooding in the City of Williams and Supai Village downstream in Cataract Canyon; the loss of irreplaceable cultural and tribal resources; the loss of recreational areas and opportunities; the loss of important wildlife and plant habitat; and the potential loss of lives and homes.

In early 2011, the Kaibab National Forest invited the public and various interested parties to participate in numerous informal “brainstorming” sessions where participants were solicited for ideas, questions, and concerns about restoration treatments on Bill Williams Mountain. All of the ideas and comments received were helpful in refining a proposal for the project area.

A Notice of Intent (NOI) was published in the Federal Register on April 21, 2011, formally initiating scoping of the proposed action and seeking public comment on the proposal. The original proposed action included four non-significant amendments to the Kaibab National Forest Plan (Forest Plan); however, a revised Forest Plan was approved in early 2014 and there are now no Forest Plan amendments included in my decision. Using the comments received from the public, other agencies, and interested and affected tribal governments and communities during scoping of the proposed action, a list of significant and non-significant issues was identified (FEIS Section 1.6, Issues). These issues led to the development and consideration of alternatives to the original proposed action. Four alternatives were analyzed in detail and several alternatives were considered but eliminated from detailed study.

A Supplemental Draft EIS (SDEIS) was prepared in October 2013 to provide additional information and clarification for portions of the project, include updates to the analysis in the Draft EIS (DEIS) based on new information that had emerged since the original analysis was completed, and clarify portions of the project. This updated information for the project related to Alternative 2 – Proposed Action.

The Forest Service collaborated extensively with the U.S. Fish and Wildlife Service throughout all phases of project development, especially as it pertains to conservation of Mexican spotted owls (see section 3.6 of chapter three for more information).

After the team analyzed the comments for the DEIS and the SDEIS, the proposed action was modified. The original proposed action was described using operability zones for mechanized equipment, and the modified proposed action uses treatment methods to describe the thinning activities that are proposed for the project. The four alternatives analyzed in detail in this FEIS include Alternative 1 – No Action, Alternative 2 – Modified Proposed Action (here after referred to as Alterative 2), and Alternatives 3 and 4, which were developed to address one or more significant issues associated with the proposed action.

Major Conclusions: The analysis by resource specialists indicates all of the action alternatives would reduce hazardous fuels and the risk of high intensity stand-replacing wildfires and allow for the reintroduction of fire as a natural part of the ecosystem. The action alternatives would reduce fuel buildup and help prevent the spread of wildfire onto private property and into drainages leading to the City of Williams reservoirs. Currently, and under the no action alternative, approximately 61% of the project area has the potential for active crown fire. Under the action alternatives, this reduces active crown fire susceptibility to approximately 18% for Alternative 2 (the preferred alternative), 27% for Alternative 3, and 35% under Alternative 4.

Under Alternative 2 only, approximately 8,900 acres of ponderosa pine forest surrounding the base of Bill Williams Mountain would have reduced stand densities similar to pre-settlement reference conditions. Timber stands would be thinned and grouped, which would break up the continuity of the forest structure and increase forest diversity, tree vigor, and stand resiliency. The reduction of tree densities on steep slopes will also improve forest health by reducing competition for nutrients, and would protect the loss of specialized wildlife habitat from fire and forest disease and pests.

Treating fuel accumulations would abate fire risks to Mexican spotted owl habitat, while conserving existing nesting and roosting habitat. Mistletoe infection levels would be more manageable as the area would be managed in an uneven-aged condition over time. Alternatives 2-4 would also remove poorly located roads from drainage bottoms. Alternatives 2 and 3 would allow the construction of a new and more sustainable road system that would also provide access for hazardous fuel reduction treatments. The net number of miles of open roads would remain essentially the same under all of the alternatives. Overall, I have determined the purpose and need for action would be best achieved with implementation of Alternative 2.

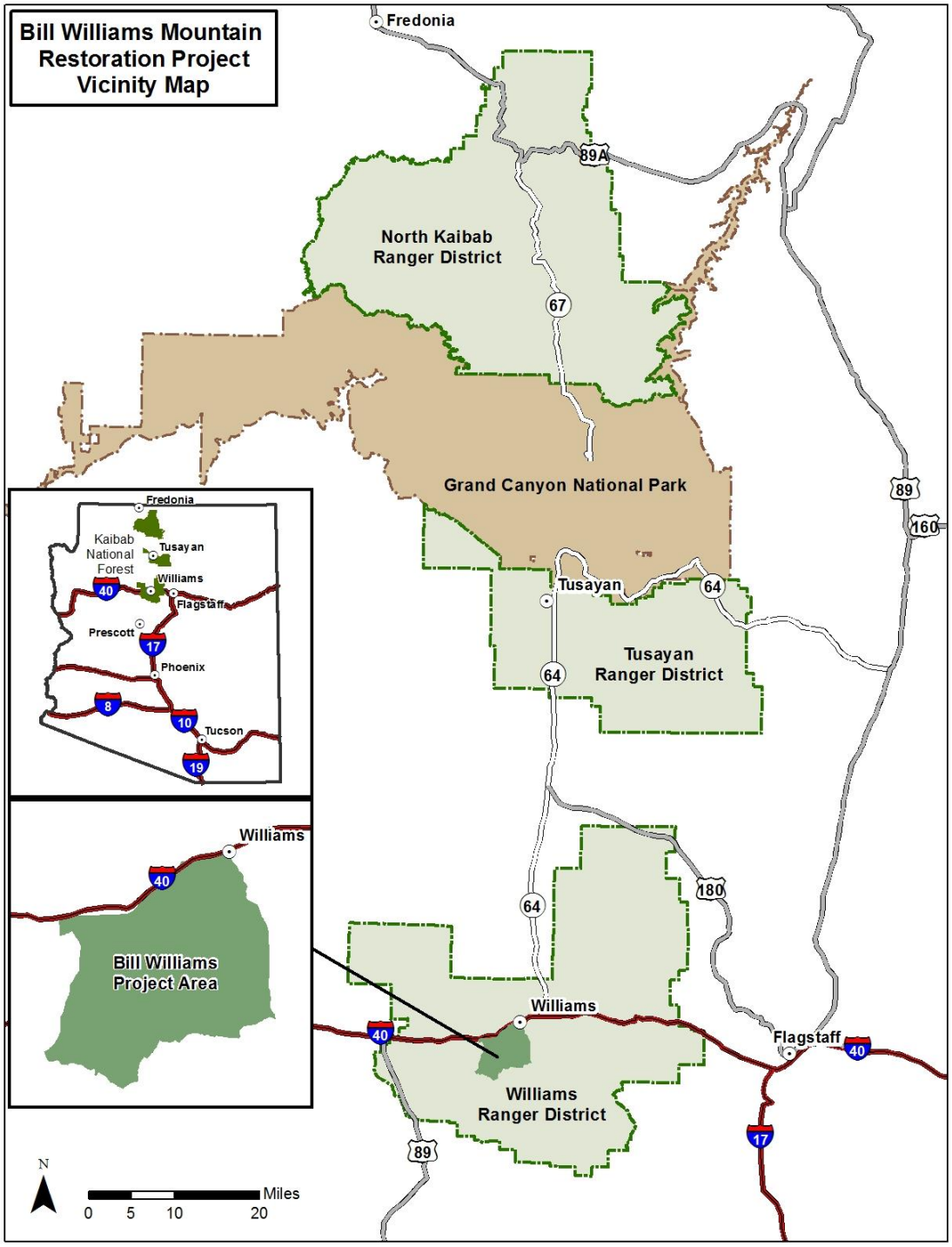


Figure 1. Location of the Bill Williams Mountain Restoration Project

Purpose and Need for Action

The purpose of the Bill Williams Mountain Restoration Project is to improve the health and sustainability of forested conditions on and surrounding Bill Williams Mountain by reducing hazardous fuels and moving vegetative conditions in the project area toward the desired conditions. This work would be done to directly and indirectly improve the watershed conditions contributing to the City of Williams water supply.

The purpose and need for action is derived from the differences between existing conditions and desired conditions in the project area. The desired conditions are based on management direction in the 2014 Land and Resource Management Plan for the Kaibab National Forest and reference conditions for vegetation in the project area.

As stated in the FEIS on page three, the need for this project is to:

- Reduce the risk for high intensity, stand-replacing wildfires;
- Reintroduce fire as a natural part of the ecosystem;
- Reduce fuel buildup to help prevent the spread of wildfire onto private property and into drainages leading to the City of Williams reservoirs;
- Reduce overall stand densities and move stand conditions toward forest structures considered to be more typical of forest structure under pre-settlement fire regimes;
- Treat fuel accumulations to abate fire risks to Mexican spotted owl habitat, while conserving existing nesting and roosting habitat;
- Improve tree vigor and stand resiliency;
- Improve the diversity of age classes and structure of woody vegetation;
- Improve ground cover, including down woody debris, fine litter and herbaceous understory composition and productivity;
- Reduce mistletoe infection levels to more manageable levels where the area can be managed in an uneven-aged condition over time;
- Provide forest products, such as firewood, for residents living in Williams, Arizona and the surrounding area, in order to meet their needs for forest and wood products, while protecting these resources for future generations; and
- Improve the motorized transportation system to provide for a more sustainable road system where poorly located roads are relocated or obliterated.

Issues

Using the comments received during the scoping process (see Public Involvement section below) from tribes, agencies, organizations, and the public, the Forest Service identified significant issues to address in the Draft EIS (DEIS Section 1.6). These issues were used to help formulate alternatives to the proposed action, develop elements or components of the alternatives, develop mitigation measures, and analyze environmental effects. Significant issues were identified as those directly or indirectly caused by implementing the modified proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

Public Involvement and Documents

Scoping

Public involvement for this project began prior to the publication of the Notice of Intent (NOI) to prepare an EIS. The Kaibab National Forest invited the public and various interested parties to participate in numerous informal "brainstorming" sessions during January, February, and March of 2011. Participants were solicited for ideas, questions, and concerns about treating hazardous fuels on Bill Williams Mountain, thereby improving forest health near the community.

Where possible, the input received was incorporated into the purpose and need for action and the desired conditions for the project area. Many overarching themes were repeated during these discussions. For example, many statements were made about the need to avoid incidents like the Schultz Fire and the subsequent flooding events. Others stated the Kaibab National Forest should consider the cost versus benefits of treating the fuels now versus trying to suppress a high-intensity wildfire later. All of the ideas and comments received are appreciated and were helpful in refining a proposal for the Bill Williams Mountain Restoration Project area.

The NOI was published in the Federal Register on April 21, 2011. The NOI asked for public comment on the proposal by May 23, 2011. In addition, as part of the public involvement process, the Kaibab National Forest invited public comment and participation through listing the project in the Schedule of Proposed Actions (SOPA); posting the scoping packet online (http://fs.usda.gov/goto/kaibab/projects); and mailing letters to potentially interested persons, tribal governments, and State and other Federal agencies. Three letters and six emails were recorded from this effort. A scoping meeting was also hosted at the Williams Ranger District on Wednesday May 11, 2011, to discuss the proposed action and accept comments. During these public scoping meetings, the Kaibab National Forest received nine written comments as well as several oral questions and comments.

Using the comments received from the public, other agencies, and interested and affected tribal governments and communities during scoping of the proposed action, the interdisciplinary (ID) team identified a list of significant and non-significant issues (DEIS Section 1.6 Issues, FEIS Section 1.8, and FEIS Appendix C) that were used to develop alternatives to the proposal.

DEIS

A 45-day comment period for the Bill Williams Mountain Restoration DEIS was provided for interested and affected publics, including appropriate local, State, and Federal Government agencies, and tribes. This period started with the publication of a notice of availability in the Federal Register on July 13, 2012. The official public comment period ended on August 27, 2012. During this period, the Forest received comments from different sectors of the public, with a range of concerns and questions. All comments were reviewed and substantive comments were considered during the comment analysis. Some comments resulted in further clarification or analysis within the FEIS.

SDEIS

A Supplemental DEIS (SDEIS) was prepared in October 2013 to provide additional information and clarification for portions of the project, include updates to the analysis in the DEIS based on new information that had emerged since the original analysis was completed, and clarify portions of the project. This updated information for the project related to Alternative 2 - Proposed Action and included:

- Consistency checks for both the 1988 Kaibab National Forest Plan, as amended and the revised 2014 Land and Resource Management Plan for the Kaibab National Forest. The FEIS and ROD are being issued under the 2014 Forest Plan.
- Clarification on the 1988 Forest Plan amendment language that was included in the project at the time the SDEIS was released.

- Two additional non-significant amendments* to the 1988 Forest Plan related to 24-inch tree retention and treatments in the 100-acre Mexican spotted owl (MSO) core area. (*Beginning in February 2014, the Kaibab National Forest had a revised forest plan. The decision for this project is being signed under the revised plan. Proposed actions associated with this project are consistent with the revised forest plan and amendments are no longer needed.)
- Clarification on how snags would be addressed in this project, including an additional project mitigation measure tied to snags and down woody debris.
- The addition of three project mitigation measures tied to wildlife habitat protection.
- Clarification, at the time, that 31 acres of cable logging treatments were proposed within the Bill Williams Mountain Mexican spotted owl protected activity center (cable logging is no longer included in the project).
- Information on the project-level pre-decisional administrative review process that had recently gone into effect (36 CFR Part 218) and how it applied to the project.

FEIS

The FEIS is a culmination of the work between the DEIS and the SDEIS. The FEIS was made available along with a draft ROD for the required objection period under 36 CFR Part 218. The FEIS has been completed under the 2014 Land and Resource Management Plan for the Kaibab National Forest. There are no amendments to the Forest Plan in the project.

I have reviewed and considered the comments received during public involvement as part of the decision making process. The response to substantive comments for the DEIS and SDEIS is included in the FEIS in Appendix B. The complete comment record is kept within the Bill Williams Mountain Restoration Project public record and is available for review at the Williams Ranger District, Williams, Arizona.

Alternatives Considered

Four alternatives were analyzed in detail for the Bill Williams Mountain Restoration Project. They include: Alternative 1, no action; Alternative 2, the modified proposed action; and Alternatives 3 and 4, which were developed to address one or more significant issues associated with the proposed action. These alternatives are summarized below, and a full description is included in chapter 2 of the FEIS. Chapter 3 of the FEIS analyzes the potential effects of implementing these alternatives. Additional alternatives include those considered in the FEIS but eliminated from detailed study (FEIS, pp. 42-44).

Alternative 1 - No Action

Alternative 1 would allow current processes to continue, along with associated risks and benefits, in the Bill Williams Mountain Restoration Project area. Current management plans would continue to guide management, and there will be no change in the level of ongoing management activities within the project area. All custodial activities such as road maintenance, law enforcement, and response to emergencies, including wildfire, would continue. None of the treatments or transportation system modifications described in the action alternatives would be implemented. Chapter 3 of the FEIS analyzes the effects of Alternative 1 and compares them to the effects of the action alternatives.

Alternative 2 – Modified Proposed Action

The management activities in Alternative 2, which is the preferred alternative, include:

- Mechanical treatments in a combination of commercial timber harvest treatments and non-commercial mechanical treatments on approximately 15,200 acres (Map 1). Treatments will thin stands with mechanized equipment to meet or move toward the desired conditions; in some stands, non-commercial treatments may be the only treatments feasible/necessary to achieve resource objectives.

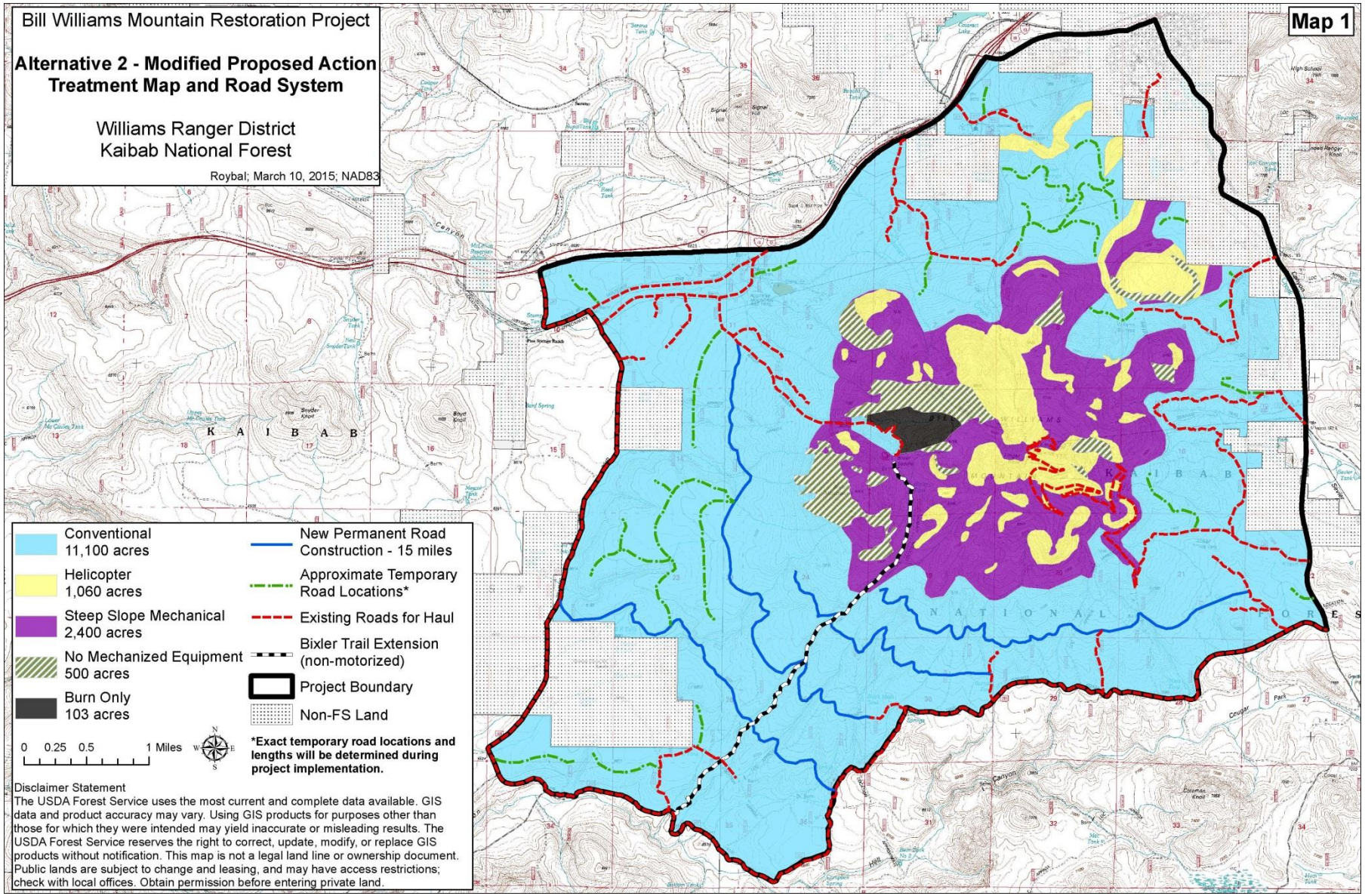
- Post-mechanical treatments on activity slash will be accomplished using whole-tree skidding, machine piling, hand piling, mulching, crushing, commercial/personal use fuelwood sales, lop and scatter, and/or prescribed burning. Some areas throughout the project area may have standing and down fuels piled and burned rather than removed.
- Rehabilitation and reclamation of areas impacted by treatments to ensure the health and productivity of the forested ecosystem is sustained, including work in aspen sites to protect newly developing aspen sprouts from elk and deer browsing with fencing and jack-strawing of activity slash.
- Strategic fuel treatments designed specifically to enhance control lines (Map 4 FEIS Appendix A) may be implemented to enable land managers to achieve resource objectives with prescribed fire while serving to protect important resources. Treatments will reduce surface, ladder, and canopy fuels (i.e. fuel loading) up to 300 feet along both sides of control lines. Approximately 2,500 acres may receive non-commercial treatments and fuels will most likely be thinned by hand-felling techniques or, where practical, machinery equipped with cutting or grinding heads. These treatments represent the minimum acreage needed to prepare stands on steeper slopes for prescribed burning and may be combined with mechanical treatments where possible.
- Prescribed fire may be applied to approximately 15,200 acres of the project area. In most areas, prescribed fire will follow or be used in conjunction with mechanical treatments. In other areas where operability is limited and more costly, such as steep slopes, prescribed burning alone may be used to meet resource objectives; this will be dependent on implementation of the strategic fuel treatments designed to enhance control lines (described above). Areas to be burned will be grouped into several burn units using natural and man-made features, such as roads, trails, and natural rock stringers, for control lines. The size, location, timing, and sequence of burning will consider impacts, such as smoke and risk of fire escape, to downwind communities and users of the Forest.
- A combination of firing techniques, including ground and aerial ignitions, may be used to accomplish objectives and minimize the risk to human resources. Finally, because the intent of prescribed burning is to reduce fuel loading, raise crown base heights, and reduce live tree density, maintenance burning may be conducted as needed to maintain desired conditions every few years for up to 40 years.
- An improved transportation system, including construction of approximately 15 miles of new roads to provide sustainable access for ground-based logging treatments (Map 1 FEIS Appendix A). Sustainable access is a road system that will require less long-term maintenance and is located to allow access to treatment areas. Additionally, approximately 16 miles of temporary roads will be constructed that would be obliterated after use (Map 1 FEIS Appendix A), and approximately 23 miles of poorly-located existing roads will be obliterated (Map 5 FEIS Appendix A). Most of the newly constructed roads will be closed to the public and open for administrative use following implementation. The resulting open road system after implementation will be reflected in the Kaibab National Forest Motor Vehicle Use Map (MVUM) (Map 7, FEIS Appendix A).
- Bixler Trail will be extended by converting a portion of Forest Service Road (FSR) 45 (from Bixler saddle south) to a non-motorized trail, constructing approximately 1 mile of new trail, and constructing a new trailhead and parking area along FSR 122 (Map 1, FEIS Appendix A).

Alternative 3

Alternative 3 (Map 2 FEIS Appendix A) is similar to Alternative 2 except for the following differences. There would be no ground-based thinning operations on slopes greater than 40 percent; instead, these areas would be treated via helicopter. Thinning in the MSO protected activity center and MSO mixed conifer nest roost recovery habitat would be restricted to nine inches diameter at breast height and below. No prescribed burning would be conducted in the Arizona Bugbane Botanical Area. Alternative 3 would include construction of 22 miles of new permanent road and 16 miles of temporary road that would be obliterated after use, and obliteration of 26 miles of poorly-located existing road. Chapter 2 of the FEIS provides a full description of Alternative 3. Chapter 3 of the FEIS analyzes the potential effects of implementing this alternative.

Alternative 4

Alternative 4 (Map 3 FEIS Appendix) is similar to Alternative 2 except under Alternative 4, a combination of commercial timber harvest and non-commercial mechanical treatments would occur on approximately 11,150 acres. Vegetative treatments would be limited to slopes less than 40 percent, except for strategic fuel lines. Alternative 4 would include constructing approximately 38 miles of temporary roads that would be obliterated after use as well as obliterating approximately 23 miles of poorly located roads within the project area. There would be no construction of the new Bixler trailhead or proposed new trail segment under Alternative 4.



Map 1. Bill Williams Mountain Restoration Project, Alternative 2 – Modified Proposed Action

Environmentally Preferable Alternative

Under the National Environmental Policy Act, the USDA Forest Service is required to identify the environmentally preferable alternative (40 CFR 1505.2(b)). This is interpreted to mean the alternative that would cause the least damage to the biological and physical components of the environment, and which bests protects, preserves, and enhances, historic, cultural, and natural resources (Council on Environmental Quality, Forty Most Asked Question Concerning CEQ's National Environmental Policy Act Regulations, 46 Federal Register 18026).

In the short-term, it could be argued that Alternative 1 would best meet the definition of "environmentally preferable" because it would not alter the existing biological and physical environment and, thus, would not result in any short-term impacts to vegetation, water, wildlife or social values. In addition, it does not have any of the impacts associated with building roads or of the increased traffic associated with treatments. However, Alternative 1 does not address the pressing environmental issues identified in the FEIS, such as the need to reintroduce fire into the ecosystem, reduce the risk for high intensity stand-replacing wildfires, reduce fuel buildup to help prevent the spread of wildfire onto private property and into drainages leading to the City of Williams reservoirs, or treat fuel accumulations to abate fire risks to Mexican spotted owl habitat, while conserving existing nesting and roosting habitat.

Further, taking no action would likely lead to undesirable and unintended consequences because the environmental conditions of the area would continue to trend away from desired watershed, wildlife habitat, and fuel loading conditions. Therefore, I have determined that the environmentally preferable alternative is Alternative 2 as it balances the short-term impacts of implementing the project with the long-term benefits that will result.

Unavoidable Adverse Effects

Under the Modified Proposed Action, approximately 8,900 acres of ponderosa pine forest surrounding the base of Bill Williams Mountain will have reduced stand densities similar to pre-settlement reference conditions. The Modified Proposed Action will result in the largest reduction in large trees initially, but then remaining trees will grow faster due to increased sunlight, nutrients and water (DEIS, Section 2.5).

Alternative 2 will result in more than half of the project area to the historic fire regime range available for fighting wildland fire through direct attack tactics and Alternative 3 and 4 would result in less than half the area available for direct attack tactics (DEIS, Sections 2.5 and 3.3).

Alternative 2 will result in a short-term increase in particulate matter from burning. There would also be short-term increases in soil disturbance, erosion potential, and soil compaction (DEIS, Sections 2.5 and 3.4).

Alternative 2 will result in short-term reduction of Mexican Spotted Owl habitat, but Alternative 2 moves the project area toward the most sustainable conditions. Alternative 2 provides the greatest amount of protection to nest area and PFA's from active crown fire (DEIS, Sections 2.5 and 3.6).

Alternative 2 also results in a temporary reduction in forest visitors, and short-term effects to scenery management due to mechanical treatments (DEIS, Sections 2.5, 3.10 and 3.11). And, Alternative 2 will also result in the greatest short-term potential increase in weeds.

My Decision

Based upon my review of the alternatives and environmental consequences, I have decided to implement Alternative 2. Alternative 2 and the associated environmental effects are described in detail in the Bill Williams Mountain Restoration Project FEIS. My decision to implement the modified proposed action will allow for commercial timber harvest treatments and non-commercial mechanical treatments on approximately 15,200 acres and prescribed burning on up to 15,200 acres.

This Record of Decision documents my decision and rationale for the selection of Alternative 2. Alternative 2 is described in the FEIS between pages 26 and 28. My decision includes the associated transportation system, the design features, mitigation measures, and monitoring described in Chapter 2 of the FEIS. My conclusion is based on a thorough review of the FEIS, public comments, and the project record. I considered relevant scientific information, public concerns and opposing viewpoints, incomplete information, scientific uncertainty, and risk.

On a landscape scale, the project works toward the goals of reducing the risk of and increasing the resistance to wide-scale disturbance events in the form of high intensity, stand replacing wildfire; improving forest health; and protecting the watershed for the City of Williams and the health and safety of its residents. The majority of activities will be accomplished over a 10-year period, following an implementation schedule that will prioritize treatments. Maintenance burns will continue for up to 40 years.

Decision Rationale

My decision to select Alternative 2 - Modified Proposed Action is based on its responsiveness to the project's purpose and need and its ability to mitigate issues that arose through the public involvement process.

Responsiveness of Alternative 2 to the Purpose and Need

As with many areas on the Kaibab National Forest, changes in forest dynamics have occurred within the Bill Williams Mountain Restoration Project area during the past 130 years. Although fire exclusion has been a primary factor in these changes, other management practices have contributed as well. As a result, forest density has increased and species composition has changed with the forest becoming more at risk and less resistant to wildfire, insect, and disease problems.

The purpose of the Bill Williams Mountain Restoration Project is to improve the health and sustainability of forested conditions on and surrounding Bill Williams Mountain by reducing hazardous fuels and moving vegetative conditions in the project area toward the desired conditions. This work will be done to directly and indirectly improve the watershed conditions contributing to the City of Williams water supply.

Based on my review of the effects analysis in the FEIS, I believe Alternative 2 best meets the stated purpose and need of the project to protect the Bill Williams Mountain watershed from high intensity, stand replacing wildfire while complying with applicable laws and regulations and addressing the public's concerns. Furthermore, the selected action provides practicable environmental safeguards, including features designed to avoid or reduce environmental impacts; mitigation measures designed to avoid, reduce, or minimize impacts; and a monitoring plan to ensure that resulting impacts comply with applicable laws and regulations and are within the range predicted in the FEIS impacts analysis. Refer to Chapter 2 of the FEIS for a description of the components of Alternative 2 and to Chapter 3 of the FEIS for a complete description of the environmental impacts predicted for Alternative 2.

Forest Structure

Alternative 2 provides proactive management of the forest and will result in a substantially reduced risk of tree mortality from wildfire and bark beetles in high-density stands. The longevity and vigor of larger older trees will increase over time because there will be less competition from mid-aged trees. A mix of trees of different ages and species will be allowed to develop over time and the risk of large stand replacement fires will be reduced. Alternative 2 will create a more diverse forest structure with a broader distribution of tree age classes, increased stand vigor, increased forest resiliency, faster growth and development of individual trees, and decreased levels of dwarf mistletoe infections. Alternative 2 has the greatest increase in understory abundance and productivity of all alternatives.

Reducing the amount of dead and down woody debris, ladder fuels, and unnaturally high tree density would greatly reduce the risk of effects to the mountain, which is a traditional cultural property (TCP), from stand

replacing wildfire. Treatments will open the forest canopy and alter its scenic integrity and potentially affect plants collected for ceremonies and medicinal use.

Alternative 2 also creates more openings in the forest canopy, restores natural meadows and savannahs, increases development of understory grasses/forbs/shrubs, and increases vigor and sustainability of aspen clones. Alternative 2 will promote the production of grasses, forbs, and shrubs in the understory. Alternative 2 is also the best for overall forest health, the lowest mistletoe levels, highest stand and individual tree growth and vigor, and lowest susceptibility to epidemic beetle attack.

High Intensity Stand-Replacing Wildfire

Alternative 2 will reduce risk of high intensity stand replacing fires by opening forest canopies and reducing understory fuels. Alternative 2 includes thinning small trees, treating or removing slash, and applying prescribed fire to the project area, which will substantially improve the ability of the forest to withstand a major wildfire should one start in the planning area or enter from adjacent areas. Alternative 2 includes prescribed fire under low or moderate weather and fuel conditions to help alleviate these issues. Managers will have increased ability to consider these options when they are managing a natural ignition wildfire for multiple objectives.

Alternative 2 moves most of the area to a fire regime within historical range and demonstrates a marked reduction in active crown fire potential in the project area from 61 percent to 18 percent, which is a greater reduction than any of the other alternatives. This will greatly increase the potential for control of a fire and reduce the spotting potential by shifting anticipated fire behavior from active crown fire to surface fire in many areas. Fuel loadings are reduced, canopy base heights increased, and canopy bulk densities are lowered leaving less potential for large areas of crown fire. Habitat, watershed, and plants will be more defendable from high intensity stand replacing wildfire.

Alternative 2 most reduces probability of active crown fire in MSO habitat. Uneven-aged management most sustainably conserves MSO habitat at or toward desired conditions. Alternative 2 most protects nest areas and Post-Fledging Family Areas (PFAs) from active crown fire. Alternative 2 most restores landscapes outside goshawk PFAs toward conditions to which the species adapted and evolved.

Arizona Bugbane Botanical Area

Alternative 2 provides the greatest opportunity for Arizona bugbane (*Actaea arizonica)* habitat enhancement through thinning and prescribed fire. Prescribed fire can improve tree health by reducing density, which may also result in long-term resistance to disturbance (e.g., insect outbreaks, drought), thus enhancing the long-term sustainability of the Arizona bugbane microenvironment.

Alternative 2 will also result in the greatest reduction in the risk to Arizona bugbane from high-intensity wildfire, which will provide the greatest safeguard against the undesirable effects that are associated with high-intensity fires such as intense flooding. Low intensity thinning of coniferous trees in the Botanical Area may also promote the health and sustainability of Arizona bugbane's deciduous tree associates.

Old Growth

The Land and Resource Management Plan for the Kaibab National Forest (USDA 2014, p. 153) defines old growth as follows:

> *"Old growth in southwestern forested ecosystems is different than the traditional definition based on northwestern infrequent fire forests. Due to large differences among Southwest forest types and natural disturbances, old growth forests vary extensively in tree size, age classes, presence and abundance of structural elements, stability, and presence of understory (Helms 1998). Old growth refers to specific habitat components that occur in forests and woodlands—old trees, dead trees (snags), downed wood (coarse woody debris), and structure diversity (Franklin and Spies 1989, Helms 1998, Kaufmann et al. 2007). These important habitat features may occur in small areas, with only a few components, or over*

> *larger areas as stands or forests where old growth is concentrated (Kaufmann et al. 2007). In the Southwest, old growth is considered "transitional" (Oliver and Larson 1996), given that the location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). Some species, notably certain plants, require "old forest" communities that may or may not have old growth components but have escaped significant disturbance for lengths of time necessary to provide the suitable stability and environment"*

Alternative 2 provides for a flow of old-growth conditions and function over time at the fine, mid, and landscape scale. Spatial shifting or transition of old growth on the landscape over time will remain consistent with historic conditions. While Alternative 2 allows for the removal of some large, mature, and old trees, the vegetation analysis demonstrates a greater net gain of large trees over time than any other alternative. Moreover, managing for restored forest conditions that are similar to natural conditions will restore resiliency and the evolutionary environment of these forests, providing the best opportunity for these forests to persist and adapt to future climates (Reynolds and others 2013).

Alternative 2 will provide for goshawk nest areas, which are typically well-defined tree groups that meet the definition of old growth. Alternative 2 also provides larger areas managed for MSO recovery nest/roost habitat, MSO PAC, and Arizona bugbane that will be dominated by old growth patches and tree groups.

Mitigation measures will maintain and protect pre-settlement trees, the old trees that lived during the time period where natural functions such as frequent fire events persisted naturally under historic fuel loadings. The locations of these old trees across the landscape helped define existing old growth on the ground. The project manages for old growth and old-growth components for all forest and woodland vegetation types, which activities maintain or make progress toward. Additionally, Alternative 2 follows Forest Plan guidance to generally not remove structural components associated with old growth including large old ponderosa pine trees with reddish-yellow wide platy bark, mature trees with large dwarf mistletoe-induced witches' brooms, large snags, partial snags, and trees (greater than 18 inches dbh) with broken tops, cavities, sloughing bark, and lightning scars. In addition, Alternative 2 should generally retain at least historic frequencies of trees by species across broad age and diameter classes at the mid-scale. As such, the largest and oldest trees will usually be retained.

Managing for large trees across the landscape

The Kaibab National Forest Plan (USDA 2014, p. 30) provides guidelines for managing for large trees across the landscape:

> *Project design and treatment prescriptions should generally not remove:*
>
> *Large, old ponderosa pine trees with reddish-yellow, wide platy bark, flattened tops, with moderate to full crowns and large drooping or gnarled limbs (e.g. Thomson's age class 4, Dunning's tree class 5 and/or Keen's Tree Class 4, A & B [appendix C]).*
>
> *Mature trees with large dwarf mistletoe induced witches' brooms suitable for wildlife nesting, caching, and denning, except where retaining such trees would prevent the desired development of uneven-aged conditions over time.*
>
> *Large snags, partial snags, and trees (>18 inches dbh.) with broken tops, cavities, sloughing bark, lightning scars >4 inches wide, and large stick nests (>18 inches in diameter).*

This analysis measures large tree retention as numbers of trees remaining after treatment, growing space for allocated large tree and longevity of large trees. Large trees are defined as 18" + DBH trees due to the relationship to VSS 5 and 6 groups (starting with an average diameter of 18" DBH). The Vegetative Structural Stage (VSS) 5 and 6 group average diameter limits provide an ecological tie to a diameter. Implementing Alternative 2 will result in the most large trees through time and Alternative 2 will also retain many large trees in the short-term. Recruitment of large trees is higher in Alternative 2 due to the reduced potential for high-intensity stand replacing wildfire and less competition.

Scenic Resources

The Kaibab National Forest Plan (USDA 2014, p. 66) provides the following guideline for scenic resources:

> *The "Kaibab NF Recreation Opportunity Spectrum and Scenery Management Handbook" (USDA 2004) and "Built Environment Image Guide" should be used for recreation management and project design.*

The Kaibab National Forest Plan (USDA 2014, p. 5) also provides direction for following guidelines in projects:

> *Guidelines are technical design criteria or constraints on project and activity decision making that help to make progress toward desired conditions. A guideline allows for departure from its terms, so long as the intent of the guideline is met. Deviation from a guideline must be specified in the decision document with the supporting rationale. When deviation from a guideline does not meet the original intent, a plan amendment is required.*

The Recreation Opportunity Spectrum/Scenery Management System (ROS/SMS) Guidebook states recovery timelines for Scenic Integrity Objectives (SIO) 2 and SIO 3 of one year and two years respectively, after implementation. The Kaibab National Forest Recreation Opportunity Spectrum and Scenery Management Guidebook, Appendix B allows for the SIO to drop one level during critical project and management activities, such as the restoration of Bill Williams Mountain. It is unlikely that the SIO recovery to satisfactory levels will meet the expected timelines; therefore, SMS direction for the SIO levels 2 and 3 would be met within 5-10 years after project completion. Although this represents a

short-term deviation from this guideline, the intent of the guideline will be met in 5 to 10 years through the mitigation measure outline in section 2.3 Chapter 2 FEIS.

Responsiveness of Alternative 2 to the Significant Issues

The selected action is responsive to the issues described in Chapter 1 of the FEIS. Alternative 2 was modified during the comment analyses for the DEIS and the SDEIS to respond to significant issues regarding potential impacts on biological resources, cultural resources, and the surface water component of water resources. Alternative 2 also responds to the other significant issues through design features and mitigation measures that reduce potential environmental and social impacts.

Reasons for Not Selecting Alternatives 1, 3, or 4

I selected Alternative 2 rather than Alternative 1 because Alternative 1 does not meet the purpose and need of the project. Heavy fuel loadings, low canopy base heights and dense canopy bulk densities would continue to exist under Alternative 1, which preserves the high potential for high intensity stand replacing wildfire in the project area. This would directly affect wildlife habitat, watershed integrity, plant communities, cultural resources, and the municipal water supply for the City of Williams.

Alternative 1 would perpetuate a high probability of active crown fire (61%) in the project area. A high intensity stand replacing fire could degrade most or all MSO and northern goshawk habitat in the project area. Under Alternative 1, insect and disease levels would likely continue to increase, decreasing forest health and causing increased tree mortality and fuel accumulations. Herbaceous ground cover would continue to decline and soil duff layers would increase as forest canopies continue to close. Abundance and productivity of understory species and species richness may decline in the long-term under Alternative 1. The poorly located roads that would be obliterated under the Action Alternatives would continue to erode, further decreasing soil productivity in these areas and contributing to downstream surface water quality degradation.

The continued deposition of fuels in the area would increase the likelihood of a high intensity stand replacing wildfire on Bill Williams Mountain. It is likely that the Bill Williams Mountain Traditional Cultural Property, its scenic integrity, and plants collected by tribes and used for ceremonial purposes would suffer adverse effects from intense fire behavior. The continued deposition of fuels under Alternative 1would also increase the likelihood of

a high intensity stand replacing wildfire that could cause many of the prehistoric and especially the few cultural sites with combustible features to suffer adverse effects from high intensity fire and post-fire erosion.

The communication site at the top of Bill Williams Mountain would be at the highest risk of loss due to high intensity stand replacing wildfire under Alternative 1. Although there would be no upfront cost to implement Alternative 1, the risk of high costs to mitigate high intensity stand replacing wildfire and flooding would likely exceed the cost of implementing any action alternative.

I selected Alternative 2 rather than Alternative 3 because Alternative 2 better meets the purpose and need of the project. Alternative 3 has a lesser ability to improve forest health, reduce mistletoe levels, increase tree growth and vigor, and reduce susceptibility to epidemic bark beetle attack and catastrophic stand replacing fire.

Alternative 3 moves less than half of the project area to a fire regime that is within the historic range, and portions of the project area would be more likely to depart from this restored fire regime more rapidly in future than under Alternative 2. Under Alternative 3, 27% of the project area would have the potential for active crown fire, which is higher than Alternative 2.

Although fuel loadings are reduced, canopy base heights are increased, and canopy bulk densities are lower under Alternative 3, habitat and watersheds are less defendable against active crown fire under Alternative 3 than Alternative 2. Rare plant species will continue to be at risk of high intensity stand replacing wildfire, particularly on the north face of the mountain.

Alternative 3 would not reduce the probability of active crown fire in MSO habitat as much as Alternative 2. Even-aged management (9" diameter cap on tree-cutting) moderately conserves MSO habitat at or moves it toward desired conditions. Alternative 3 moderately protects nest areas and PFAs from active crown fire, but less than Alternative 2. Alternative 3 would moderately restore foraging areas (i.e., landscapes outside PFAs) toward desired conditions, but to a lesser degree than Alternative 2.

Alternative 3 has a slightly lower increase in abundance, productivity, and understory species richness than Alternative 2. Reducing the amount of dead and down woody debris, ladder fuels, and unnaturally high tree density in Alternative 3 would greatly reduce the risk of effects to the TCP from stand replacing wildfire, and treatments would open the forest canopy and alter its scenic integrity and potentially affect plants collected for ceremonies and medicinal use. However, these effects occur to a lesser degree than under Alternative 2. The Bill Williams Communication Site would be at greater risk than under Alternative 2.

I selected Alternative 2 rather than Alternative 4 because Alternative 2 better meets the purpose and need of the project. Alternative 4 moves less than half of the project area to historic fire regime range. Under Alternative 4, 35% of the project area has the potential for active crown fire, which is higher than Alternative 2. Ecosystem components would be more likely lost in future, and some of the project area would be likely to regress more rapidly in the future under Alternative 4. Habitat and watershed have higher potential of higher intensity and stand replacing wildfires and a potential increase in mortality during prescribed fire due to higher stand densities than Alternative 2.

Rare plant species would be at a higher risk of high fire severity than under Alternative 2. Alternative 4 does not reduce the probability of active crown fire in MSO habitat as much as Alternative 2. Prescribed fire alone does little to conserve MSO habitat at or toward desired conditions. Alternative 4 also least protects nest areas and PFAs from active crown fire, and least restores foraging areas toward conditions to which the species adapted and evolved.

Alternative 4 has a lower increase in understory abundance, productivity, and species richness. The steep slopes of Bill Williams Mountain would not be treated under Alternative 4, leaving the Traditional Cultural Property more vulnerable to the effects of post fire flooding and erosion than under Alternative 2. The Bill Williams Communication Site would be at greater risk than under Alternative 2.

Consultation with Government Agencies and Tribes

Consultation with many Federal and State agencies is required and was completed during the DEIS comment period. A list of agencies consulted is found in Chapter 4 of the FEIS. Most notably, the Arizona Game and Fish Department and U.S. Fish and Wildlife Service played key roles in the project. Both agencies participated in many of the interdisciplinary meetings and field trips and provided input throughout the project. The Forest Service collaborated extensively with the U.S. Fish and Wildlife Service throughout all phases of project development, especially as it pertains to conservation of Mexican spotted owls (see section 3.6 of chapter three for more information).

Government-to-government consultation with tribes is guided by existing law, regulation, and policy, including the National Environmental Policy Act (NEPA), the Archaeological Resources Protection Act (ARPA), the National Historic Preservation Act (NHPA), the American Indian Religious Freedom Act (AIRFA), the Native American Graves Protection and Repatriation Act (NAGPRA), the National Forest Management Act (NFMA) of 1976, the Religious Freedom Restoration Act (RFRA), Executive Order 13007-Indian Sacred Sites, Executive Order 13175-Consultation and Coordination with Indian Tribal Governments, and Executive Order 12898 - Environmental Justice. The Kaibab National Forest has entered into Memoranda of Understanding with the Havasupai Tribe, the Hualapai Tribe, the Hopi Tribe, and the Kaibab Band of Paiute Indians to establish a standard process for consultation with each tribe.

The Kaibab National Forest recognizes that area tribes have cultural ties and knowledge about the lands now managed by the USDA Forest Service. Many tribal members regularly visit the Forest to gather traditional resources and to visit traditional cultural properties and sacred sites. Therefore, tribes share an interest in the management of National Forest System lands.

To recognize the high level of use of the forest by tribal members and because area tribes have unique interests in the Forest, the Kaibab National Forest has conducted extensive tribal consultation and scoping of tribal communities throughout the environmental analysis process. This consultation process reflects a long-standing commitment by the Forest to share the stewardship of public lands with area tribes. For the Bill Williams Mountain Restoration Project, tribal consultation was conducted at the government-to-government level with concerned tribes according to established memoranda of understanding and pertinent laws and regulations. Additionally, the Kaibab National Forest scoped the project with tribal communities that utilize the Forest. The Kaibab National Forest initiated consultation with tribes in the earliest stages of analysis, and incorporated tribal comments into the development of the alternatives.

Based on consultations with the tribes (FEIS p 306-309), all tribes support the purpose and need for the project. No tribe has recommended Alternative 1- the No Action Alternative. Tribes agree with the ID team's assessment that current conditions in the project area present an unacceptable long-term risk to cultural and traditional resources. While Alternatives 2, 3 and 4 propose active thinning treatments on the mountain, tribes have stated that these activities will result in a long-term beneficial effect to the Bill Williams Mountain Traditional Cultural Property.

Consultation occurred with the Arizona State Historic Preservation Office and a finding of "no adverse effect" was made for this project.

Consistency with Other Laws and Regulations

After consideration of the discussion of environmental consequences (FEIS, Chapter 3), I have determined that Alternative 2 is consistent with other laws and regulations as outlined in the FEIS. Detailed discussions of laws and regulations are provided in the FEIS, Chapter 3.

The National Forest Management Act (NFMA)

Consistency with the Land and Resource Management Plan for the Kaibab National Forest and Other NFMA Requirements

The National Forest Management Act requires projects to comply with forest plan direction. The Land and Resource Management Plan for the Kaibab National Forest establishes management direction for the Kaibab National Forest. This management direction is achieved through the establishment of Forest Plan goals and objectives, standards and guidelines, and management area goals and accompanying standards and guidelines. Projects and activity decisions must demonstrate and explicitly document consistency and compliance with Forest Plan Forest-wide standards, management area standards, and monitoring plan requirements.

The selected alternative is consistent with the 2014 Land and Resource Management Plan for the Kaibab National Forest. This action responds to the goals and objectives outlined in the Forest Plan and helps maintain and/or move the project area towards desired conditions described in this plan.

Forest Plan Revision

During development, the Bill Williams Mountain Restoration Project was designed under the framework provided by the 1988 Kaibab National Forest Plan, as amended (1988 Forest Plan). On February 3, 2014, a Record of Decision (ROD) was issued for the revised Land and Resource Management Plan for the Kaibab National Forest, superseding the 1988 plan. As a result, the ROD for the Bill Williams Mountain Restoration Project is being issued under the 2014 Land and Resource Management Plan for the Kaibab National Forest.

A consistency review for the Bill Williams Mountain Restoration Project with the Forest Plan resulted in a determination that implementing the modified proposed action or any of the action alternatives would be consistent with the revised plan and would result in conditions that are consistent with management direction in the Forest Plan.

Forest Plan Amendments

There are no Forest Plan amendments included in my decision. The modified proposed action is found to be consistent with all standards and guidelines in the 2014 Forest Plan and thus no longer requires any Forest Plan amendments.

National Environmental Policy Act (NEPA)

NEPA establishes the format and content requirements of an environmental analysis and documentation as well as requirements for public involvement and disclosure. The entire process of preparing this EIS was undertaken to comply with NEPA.

The National Historic Preservation Act: The Arizona State Historic Preservation Office

Consultation occurred with the Arizona State Historic Preservation Office (SHPO). A finding of “no adverse effect” was made for the Bill Williams Mountain Restoration Project. This finding was based on the knowledge that although cultural resource sites may be impacted by the proposed undertaking, site avoidance and project design criteria will provide protection of eligible site characteristics. The probability that certain eligible sites

may be impacted during project activities leads to this finding of effect as described in 36 CFR 800.5 (b) and 36 CFR 800.16(i) (Federal Register Vol. 65, No. 239; Tuesday, December 12, 2000; pages 77730 and 77738). The SHPO concurred with this finding of "no adverse effect' on August 6, 2012.

American Indian Religious Freedom Act of 1978

This act provides for the maintenance of "access to sites … freedom to worship through ceremonials and traditional rites." This decision allows for continued access and does not abridge any rights to continue "worship" in the project area.

Executive Order 13007 - Indian Sacred Sites

This order indicates that Federal land management agencies "shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites." This order is based on a "government-to-government" relationship between agencies and tribal government. There have been ongoing government-to-government consultations on the Bill Williams Mountain Restoration Project under section 106 of NHPA. Access to sacred sites and their physical integrity will be maintained with this project (see "Consultation with Government Agencies and Tribes" section above).

The Endangered Species Act and Regional Forester's Sensitive Species

Details regarding actual species found within the Bill Williams Mountain Restoration Project area and potential effects of proposed activities on those species and their habitat are discussed in the "Wildlife" section in Chapter 3 of the FEIS. The Endangered Species Act requires protection of all species listed as threatened or endangered by Federal regulating agencies. A biological assessment was prepared to document the possible effects of the proposed activities to endangered, threatened, and sensitive plant and wildlife species within the Bill Williams Mountain Restoration Project area. Appropriate coordination, conferencing, and consultation with the U.S. Fish and Wildlife Service have been completed as directed under Section 7 of the act (see previous section of this document titled "Consultation with Government Agencies and Tribes").

I have determined that implementation of Alternative 2 will result in a "may affect, and is likely to adversely affect" the MSO and its Critical Habitat. However, it would not cause a trend toward loss of viability, the project's impacts would not be enough to change forest-wide population or habitat trends for the species, and the project will not cause an irreversible or irretrievable commitment of resources per section 7(d) of the Endangered Species Act.

The biological opinion issued by the U.S. Fish and Wildlife Service after consultation concludes that implementation of the project will contribute to the likelihood of the survival and recovery of the Mexican Spotted Owl throughout its range ("Biological Opinion – Bill Williams Mountain Restoration Project," 22140-2011-F-0233, May 5, 2015). The biological opinion also concludes that the project is neither likely to jeopardize the continued existence of the spotted owl, nor result in destruction or adverse modification of spotted owl critical habitat. In their opinion, the project will ultimately improve forest health and reduce the likelihood of high-severity wildfire, the primary threat to spotted owl habitat on Bill Williams Mountain.

Arizona bugbane *Actaea arizonica* is a Forest Service Sensitive Species and Conservation Agreement Species. Alternative 2 will result in a determination of may impact individuals of Arizona bugbane, but is not likely to result in a trend toward Federal listing or loss of viability because of the implementation of the mitigation measures that have been designed to protect the important habitat components that provide the unique microenvironment for Arizona bugbane. Because Alternative 2 provides the greatest opportunity for Arizona bugbane habitat enhancement, Alternative 2 will not contribute to a trend toward Federal listing and a loss of species and population viability.

Alternative 2 may impact individuals of Rusby milkvetch *Astragalus rusbyi*, Arizona leather flower *Clematis hirsutissima*, Flagstaff beardtongue *Penstemon nudiflorus*, Arizona phlox *Phlox amabilis*, Cliff fleabane *Erigeron saxatilis*, and Mt Dellenbaugh sandwort *Arenaria aberrans*, but is not likely to result in a trend toward Federal listing or loss of viability.

Determination of Effects for Sensitive Species

Bald Eagle, Peregrine Falcon, and Northern Goshawk

Alternatives 2-4 may adversely impact the above species in the short-term but could cause a long-term beneficial impact. Alternatives 2-4 would not cause a trend toward listing or loss of viability of these species. More habitats would be protected and restored for these species under Alternative 2 than under Alternatives 3-4, as there would be less fire hazard and more flexibility to promote the growth of the largest trees that goshawk use for nesting and which serve as recruitment snags and down logs on which goshawk prey species rely. More habitats would be restored for falcon and goshawk prey species under Alternative 2 than under Alternatives 3-4, as there would be more flexibility to restore openings that existed in pre-settlement times. For these three species Alternative 4 would have less road-related impacts than Alternatives 2-3. Unintentional take of eagles would not occur under any of the Alternatives.

Navajo Mogollon Vole

Alternatives 2-4 may affect individuals but would not cause a trend toward listing or loss of viability for the species. More vole habitat would be restored for this species under Alternative 2 than under Alternatives 3-4, as there would be more flexibility to restore openings that existed in pre-settlement times. Alternative 4 would have less road-related impacts than Alternatives 2-3, as no new permanent roads would be constructed under this Alternative.

Spotted Bat, pale Townsend's big-eared, and Allen's Lappet-browed bat

Alternatives 2-4 may adversely impact these bat species in the short-term but would cause a long-term beneficial impact. Alternatives 2-4 would not cause a trend toward listing or loss of viability. More habitats would be restored for these species under Alternative 2 than under Alternatives 3-4, as there would be more flexibility to promote the growth of the largest trees. Alternative 4 would have less road-related and thinning impacts than Alternatives 2-3.

Determination of Effects for Management Indicator Species

Grace's Warbler

Alternatives 2-4 would not cause a change in Forest-wide habitat quality or alter the population trend for the species. More habitat would be restored and protected for this species under Alternative 2 than under Alternatives 3-4, as there would be less fire hazard and more flexibility to promote the growth of the largest trees and the herbaceous understory that this species relies on for nesting, roosting, and foraging. Alternative 4 would have less road-related impacts than Alternatives 2-3.

Western Bluebird

Alternatives 2-4 could cause a long-term beneficial impact. Alternatives 2-4 would not cause a change in forest-wide habitat or population trend for the species. More habitat would be restored for this species under Alternative 2 than under Alternatives 3-4, as there would be less fire hazard and more flexibility to promote the growth of the largest trees and the herbaceous understory that the species rely on for nesting, roosting, and foraging. The action alternatives would largely restore the project area to the more open ponderosa pine habitat condition that this species is an indicator for. Alternative 4 would have less road-related impacts than Alternatives 2-3.

Ruby-crowned Kinglet

Alternatives 2-4 would not cause a change in forest-wide habitat or population trend for the species. As the mixed conifer forests in the project area exhibit uncharacteristically high fuel loadings, the probability of unintentionally torching large patches of trees (including large snags and pre-settlement trees) would be high in these areas if they did not first receive mechanical treatments. Alternatives 2-4 would allow prescribed fire to occur in kinglet habitat when conditions of weather and fuel moistures are most favorable, so loss of important habitat components would be much less than if a wildfire were to occur under extreme conditions of weather and fuel moistures. The action alternatives would improve habitat quality for kinglets as it would assist in moving the limited amount of habitat on the district closer to reference condition.

Alternative 2 would best conserve kinglet habitat, as this Alternative would achieve the greatest balance of conserving large trees, canopy cover, and other attributes important to ruby-crowned kinglets while most reducing the probability of active crown fire in and around the PAC (Tables 3 and 4). Alternative 3 would have an intermediate effect on reducing fire hazard, and it would have the greatest effect on promoting individual kinglet habitat attributes of importance. Alternative 4 would do little to reduce fire hazard (Tables 3 and 4) and it would result in the greatest loss of important habitat attributes of the Action Alternatives. However, Alternative 4 would have less road-related impacts on kinglet habitat than Alternatives 2-3. None of the Action Alternatives' effects are enough to change Forest-wide habitat or population trends for the ruby-crowned kinglet.

Pronghorn Antelope

Alternatives 2-4 may impact pronghorn antelope in the short-term but would cause a long-term beneficial impact. Alternatives 2-4 would keep Forest-wide habitat or population trends for pronghorn antelope as stable to increasing. More habitat would be restored for the species under Alternative 2 than under Alternatives 3-4, as there would be more flexibility to restore grasslands, meadows, and forest openings that existed in pre-settlement times. Alternative 4 would have less road-related impacts than Alternatives 2-3, as no new permanent roads would be constructed under this Alternative.

Determination of Effects for Migratory Birds

Alternatives 2-4 would not cause a trend toward listing or loss of viability, or change community trends for birds. In general, more habitat would be restored for birds under Alternative 2 than under Alternatives 3-4, as there would be more flexibility to restore grasslands, meadows, woodlands, and forests to their pre-settlement conditions. Alternative 4 would have less road-related impacts than Alternatives 2-3, as no Maintenance-Level 1 Roads would be constructed. Unintentional take may occur for all species but bald eagle, Swainson's Hawk, Ferruginous Hawk, Peregrine Falcon, and Lark Bunting. These exceptions exist because these species do not breed in the area or they nest on cliffs or high in trees within grasslands and the probability of fire entering or causing smoke-related asphyxiation in these fine, flashy fuels is so low that it is negligible. Although unintentional take may occur to some migratory bird species, the widespread distribution of these species over hundreds of thousands of acres (BNA Online 2012) precludes such take from causing a measurable effect to the populations of the species.

The Migratory Bird Treaty Act of 1918

As identified in the FEIS, there are no designated important bird areas (IBAs) or important over-wintering areas (large wetlands) in or in the vicinity of the project area that would be expected to be impacted by activities prescribed in Alternative 2. The EIS discloses that Alternative 2 will have positive effects on migratory birds and their habitat (FEIS pp. 222-227). There is the potential of unintentional take occurring due to the implementation of the project, however, no measureable negative effects to any of the bird populations would occur (FEIS p. 246). No violations of the Migratory Bird Treaty Act or EO 13186 are anticipated.

The Clean Water Act, 1982 and 303(d)

This act is the basis for the Intergovernmental Agreement between the Arizona Department of Environmental Quality (ADEQ) and Forest Service for the control of nonpoint source pollution and maintenance of clean water (ADEQ Contract No. HH-1037). This is accomplished through planning, application, and monitoring of best management practices, which are recognized as the primary means to control nonpoint source pollution on National Forest System lands. Alternative 2 incorporates project design features that would ensure compliance with these regulations.

The Clean Air Act, as amended in 1990

As discussed in Chapter 3 of the FEIS and in supporting documents, implementation of Alternative 2 and associated management actions is compliant with the Clean Air Act, as amended in 1990. Fire managers will coordinate prescribed burning under the Arizona State Smoke Management Rule which implements the Clean Air Act and contains regulations that all State and Federal natural resource agencies must follow before a prescribed burn is ignited.

Civil Rights and Environmental Justice

Executive Order 12898 requires Federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low income populations. I have determined that there would be no discernable impacts from the selected alternative in the effects on Native Americans, women, other minorities, or the Civil Rights of any American citizen (see Chapter 3 of the FEIS).

Administrative Review

Objection under 36 CFR 218

Planning for the Bill Williams Mountain Restoration Project began under the appeal regulations (36 CFR 215). However, because a Record of Decision was not signed before September 27, 2013, the draft Record of Decision was subject to the objection procedures (36 CFR 218, subparts A and B) under the "Project Level Pre-decisional Administrative Review Process." The 45-day objection period was initiated by a legal notice published in the *Arizona Daily Sun* on September 15, 2015 and ran through October 30, 2015. No objections were received.

Project Implementation, Monitoring, and Coordination

Implementation may begin immediately following the date of this final decision. I have reviewed the Bill Williams Mountain Restoration Project FEIS and associated documents, and I believe there is adequate information within these documents to provide a reasoned choice of action. I am fully aware of the possible adverse environmental effects that cannot be avoided with Alternative 2 described in the environmentally preferable alternative section of this ROD. I have determined that these risks will be outweighed by the benefits of protecting Bill Williams Mountain and its associated resources. Implementing Alternative 2 in conjunction with any past, present, or reasonably foreseeable future actions will cause no unacceptable cumulative impact to any resource.

Monitoring during project implementation will include the monitoring listed in Chapter 2 of the FEIS. Specifically, continued monitoring, collaboration, and technical assistance during project implementation will occur with the U.S. Fish and Wildlife Service related to Arizona Bugbane and management of the Arizona Bugbane Botanical Area.

Procedure for Change during Implementation

Minor changes may be needed during implementation to better meet onsite resource management and protection objectives. In determining whether and what kind of further NEPA action is required, I will consider the criteria to supplement an existing environmental impact statement in 40 CFR 1502.9(c) and FSH 1909.15, sec. 18, and in particular, determine whether the proposed change is a substantial change to the intent of the selected alternative as planned and already approved, and whether the change is relevant to environmental concerns. Connected or interrelated proposed changes regarding particular areas or specific activities will be considered together in making this determination. The cumulative impacts of these changes will also be considered.

Contacts for Information

For information concerning the record of decision or the final environmental impact statement contact:

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Additional information is also available on the project website at http://www.fs.usda.gov/project/?project=34690.

Responsible Official Signature

DANELLE D. HARRISON
District Ranger, Williams Ranger District

12/10/2015
Date

Bill Williams Mountain Forest and Watershed Restoration Project
Relevant Plans, Reports and Information

Kaibab National Forest NEPA Record of Decision, Bill Williams Mountain Restoration Project, 2016[1]
The Bill Williams Mountain Restoration Project was designed to reduce the risk of high intensity stand replacing wildfire and improve both forest health and the watershed for the City of Williams, Arizona. An environmental impact statement was developed to analyze the potential effects of the Bill Williams Mountain Restoration Project. Four alternatives were considered and analyzed. The Record of Decision documents selection of a preferred treatment alternative to implement the project, addressing the following needs:

- Reduce the risk for high intensity, stand-replacing wildfires;
- Reintroduce fire as a natural part of the ecosystem;
- Reduce fuel buildup to help prevent the spread of wildfire onto private property and into drainages leading to the City of Williams reservoirs;
- Reduce overall stand densities and move stand conditions toward forest structures considered to be more typical of forest structure under pre-settlement fire regimes;
- Treat fuel accumulations to abate fire risks to Mexican spotted owl habitat, while conserving existing nesting and roosting habitat;
- Improve tree vigor and stand resiliency;
- Improve the diversity of age classes and structure of woody vegetation;
- Improve ground cover, including down woody debris, fine litter and herbaceous understory composition and productivity;
- Reduce mistletoe infection levels to more manageable levels where the area can be managed in an uneven-aged condition over time;
- Provide forest products, such as firewood, for residents living in Williams, Arizona and the surrounding area, in order to meet their needs for forest and wood products, while protecting these resources for future generations; and
- Improve the motorized transportation system to provide for a more sustainable road system where poorly located roads are relocated or obliterated.

NAU EPI Economic Impact Study[2]
The Northern Arizona University (NAU) Alliance Bank Economic Policy Institute (EPI) study of the Economic Impact of Post Fire Flooding: Bill Williams Mountain focused on the economic impact of post wildfire flooding to the City of Williams resulting from a wildfire on Bill Williams Mountain. Commissioned by the CFD, the study estimates that the economic impact from a catastrophic wildfire and the post-wildfire flooding in the Bill Williams Mountain watershed (City of Williams and downstream) is between $379 million and $694 million. The estimated cost of forest restoration on Bill Williams Mountain is approximately $8 million. The response to a fire would incur immediate expenses,

[1] https://www.fs.usda.gov/nfs/11558/www/nepa/75077_FSPLT3_2610206.pdf
[2] http://coconino.az.gov/DocumentCenter/View/21682/The-Economic-Impact-of-Post-Wildfire-Flooding-Bill-Williams-Mountain?bidId=

including suppression, post-fire rehabilitation, evacuation and repair costs. Long-term impacts of a catastrophic fire include the loss of sales tax revenue, tourist revenue, business revenue, and repair costs to railroads, highways and facilities.

Post-Wildfire Debris-Flow & Flooding Assessment[3]

Completed in 2017, the Post-Wildfire Debris-Flow & Flooding Assessment identified areas within the County that are at high risk for flooding and debris flows in the aftermath of a wildfire. The study included in-depth evaluations of two areas that are at very high risk to post-wildfire flooding: Fort Valley and the City of Williams. The evaluations quantified the risks in these areas and identified potential mitigation measures that could reduce these hazards.

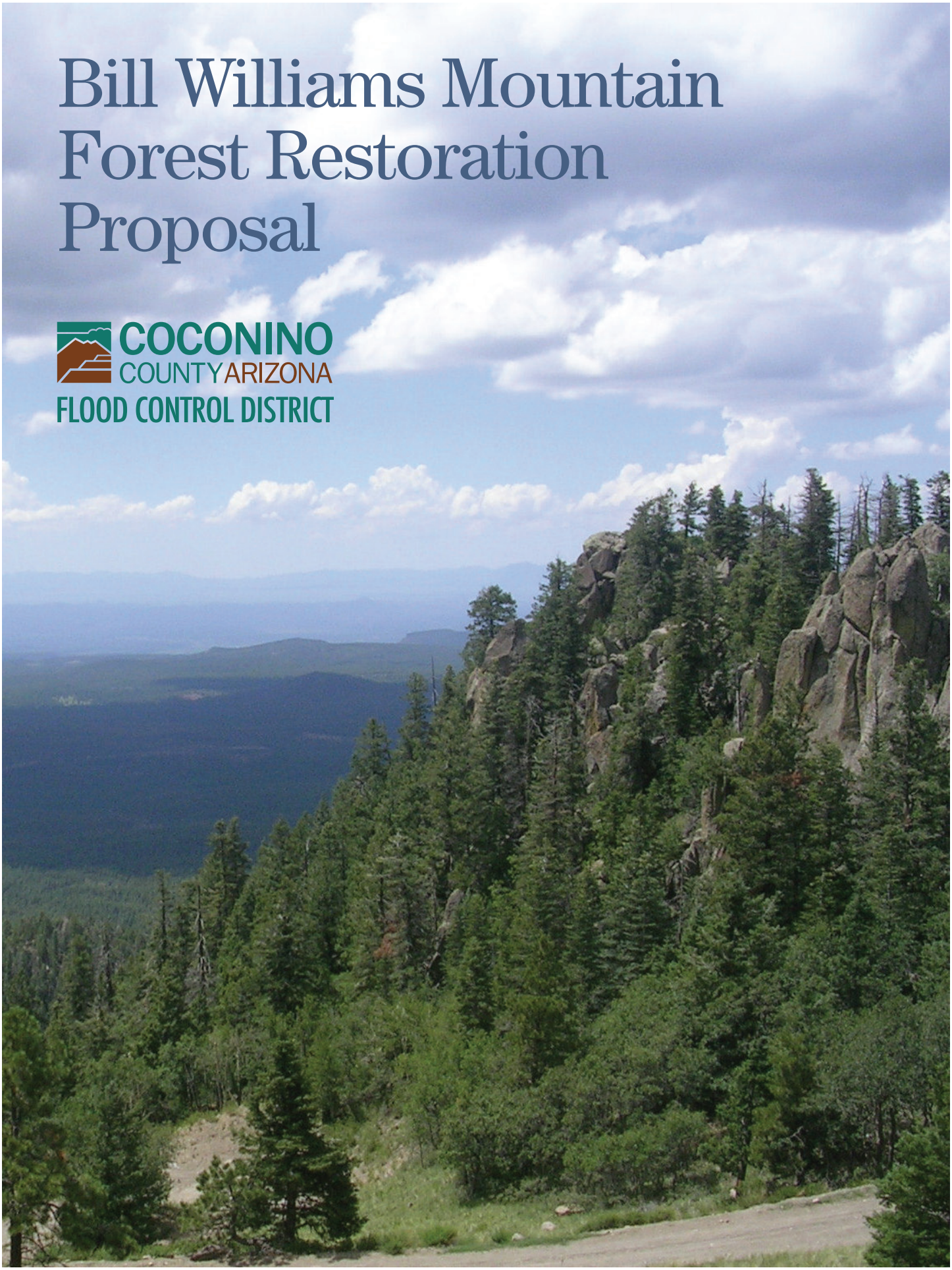
Bill Williams Mountain Forest Restoration Proposal by Coconino County

The restoration of Bill Williams Mountain is a top priority for Coconino County given the document impacts to public safety, private property, public infrastructure and the regional economy from post-wildfire flooding and debris flows. In this proposal to the Forest Service, the County describes the economic and watershed values at stake if the Bill Williams Mountain Burns, and as such is developing alternative partnership mechanisms for the benefit of treating the 15,000 acres across the Bill Williams landscape. The National Forest Foundation is working with the County to leverage resources and funds to treat these important acres.

[3] http://repository.azgs.az.gov/sites/default/files/dlio/files/nid1727/ofr-17-06_v1_cococty_0.pdf

Bill Williams Mountain Forest Restoration Proposal

COCONINO COUNTY ARIZONA
FLOOD CONTROL DISTRICT



Proposing a Pilot Forest Restoration Model for Bill Williams Mountain

Coconino County proposes to enter into a Good Neighbor Authority (GNA) Agreement with the U.S. Forest Service to implement a pilot project resulting in the restoration for 15,000 acres on Bill Williams Mountain in the Kaibab National Forest. The goal of this partnership is to complete this restoration project in no more than five years. The structure of the proposed agreement provides for the long-term (20 year) maintenance of the restoration measures. The County recognizes that the Forest Service currently does not have the authority to enter into a GNA agreement with counties. However, this is a component of the Farm Bill, which is expected to be approved in September.

Furthermore, the Forest Service does have the authority to enter into a GNA with state agencies and thus Coconino County is discussing this as an option with the Arizona Department of Forestry and Fire Management.

A Trusted Relationship Can Again Translate to Action…

Trust and commitment are foundational for all successful partnerships. Coconino County and the U.S. Forest Service built a trusted and committed relationship in the wake of the devastating Schultz Fire and flooding. As partners, we proved that a county and the Forest Service can innovatively address serious public safety issues. Just recently, the northern section of the Schultz Flood Area experienced a 1,000-year rain event. The on- and off-forest flood mitigation measures put into place as a result of this collaboration performed way beyond expectations and avoided what would likely have been another catastrophic disaster. The County wants to build on this successful relationship with the Forest Service to address the County's most pressing public safety issue – wildfire and post-wildfire flooding.

The only effective way to address the threats of wildfire and post-wildfire flooding is forest restoration. However, forest restoration in Arizona has not achieved its objectives and is significantly behind schedule. Although subsidized timber sales in northeastern Arizona where small wood operations exist has shown some success, the private market investment model underlying the Four Forest Restoration Initiative has failed to deliver and is severely challenged in addressing forest health, particularly in steep slope areas such as Bill Williams Mountain.

Coconino County believes a non-traditional pilot project involving Bill Williams Mountain can accomplish the mutual objectives of the County and the Forest Service to advance forest restoration and reduce threats to public safety posed by catastrophic wildfire and post-wildfire flooding. This innovative project can serve as a national model for addressing many of the factors influencing the issues surrounding forest restoration and result in implementing forest restoration treatments, particularly in areas where the impacts from post-wildfire flooding will be severe.

This non-traditional pilot project must be founded on the Forest Service and County agreeing to a fundamental fact – that the project's value and success is measured by acres treated, not the traditional Forest Service valuation associated with the timber, which in this area has no marketable value. Under this foundational principle, the legal framework and historical practices that relied on the assumption that the timber held value must be re-examined and reformed, so forest restoration can be more economically and efficiently implemented, and therefore be successful.

The Critical Nature of this Project Presents a Unique Opportunity

The restoration of Bill Williams Mountain is a top priority for Coconino County given the documented impacts to public safety, private property, public infrastructure and the regional economy from post-wildfire flooding and debris flows. These impacts are explicitly described in two key resources...

- FEMA funded *Post Wildfire Flooding and Debris Flow Study* (Appendix B) conducted by J.E. Fuller Hydrology and Geomorphology, and
- Northern Arizona University's Alliance Bank Economic Policy Institute study, *Economic Impact of Post Fire Flooding: Bill Williams Mountain* (Appendix C).

The EPI study conservatively estimates $379 million to $694 million in regional economic impacts from post-wildfire flooding.

This pilot project serves as a model project demonstrating the benefits of this partnership to reducing post-wildfire flooding impacts as well as enhancing the environment and supporting the development of a forest restoration industry. **The project creates a platform for improving the legal, financial and technical processes underlying forest restoration with the goal of significantly increasing and accelerating forest restoration.**

Goals of the Pilot Project

- To demonstrate the value to counties and the Forest Service from entering into non-traditional partnerships to implement cost-effective forest restoration projects;
- To implement improved practices identified during the *Accelerating Restoration Implementation Workshop* facilitated by the Ecological Restoration Institute at NAU in November 2017. The workshop report can be found in Appendix A. This project will intentionally implement modifications to historical Forest Service practices that are creating unnecessary costs and delays given the no or low value of the timber. Examples include chain of custody requirements involving scaling and branding of timber;
- To pilot the use of key technologies such as tethered Ponsse harvesting equipment and Air Curtain Burners to increase productivity, reduce transportation costs and improve air quality;
- To identify and implement innovations that improve outcomes relative to forest conditions and restoration technical, legal and financial processes;
- To prioritize and implement forest restoration in areas that are at high risk for severe impacts from post-wildfire flooding and debris flows;
- To support the development of the forest restoration industry in the western area of the Four Forest Restoration Initiative, which is essential for long-term restoration feasibility;
- To support the development of a trained workforce that has the skills necessary to safely and effectively implement a variety of forest restoration measures including those used on steep slopes; and
- To expedite the restoration of this challenging landscape within five years of signing the Good Neighbor Authority Agreement.

Agreement & Project Principles

- The pilot project's success will be measured by acres treated in conformance with the Record of Decision. The Kaibab National Forest will exercise flexibility whenever possible to support Coconino County achieving the agreed-to timeline and restoration plan.
- This partnership's agreement recognizes that Coconino County has a track record of successfully working with the Forest Service to implement non-traditional land management processes, which is most notably characterized by the successful Schultz Flood Mitigation Project.
- The use of a Good Neighbor Authority Agreement allows the County to assume the responsibility and risk for mitigating the existing poor and dangerous forest health conditions on Bill Williams Mountain.
- In support of transferring the responsibility and risk, the Forest Service will implement modernization practices, which recognize the no and low value of the timber and improve project cost effectiveness.

Roles & Responsibilities of the County and the Forest Service

Coconino County Roles and Responsibilities

- The County will be responsible for securing the majority of the project funding, and if advantageous third-party financing (Blue Forest Conservation or another lender).
- The County, through a Good Neighbor Authority Agreement will be responsible for implementing an agreed-to forest restoration plan that is in conformance with the Record of Decision.
- The County will seek opportunities to develop new industry partners and engage the existing forest restoration industry in achieving project goals and in doing so strengthen the overall forest restoration industry.
- The County will work with industry partners to test promising technologies in an effort to reduce costs and improve air quality.
- The County will pursue granting opportunities and/or other funding mechanisms for developing a workforce-training program.
- The County will increase allowable truck weights on County roads that will support the project.

U.S. Forest Service Roles and Responsibilities

- The Forest Service leadership will champion this non-traditional pilot project by supporting the Kaibab National Forest in implementing modernization practices outlined in the *Accelerating Restoration Implementation Workshop Report* that ensure project outcomes and economics.
- The Forest Service will identify on-forest locations that will assist industry with in-woods efficiencies.
- The Forest Service will increase allowable truck weights on Forest Service roads that will support the project and/or allow for products to be left in-woods to reduce moisture content.
- The Forest Service will support the creation of a forest restoration plan for Bill Williams Mountain that recognizes the no to low value of the timber and allows the piloting of new technologies to reduce costs and improve air quality.
- The Forest Service will commit the necessary resources to ensure restoration within the five-year timeline through direct funding and/or in-kind service support of the project.

Bill Williams Mountain Forest Restoration Plan

The Bill Williams Mountain Forest Restoration Plan encompasses 15,000 acres of National Forest land. Kaibab National Forest completed the NEPA process for restoring Bill Williams Mountain and secured a Record of Decision in December 2015. The plan includes the use of conventional forest restoration measures for 11,000 acres and steep slope technologies (hand thinning, helicopter and tethered Ponsse) for 4,000 acres. The estimated cost for implementing this plan is approximately $10 million. No Forest Service funding has been allocated to this area. The Kaibab National Forest recently offered the Ham and Beacon Hill timber sales, totaling 3,377 acres, and the Coconino National Forest offered the Windmill timber sale with 1,399 acres. No bids were submitted for any of these sales and the Kaibab National Forest is still planning to offer three additional timber sales in 2018 containing another 4,330 acres. These results once again point to the need for an innovative approach through this pilot project.

In finalizing the Bill Williams Mountain Forest Restoration Plan, the Forest Service and Coconino County will work together to complete a plan that ensures that the identified 15,000-acre area is restored within five years.

Key Project Elements

Potential Funding Sources

- Coconino County Flood Control District (FCD)
  - *Recent changes to the FCD create additional funding opportunities*
  - *The current FCD priority is forest restoration*
- City of Williams
- U.S. Forest Service
- National Forest Foundation's Northern Arizona Fund (Corporate Foundations, Corporations & Private Donors)
- Arizona Department of Forestry and Fire Management
- FEMA Pre-Disaster Mitigation Grant Funds
- Workforce Development Funds
- Environmental Organizations
- Private Investors and Opportunity Zone Investors

Financing

The County has been in conversations with Blue Forest Conservation (BFC) regarding the possible use of a Forest Resiliency Bond. In addition, the County has engaged a financial advisor who can support evaluating financing options. The project may or may not benefit from financing, depending upon the success of raising funds and reducing costs. BFC has also indicated that the organization can assist with pursuing private parties interested in investing in the forest restoration industry, which could be linked to federal opportunity zone tax benefits.

Innovative Partnership & Agreement Structures

A 20-year Good Neighbor Authority Agreement between the Forest Service and the County would be supported by a strong partnership with the National Forest Foundation (NFF). The County is willing to consider NFF serving in a project management role with significant involvement by the County's Forest Restoration Director. Given the strong timber management experience of the County's Forest Restoration Director, the County will also consider self-managing the project.

Strengthen Forest Restoration Industry

Limited forest restoration related industries exist in this region, which has had a major negative impact on forest restoration. A specific industry investment strategy will be developed to ensure that there are mechanisms for addressing the preponderance of no and low-value wood products resulting from implementing the Bill Williams Forest Restoration Plan.

Several promising efforts are underway that can complement the proposed pilot project. First there is an opportunity to leverage other nearby forest restoration projects including the restoration of 14,000 acres on Camp Navajo and any master stewardship agreements resulting from 4FRI, including The Nature Conservancy's Clover Master Service Agreement on the south side of Bill Williams Mountain.

Second, a biomass feasibility study, funded by Camp Navajo is underway. The study is evaluating the feasibility not only at Camp Navajo but in the greater Flagstaff area. APS is currently soliciting for biomass energy and the Arizona Corporation Commission is making a concerted effort to more fully engage biomass in Arizona's energy future.

Third, several firms are expressing strong interest in investing in various wood processing facilities and need land and/or facilities. Camp Navajo is a highly desirable location given the access to rail spurs, utilities and facilities. The Forest Service and County can support the Camp's efforts to accommodate forest restoration related industrial development.

Lastly, many forest restoration firms need locations either within the National Forest or on nearby private lands to conduct their operations, which include conventional sawmills and dry kilns, chipping machines, pellet mills and newer technologies like Altree, which is a mix of wood chips and recycled plastics to create solid pieces used for signs, for example.

Modify Traditional Forest Service Practices to Improve Project Economics

This project will incorporate piloting lower cost practices for managing forest restoration projects that were identified during the *Accelerating Restoration Implementation Workshop*. The workshop report, found in Appendix A includes a comprehensive list of these reforms, but the County believes that the following list of reformed practices is crucial to this project:

- Allowing the use of Air Curtain Burners to dispose of slash on site.
- Significantly reduce scaling, branding and painting requirements.
- Allowing processed wood to be left in the decks longer to reduce the moisture content, which decreases the haul cost for contractors.

Use Appropriate Technology to Reduce Costs and Environmental Impacts

The enormous amount of biomass resulting from forest restoration in Arizona creates significant costs and obstacles to restoration. The County proposes to use air curtains to burn the biomass in the field. Pile burning is creating poor air quality and is negatively associated with forest restoration measures. Burning the biomass at high temperatures using air curtains significantly reduces air quality impacts and eliminates the need to transport. For the steep slope areas on Bill Williams Mountain, the County proposes using tethered Ponsse harvesting equipment to reduce environmental impacts and improve project economics.

Lastly, our plan is to work closely with environmental corps groups to secure funding, so their crews can perform hand thinning on this project. This approach lowers the cost of treating steep slopes and provides important job skill development.

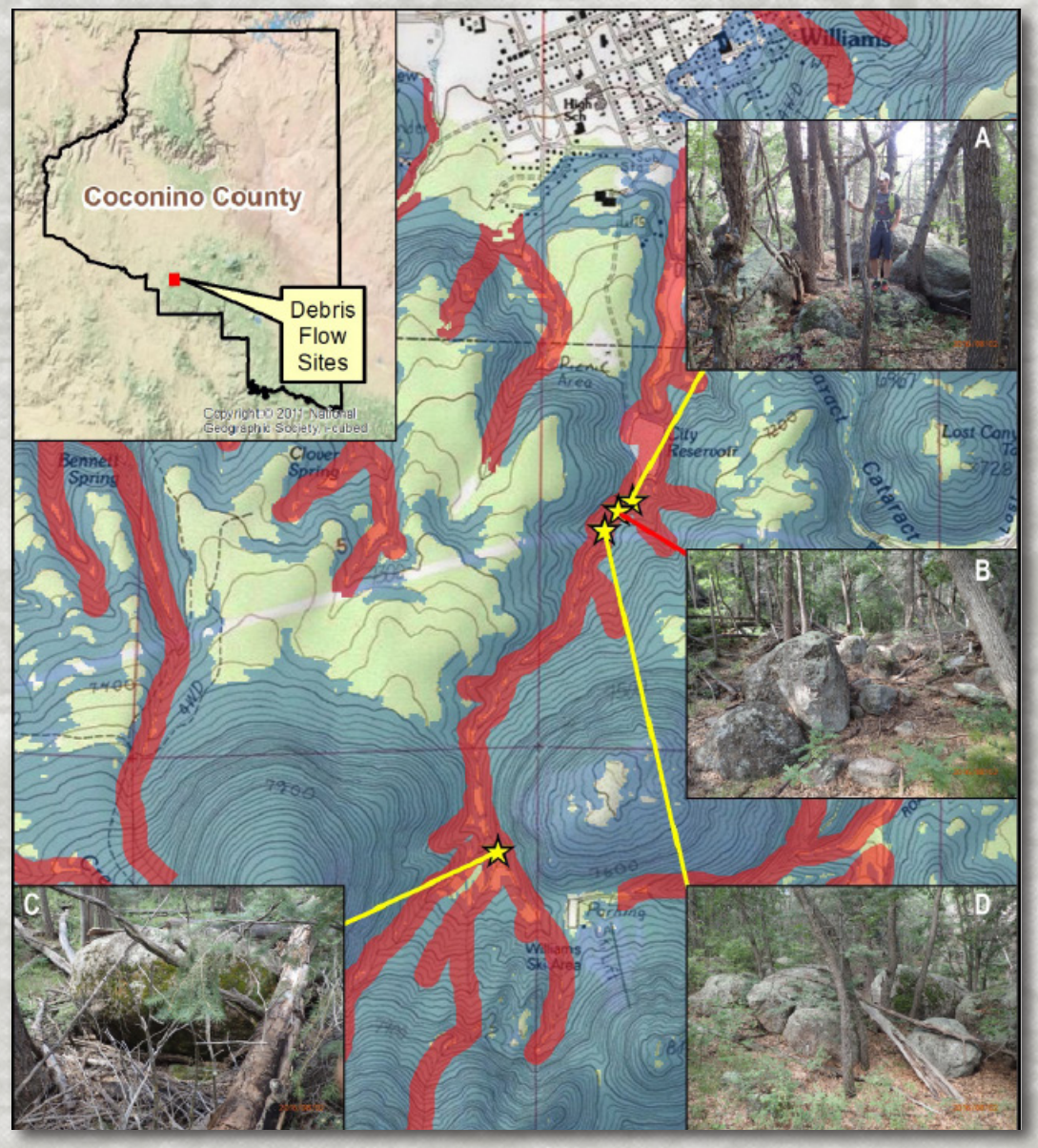
Summary

In closing, catastrophic wildfire and post-wildfire flooding are the greatest threats to public safety in Coconino County. The Board of Supervisors, acting as the Board of Directors of the County Flood Control District has identified forest restoration as the highest priority action to address these threats to public safety. The County believes that the successful partnership that was forged with the Forest Service in the wake of the devastating Schultz Fire and subsequent flooding can now deliver important outcomes relative to forest restoration through an innovative pilot project.

The County and Forest Service (and other partners and beneficiaries) must boldly move ahead now with creating this partnership and finalizing the plan to restore Bill Williams Mountain given the extreme risk posed by the condition of the forest. The County is committed to the goals and principles outlined in this proposal and is looking to the Forest Service's leadership to advance this innovative pilot project so that restoration can be completed within five years. The lessons learned and success of this project will serve as a model and inspiration to other communities throughout the west to enter into partnerships to advance forest restoration.

Post-Wildfire Debris-Flow & Flooding Assessment: Coconino County, Arizona

Joseph B. Loverich[1], Ann M. Youberg[2], Michael J. Kellogg[1] and Jon E. Fuller[1]
[1]JE Fuller Co., [2]Arizona Geological Survey



Pre-Wildfire Field Conditions near Williams, Arizona

August 2017

OPEN-FILE REPORT OFR-17-06

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Arizona Geological Survey

P.A. Pearthree, Arizona State Geologist and Director

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Post-Wildfire Debris-Flow and Flooding Assessment

Coconino County, Arizona

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Executive Summary

The Coconino County Post-Wildfire Debris Flow and Flooding Assessment identified areas that are at risk for flooding and debris flows in the aftermath of a reasonable-scenario wildfire. The study consisted of a countywide reconnaissance-level evaluation, and more detailed planning-level evaluation of post-fire flood and debris flow hazards for two pilot study areas in Fort Valley and the City of Williams. The pilot study results were based on field investigations, state-of-the-art two-dimensional FLO2D pre- and post-wildfire flood computer modeling, LAHARZ debris flow computer modeling, and GIS terrain and geographic modeling.

This study concluded that up to 34% of the buildings, and up to 26% of the critical facilities in Coconino County are at some level of increased risk of post-fire flooding, if no actions are taken to reduce the risk of severe wildfires. As many as 593 homes (2,191 parcels) in Coconino County, as well as 13 dams and other critical facilities, may be impacted by post-fire debris flows. Within the two pilot study areas, a reasonable-scenario wildfire could increase flood peaks by a factor of 4-5 times the existing 100-year flood levels, with up to a 350% increase in the number of buildings in flood-prone areas. While debris flows typically will impact only areas with land slopes greater than 5%, the resulting increased sediment deposition downstream of the debris flows will adversely impact properties and infrastructure downstream. Private homes, public buildings, roads, major transportation corridors, water supply, and other public utilities would all be adversely impacted by post-fire floods and debris flows. Maps showing post-fire flood and debris flow hazard areas were developed for the two pilot study areas.

The study also concluded that forest health initiatives can effectively mitigate as much as 58% of the post-fire flood and debris flow risk. However, the watershed modeling demonstrated that treatments such as forest thinning must include the entire watershed, including currently designated wilderness areas, to maximize the treatment benefit. Work in wilderness areas will require increased advanced planning, coordination and permitting with federal agencies. Other recommended risk mitigation actions include implementation of development guidelines to prevent new development from repeating past mistakes, creation of emergency action plans to streamline post-fire recovery efforts, and community awareness and public education activities to build support for safe development and mitigation efforts.

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1 INTRODUCTION

1.1 PURPOSE OF STUDY

Trends of increasing wildfire size and severity across the western U.S.[1] and concurrent encroachment and development into the wildland-urban interface[2] place more people and infrastructure at greater risks from wildfires and the aftermaths of fires. Wildfires dramatically alter watershed hydrologic conditions, substantially increasing the potential for post-fire floods and debris flows[3]. To further complicate matters in the Southwestern U.S., the wildfire season often ends at the onset of monsoonal rainfall, which may ultimately extinguish wildfires while producing large floods and debris flows in the immediate aftermath of a fire. These scenarios allow for very little time to assess post-wildfire damages and hydrologic changes, and to implement mitigation measures.

This phenomenon was highlighted in 2010 by the human-caused Schultz Fire on the Coconino National Forest northeast of Flagstaff, Arizona. The aftermath illustrates the challenges many developed areas have dealing with post-wildfire flooding and debris flows. The Schultz Fire was driven by high winds quickly across the steep eastern slopes of the San Francisco Peaks: approximately 60% of the total 15,075 acres (23.5 sq mi) burned on the first day[4]. Over a thousand residents from nearby housing developments were evacuated, although ultimately no structures were directly impacted by the fire itself. Following the fire, heavy rains from the 4th wettest monsoon on record in Flagstaff resulted in numerous debris flows, significant erosion, and substantial flooding of downstream residential areas[5]. Although the initial debris flows were confined to Forest Service lands, multiple sediment and ash-laden floods downstream of debris flow areas caused extensive damage to residential neighborhoods, homes, property and

Figure 1 - Risk

[1] Dennison et al., 2014; Westerling et al., 2006; Williams et al., 2010
[2] Moritz et al., 2014; Stein et al., 2013
[3] Moody and Ebel, 2012; Neary et al., 2005; Riley et al., 2013
[4] USDA Forest Service, 2010
[5] Youberg et al., 2010

infrastructure up to four miles from the burn area[5]. The risk that wildfires pose (Figure 1) on local communities can take many forms, many which happen after the fire has been extinguished.

The purpose of this study was twofold; first to determine areas within Coconino County which may be at risk for flooding and debris flows in the aftermath of a reasonable-scenario wildfire, and second to determine the extent and severity of that risk in two pilot study areas (Williams and Fort Valley).

This study has been done cooperatively between FEMA, Coconino County, Arizona Geological Survey (AZGS) and JE Fuller to identify previously unrecognized debris flow and flood risk zones. Results from this study provides information to help Coconino County, local communities and the U.S. Forest Service identify areas that should be targeted for fuel reduction treatments, develop appropriate emergency response plans and devise strategies to increase a community's resilience to post-fire floods and debris flows.

1.2 Scope of Study

This project includes a multi-stepped approach (Figure 2) to understanding where there are post-fire flood and debris flow risks within Coconino County and the potential severity. Each phase of the project was done in cooperation with Coconino County, JE Fuller, and the AZGS.

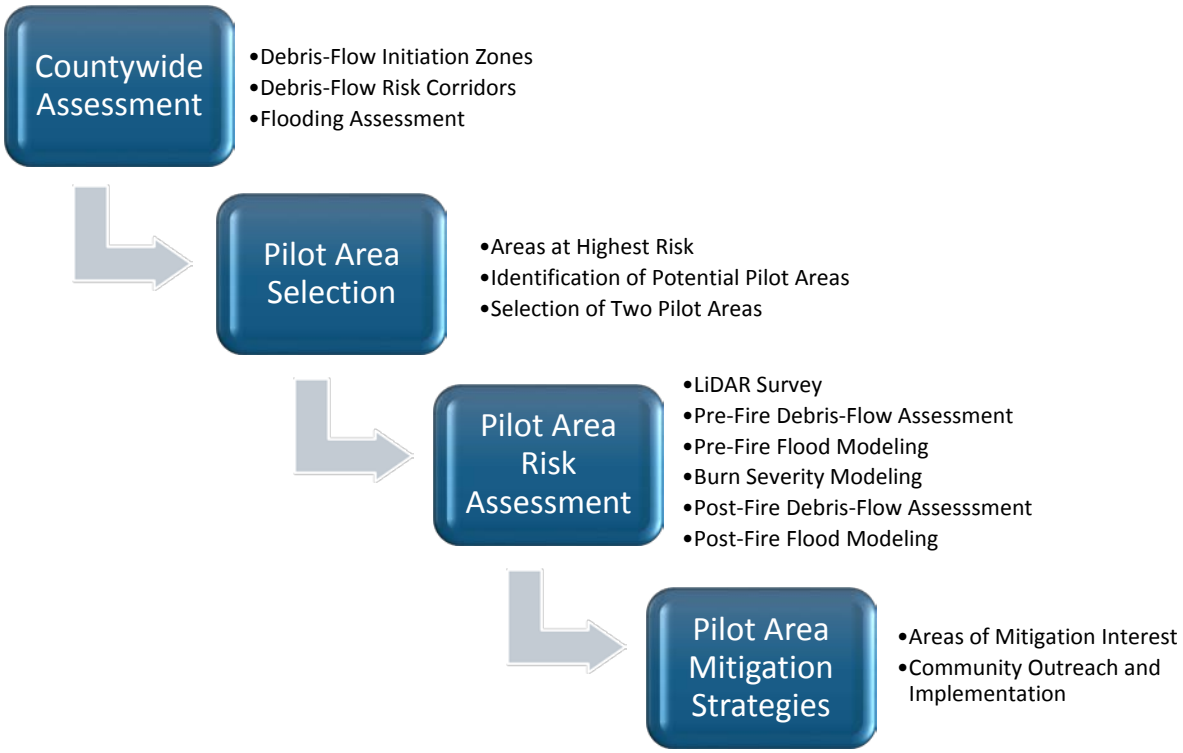

Figure 2 - Process

A summary of each phase of this project is presented in the following sections.

1.3 Study Methodology

Two pilot study areas were selected for more detailed analyses. Two burn scenarios for the City of Williams area were developed by the US Forest Service (USFS). For the Fort Valley area, forest burn severity was modeled by JE Fuller for three different cases in utilizing FlamMap Version 5[6]. The results of the fire severity models were used to model changes in flood and debris flows risk. FlamMap utilizes a series of user-specified input parameters to approximate fire behavior over a landscape. The input parameters can be calibrated using data from recent nearby fires, and varied to produce reasonable fire behavior results. Many of the parameters utilized for the Fort Valley area were provided to JE Fuller by the Coconino National Forest. These parameter files were used to represent conditions in which the fire is burning and, in the case of Fort Valley, parameters were used to closely represent conditions found at the time of the 2010 Schultz Fire. We chose to use parameters similar to the Schultz Fire to compare modeling results with previous post-fire responses. All model runs were completed using the Scott/Reinhardt crown fire calculation method.[7] The selected output included Crown Fire Activity and Heat/Unit Area.

FLO-2D PRO was chosen as the combined hydrologic and hydraulic model for both the pre- and post-fire conditions analysis. FLO-2D is a two-dimensional, flood routing model that simulates unconfined overland flow over complex topography. This modeling platform was chosen because of the distributary and unconfined sheet flooding conditions in the Fort Valley area. The model includes components such as rainfall, infiltration, and hydraulic structures (e.g., bridges, levees, culverts, etc.). An emphasis of this study is to understand and quantify the impact of increased forest health due to forest treatments (thinning, control burns, etc.) on downstream flood risk.

Debris flow inundation zones were determined in several steps. First, geomorphic data collected after the Schultz Fire was used to evaluate the current U.S. Geological Survey (USGS) post-fire debris flow volume model[8] with mapped post-Schultz Fire deposits[9]. The purpose of this step was to assess how well modeled debris flow volumes compare to volume estimates derived from field mapping. These data were then used to select volumes for modeling potential inundation zones with LAHARZ[10]. LAHARZ is an empirical model first developed to identify potential hazard zones from lahars, a type of volcanic flow. LAHARZ was later modified to include rock avalanches and debris flows, and subsequently adapted to model Arizona debris flows. LAHARZ is an ArcMap toolbox add-in. It provides a first-order approximation of the area that could be inundated by a debris flow for a given flow volume. Modeled LAHARZ inundation zones were compared with mapped post-Schultz Fire deposits to inform the interpretation of model results in the pilot study areas. The pilot study areas were assessed using the current USGS post-fire debris flow probability and volume models[6], and potential inundation zones were identified using LAHARZ[8].

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[6] Joint Fire Sciences Program, 2015
[7] Stratton, 2009
[8] Gartner *et al.*, 2014; Staley *et al.*, 2017
[9] Youberg, 2015
[10] Schilling, 1998; Schilling, 2014

2 COUNTY-WIDE ASSESSMENT

2.1 IDENTIFICATION OF POST-WILDFIRE DEBRIS-FLOW RISK CORRIDORS

The first project task consisted of a County-wide reconnaissance-level assessment of wildfire and debris flow vulnerable lands. The assessment was completed using Geographic Information System (GIS)-based analyses utilizing the following data and sources:

- Topography – (USGS 10-meter digital elevation model)
- HUC-12 Watersheds – (Hydrologic basins delineated by USGS)
- Land Ownership and Assessor Parcels – (Coconino County GIS)
- Buildings – (Coconino County GIS)
- Jurisdictional Dams – (Arizona Department of Water Resources)
- Highways, Railways, and Streets – (Coconino County GIS)
- Severe Fire Potential – (U.S. Department of Agriculture)
- Critical Facilities – (Coconino County Multi-Jurisdictional Hazard Mitigation Plan)
- Gas Transmission Mains – (Energy Transfer and Kinder Morgan)

Debris Flow Risk Corridors were determined by assigning a 100-meter wide corridor to stream flow networks developed from USGS 10-meter digital elevation models (DEM). Research indicates that debris flow initiate on slopes ranging from 15 degrees (27%) to greater than 40 degrees (84%)[11]. Analysis of debris flows after the 2010 Schultz Fire suggests the runout of most debris flows did not extend beyond a 5-degree slope. Thus, the County-wide debris flow risk corridors developed for this study (Figure 3) begin at slopes above 15 degrees and end where the slope reduces to less than 5 degrees (9%). All the corridors originate in watersheds that have potential for moderate to high severity wildfires.

The debris flow risk dataset provides Coconino County with a valuable county-wide planning tool to identify areas subject to debris flow hazards after wildfires. Although this analysis produced in county-wide results, it is recognized that debris flows in some areas would have more severe consequences than in others. For example, post-wildfire debris flow risk corridors that intersect dams, buildings, roads, and other infrastructure would be far more devastating than a debris flow risk corridor that occurred on undeveloped public land (Table 1).

Table 1 - Debris Flow Risk Corridor Weighting Criteria

Criteria	Number of Features within the Debris Flow Risk Corridors
Dams	13
Critical Facilities	10
Buildings	593
Highways, Railways, Streets, Pipelines	1,279
Parcels	2,191

[11] Melton, 1965, Takahashi, 1981; Rickenmann and Zimmermann, 1993; Coe and others, 2008; Webb and others, 2008a; Kean and others, 2013; Youberg, 2014

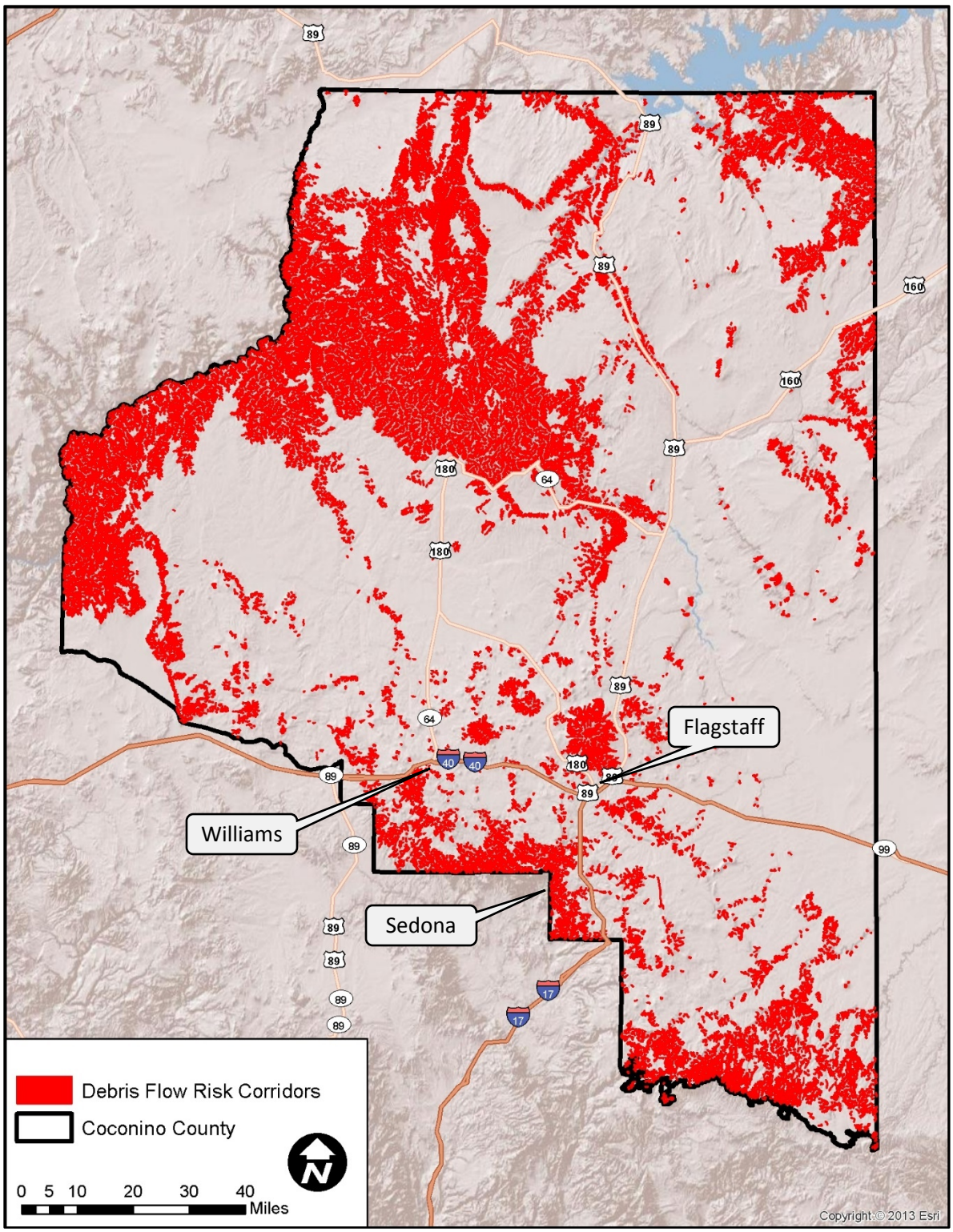


Figure 3 - Post-Wildfire Debris Flow Risk Corridors

The results shown in Table 1 and Figure 3 clearly indicate that post-fire debris flows are a significant risk to public infrastructure and private land in Coconino County.

2.2 Potential Pilot Area Identification and Selection

The debris flow risk corridors were used as a guide to highlight potential pilot study areas. These risk areas are generally confined to specific flow path(s) within a larger watershed. With this understanding, potential pilot study areas were defined by delineating a watershed which encompasses the debris flow stream corridor, as well as the potential flood risk area.

The process of identifying areas prone to post-wildfire debris flow and flood risks relied on a numerical ranking scheme based on the number of structures, parcels, etc. impacted, as well as application of common sense and engineering judgment to find watersheds that appear to be at risk. Five areas within the County were identified for consideration (Table 2, Figure 4). After inspection of the maps and the numerical ranking results, two areas, Williams and Fort Valley, were selected as the best candidates for detailed pilot studies.

Table 2 - Potential Pilot Areas

#	Name	HUC-12 Watershed Name	Area of Debris Flow Study	Flooding study	Community Impacted
1	Williams	Cataract Creek Headwaters	Upper Cataract Creek drainages/ High School Hill	Cataract Creek drainages extending to I-40	City of Williams
2	Fort Valley	Upper Rio De Flag	Big and Little Leroux Spring area	Upper Rio de Flag watershed ending at South Snow Bowl Road	Fort Valley
3	Spruce Avenue Wash	Lower Rio De Flag	East side of Dry Lake Hills/west side of Mount Elden	Spruce Avenue Wash watershed	City of Flagstaff
4	Sedona	Middle Oak Creek	Multiple drainages within the Sedona Area	Multiple drainages that outlet into Oak Creek. Oak Creek is not included.	City of Sedona
5	Stoneman Lake	Red Tank Draw	East Side of Stoneman Lake	East Side of Stoneman Lake	Ponderosa Paradise

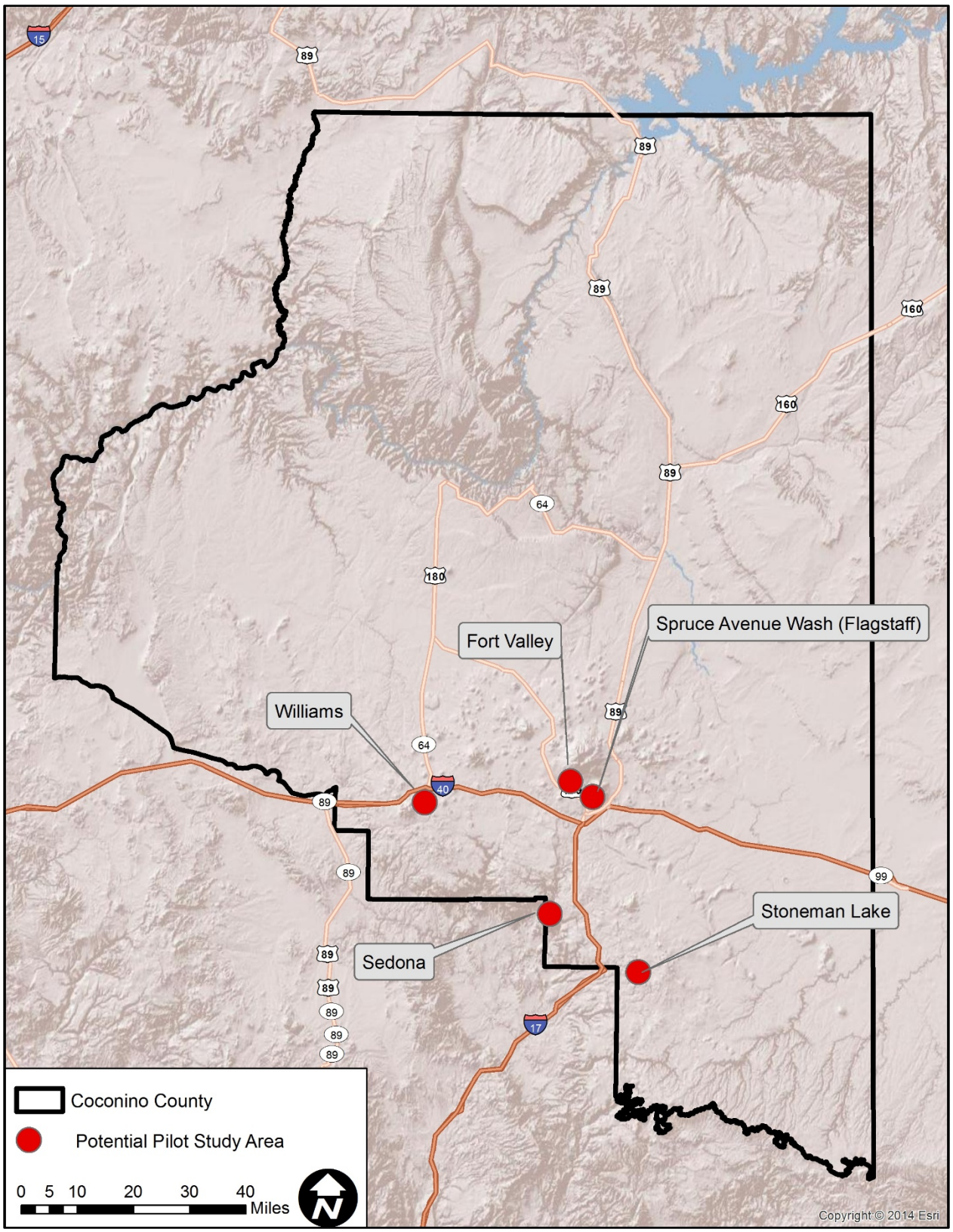


Figure 4 - Potential Pilot Study Areas

The Williams Pilot Area was selected for the following reasons:

- The watershed has a high potential to burn.
- Potential for debris flows to directly impact homes is high.
- Two drainages have reservoirs used as a source of city water. Debris flows and post-fire flooding may negatively impact the municipal water.
- A large number of structures may be inundated after a fire.
- The Kaibab National Forest had already developed burn scenarios that could be used to generate proxy burn severity maps for the Bill Williams Mountain area.
- The area on the north side of Bill Williams Mountain had been scheduled for forest treatments, but the treatments have been delayed indefinitely.
- The study and community outreach has the potential for a cooperative effort with the City of Williams.

The Fort Valley Pilot Area was selected for the following reasons:

- FLO-2D mapping has been done for the area. Since the base mapping was complete, pre- and post-thinning burned conditions could be readily modeled.
- Since an Initial Engineering Assessment (IEA) was recently completed by the County for this area, the pilot study area would be the next logical step in modeling flooding impacts and the benefit of mitigation.
- Fort Valley is in the unincorporated portion of the County, so any recommended planning or mitigation measures do not need to be coordinated with any other towns or cities.
- Fort Valley's location in the San Francisco Peaks is similar to the Timberline area relative to Schultz Peak. Timberline was severely impacted from post-wildfire floods and debris flows following the 2010 Schultz Fire. Fort Valley would likely see similar impacts if a similar wildfire and rainfall occurred on the forested slopes above this community.

3 Fort Valley Risk Assessment

The Fort Valley Pilot Area was studied to understand the pre- and post-wildfire risks associated with flooding and debris flows. To accomplish a full comparison of pre-and post-fire risks, the following watershed conditions were studied and are described in the following sections.

- Pre-Fire (unburned)
- Post-Fire, No Treatment
- Post-Fire, Treatment up to 8,200 Feet (Excluding the Kachina Peaks Wilderness Area)
- Post-Fire, Treatment (all areas)

3.1 Pre-Wildfire Risk Assessment

3.1.1 Assessment of Past Debris Flow Occurrence

The goal of this phase of the study was to assess if the Fort Valley watersheds could have debris flows after a wildfire. To do this, reconnaissance field investigations were conducted to determine if evidence of past debris flows is present in the main drainages leading to Fort Valley. Field observations were made at various locations on three main drainages at the north end of Fort Valley.

On all the main drainage channels, boulder deposits were found that had levee- and snout-like forms, which are probably associated with past debris flows (Figure 5). Most of these deposits were located in the lower elevation channel areas and on alluvial fans, while many were found within and adjacent to the channels higher in the basins. Debris flow-like boulder deposits were also found on several, but not all, tributary drainages, typically at the confluence with the main drainage.

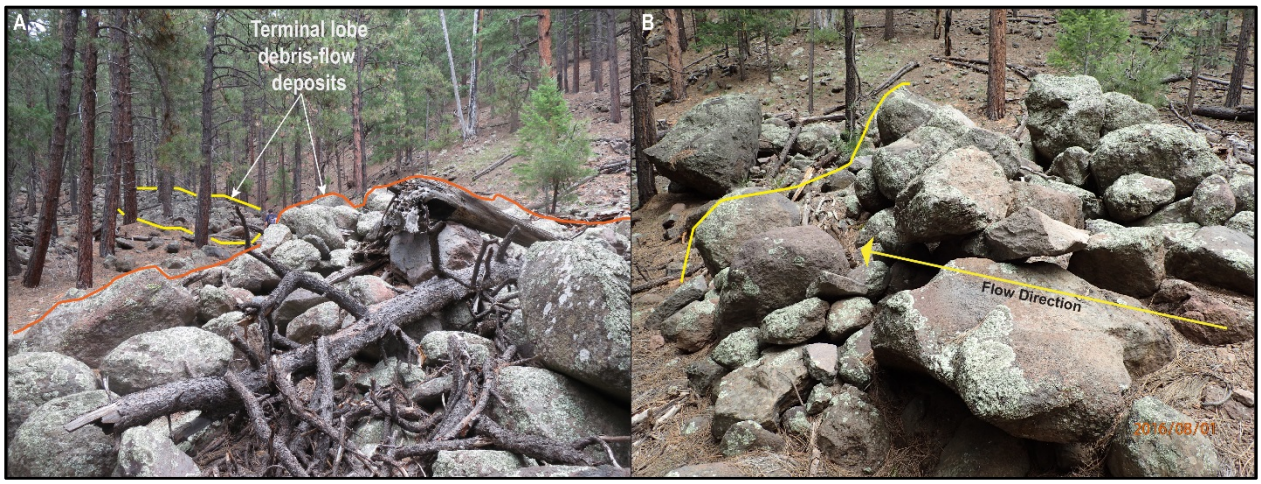


Figure 5 - Bulbous boulder deposits

Debris flow deposits were documented in the Fort Valley pilot study area in most channels that were assessed (Figure 6), and the observed deposits appear to agree well with the assumptions made in countywide assessment. These deposits are not dated but are likely geologically recent. Evidence of debris flows were limited to the base of channel areas and fan apexes. Deposits far from the channels were not observed, but may be present. Although debris flows may not travel far beyond an alluvial fan

apex, sediment-laden floods will and will be exacerbated by the occurrence of debris flows. Therefore, it was concluded that the Fort Valley area is subject to risk of post-fire debris flows.

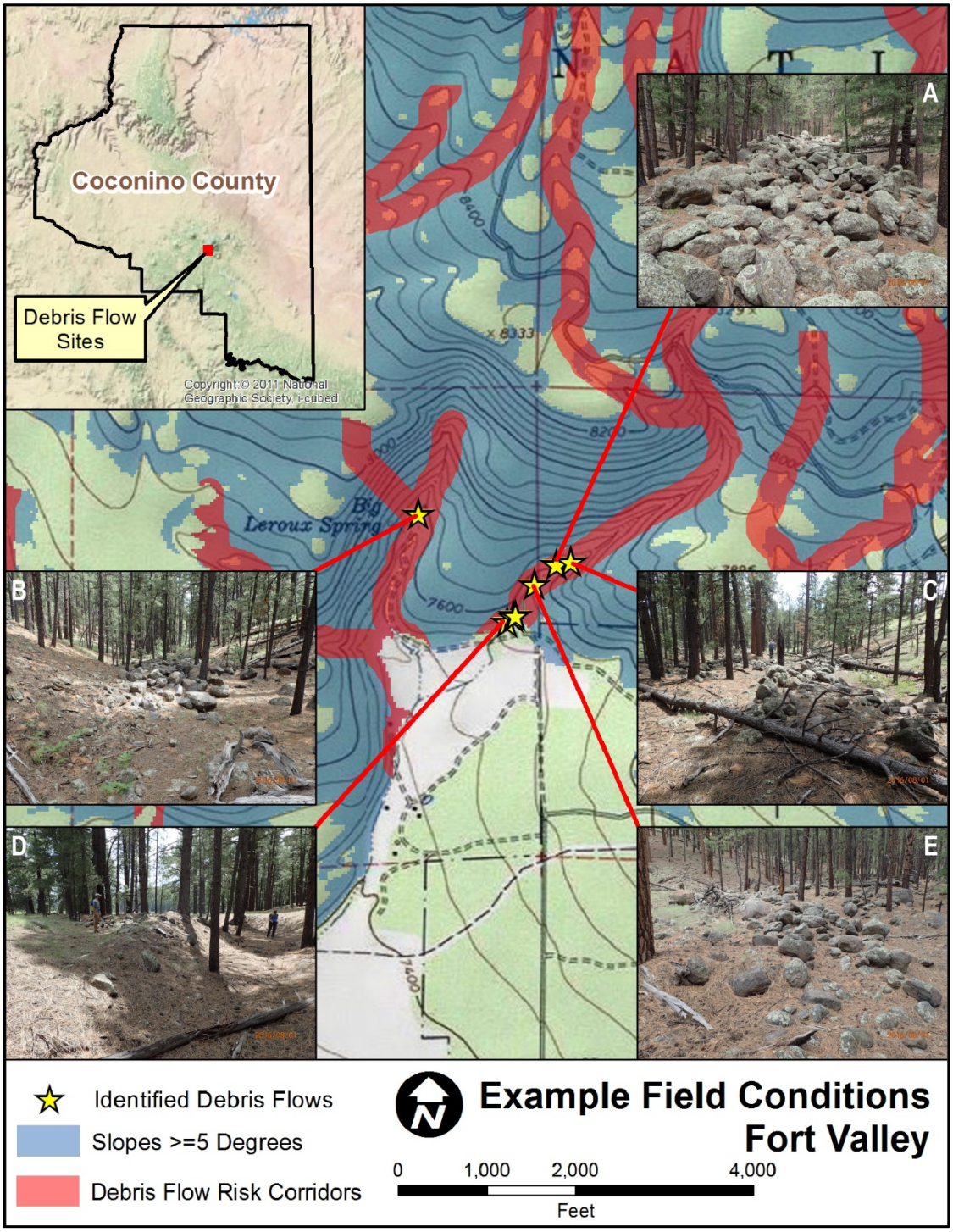


Figure 6 - Fort Valley Pre-Wildfire Field Conditions

3.1.2 Pre-Wildfire Flooding Assessment

The pre-wildfire flood risk was estimated for the 2-, 10-, and 100-year events for the Fort Valley Area. The full results are not presented in this report, but a detailed description of the pre-fire flooding assessment is provided in Appendix B. Figure 7 shows the pre-wildfire 100-year depth results.

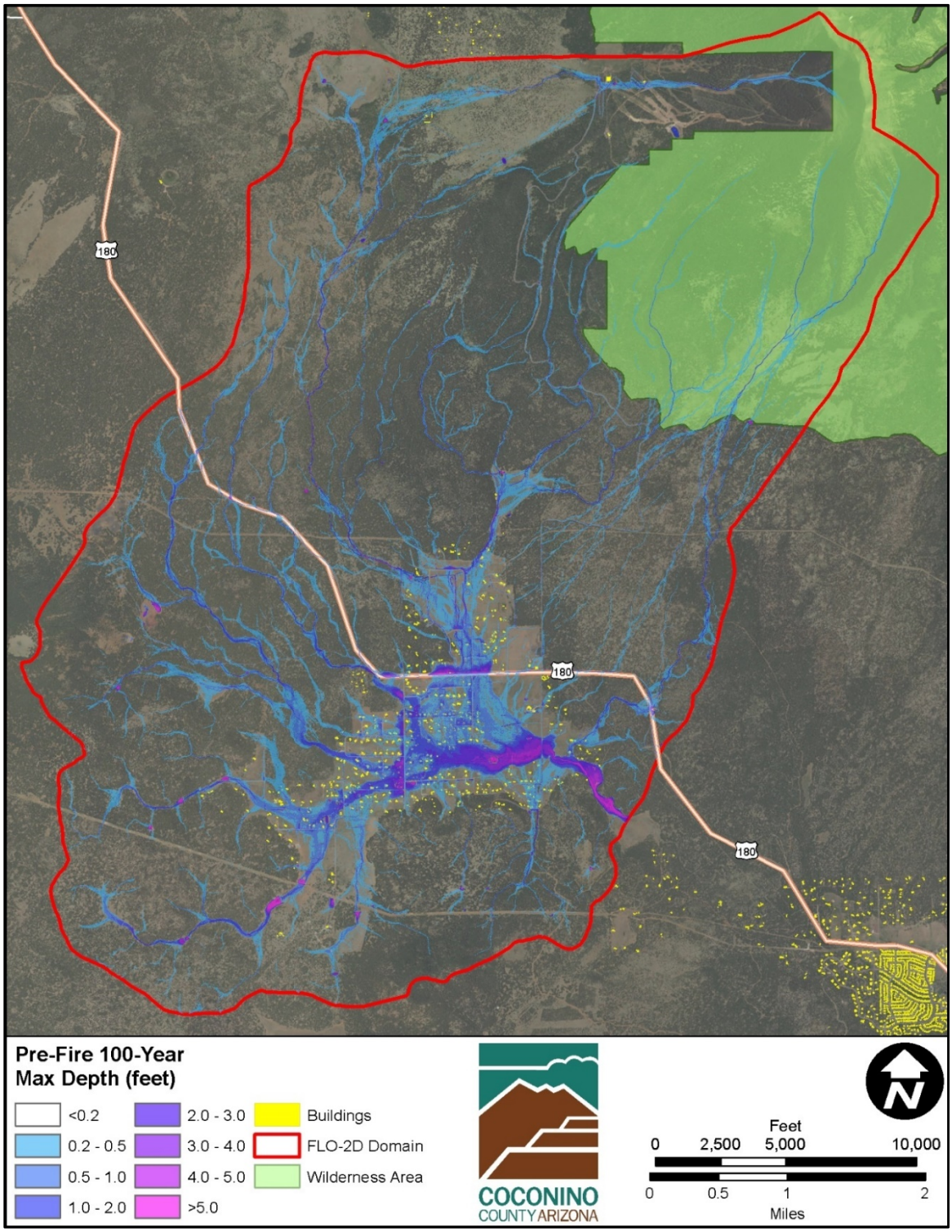


Figure 7 - Fort Valley 100-Year Pre-Wildfire Max Flow Depth

3.2 Wildfire Burn Severity Modeling

The majority of the Fort Valley pilot area was not included in the USFS fire modeling prepared for the Four Forest Restoration Initiative (4FRI) Environmental Impact Statement (EIS). Therefore, JE Fuller performed fire severity modeling to determine potential runoff curve number changes for a post-wildfire condition. Appendix D contains the full modeling results.

The Fort Valley burn modeling included the following scenarios to reflect potential watershed conditions:

- No Treatment
- Treatment up to 8,200 Feet (No treatment in wilderness areas)
- Treatment (all areas)

Forest treatment refers to thinning and controlled burn efforts used to reduce the density of the trees and the fuel load on the ground. The Fort Valley watershed extends to the top of Agassiz Peak, and includes a large portion of Wilderness Area which has use restrictions that currently prohibit certain types of forest treatment. As such, a fire modeling scenario was included with a fully treated watershed that excluded the wilderness area.

Results from the fire modeling were used to determine curve number adjustments used in the hydrologic modeling described below.

3.3 Post-Wildfire Debris-Flow Risk Assessment

The Fort Valley debris flow contributing basins were modeled for debris flow probability and volumes based on three burn scenarios. Because debris flows typically initiate in the steep headwaters of basins, which are the areas encompassed by the designated Wilderness, the "Treated All" scenario was included to assess if different responses could be seen between the three forest conditions.

Modeling results show that 15-minute rainfall intensities needed for a 50% probability that a debris flow would occur in the watershed (Table 3, Figure 8) are very low for both treated and untreated conditions. Results show that very minor storms can trigger debris flows in untreated conditions in the Fort Valley study area.

Table 3 - Fort Valley 50% Debris Flow Probability

Modeled Scenario	15-minute rainfall Intensity (inches/hour)	Approximate Storm Event
Treated All	1.5 – 3.2	1 – 5-year storm event
Treated to 8200'	0.8 – 1.7	<1-year storm event
Untreated	0.8 – 1.4	<1-year storm event

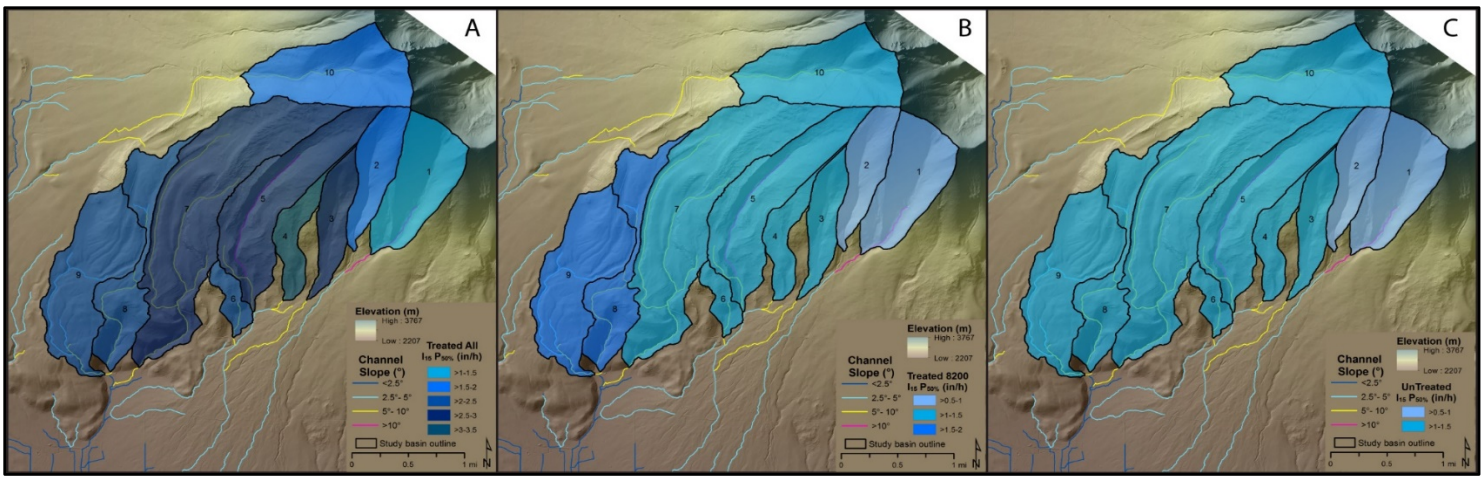


Figure 8 - 15 Min rainfall intensity required for a 50% probability of a debris flow for the TreatedAll (A), Treated8200 (B), and Untreated (C) scenarios.

Potential post-fire debris flow inundation zones were assessed in the Fort Valley watershed using LAHARZ (Figure 9). LAHARZ deposition points were selected based on the channel gradient change at or near the basin mouth, and on loss of channel confinement. Additional deposition points were selected downfan where channels, confined above, lost confinement, and also at the end of debris flow corridors developed during the countywide assessment. A deposition point for the northern portion of the watershed was selected above the Snowbowl Ski Area where the channel sharply turns across the terrace.

Snowbowl Ski Area is located below a bowl on the west side of the San Francisco Peaks and does not flow directly into Fort Valley (Figure 10). While hillslopes in the bowl are steep, channel slopes are 5-10°. LiDAR topography shows terraces along the channel above the ski area. If a post-fire debris flow initiated on the steep hillslopes, there appears to be a good source of transportable material in the terraces that could be eroded and entrained in a flow. Based on observations in the Schultz Fire burned area, debris flows could travel down channels with the existing slopes. The LAHARZ hazard zones show confined and consistent runout patterns for all volumes modeled. If a wildfire burned the slopes above the ski area at high and moderate severity, and a debris flow was initiated during a storm, it is possible that the ski area would be impacted, if not directly by a debris flow, then by flood or hyperconcentrated flows. Depending on where debris flow deposition begins and the runout distance, various facilities at the Snowbowl Ski Area could be impacted including buildings and a cell tower.

LAHARZ model results from basins that flow directly into the meadows of Fort Valley indicate that debris flows are unlikely to directly impact private property or county-identified buildings or critical infrastructure, if deposition begins near points selected in this modeling. While none of the modeled inundation zones approach the developed meadows below, impacts will depend on where deposition actually begins, as well as the characteristics of the flows. High flows across fan surfaces could erode existing channels or cut new channels, providing additional sediment for delivery into the developed areas. In newly incised and confined channels, breach hydrology (debris jams) could occur resulting in temporary dams, dam breaks, and debris flows redeveloping and traveling farther downstream. However, the developed areas will likely be impacted from sediment-laden flood flows and hyperconcentrated flows (flood waters containing high loads of debris, boulders, ash and sediment) that could carry sediment, some of which may be large cobbles or small boulders into the developed areas

below. The developed meadows will probably be impacted similarly to those developed areas below the Schultz Fire.

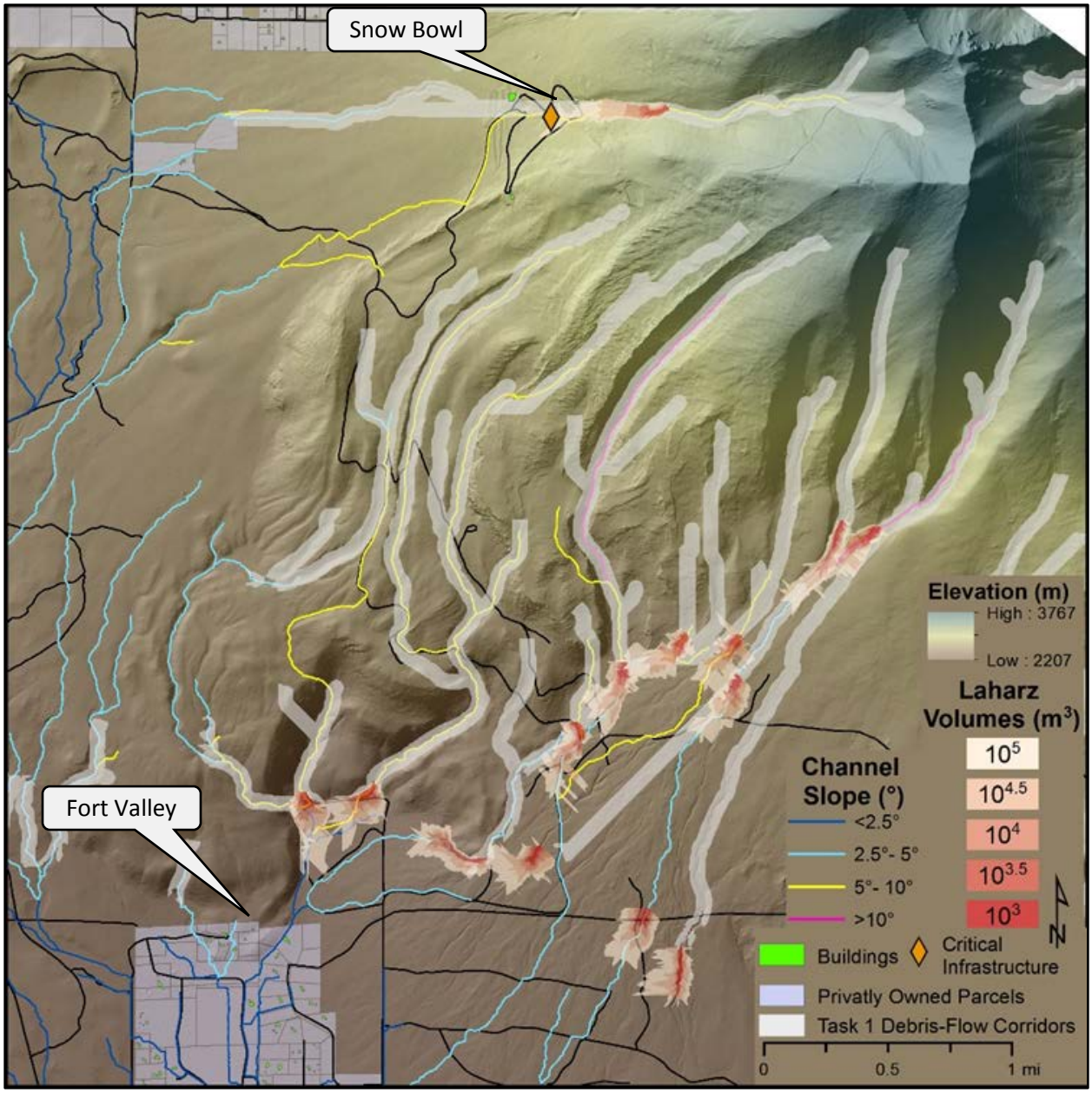


Figure 9 - Fort Valley LAHARZ Model Results

Figure 10 - LAHARZ Model Results at Snowbowl

Results from the 1-year storm show a response difference between the three scenarios. An important comparison is the probability that a debris flow will occur during a 1-year storm event (Table 4) and the hazard class ranking of the contributing basins (Figure 11).

Table 4 - Fort Valley Debris-Flow Probability

Modeled Scenario	Probability of Debris Flow in 1-Year Event	Basin Hazard Class Ranking
Treated All	45% - 77%	Moderate to High
Treated to 8200’	66% - 99%	Moderate to High
Untreated	77% - 99%	High

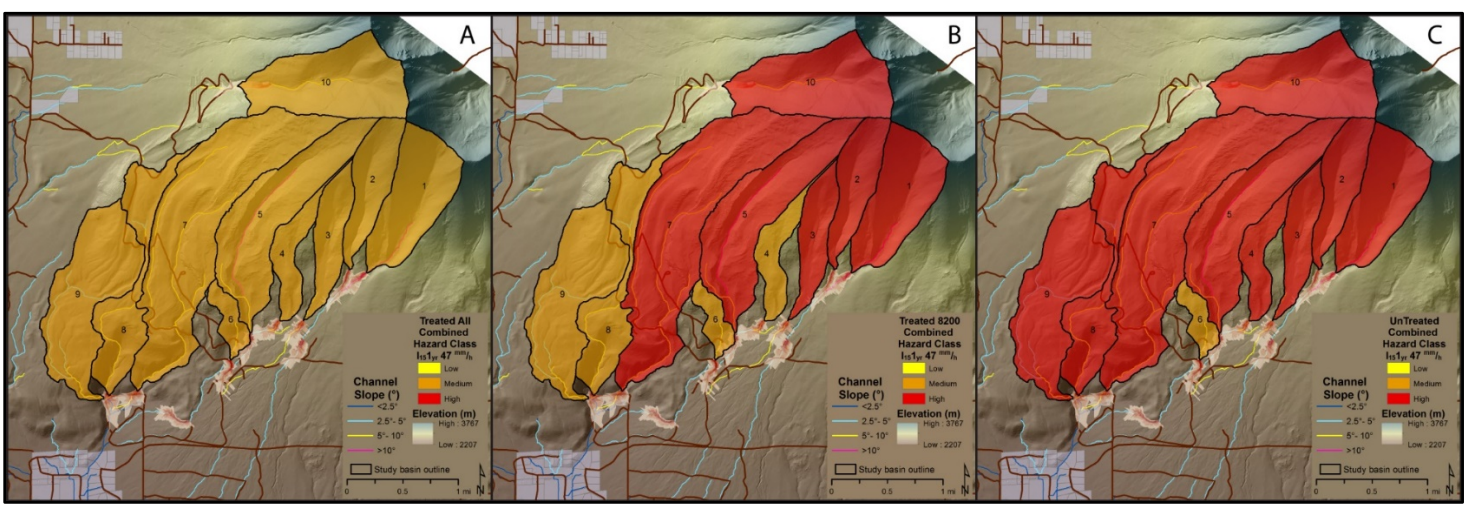


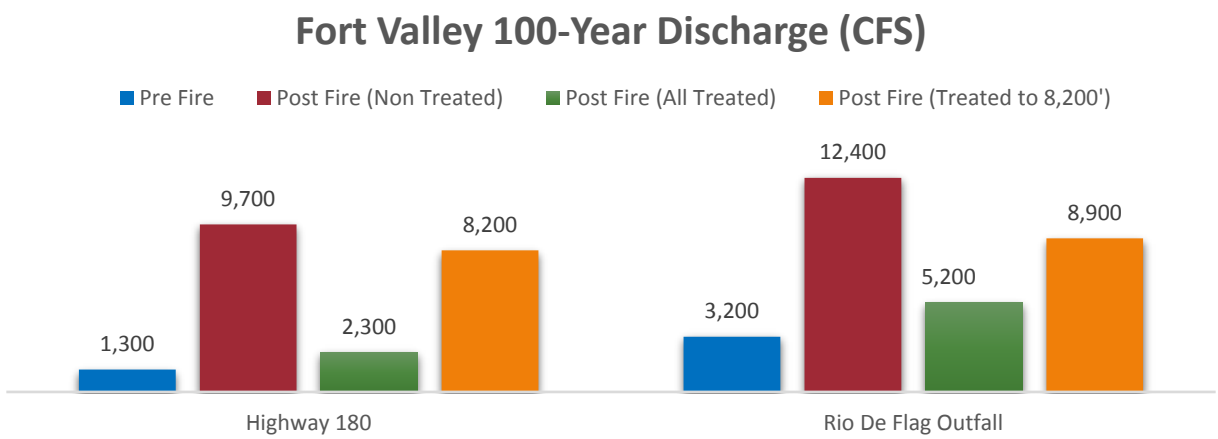
Figure 11 - Combined hazard ranking of the TreatedAll (A), Treated8200 (B), and Untreated (C) scenarios for the I_{15} 1-year storm

Full results of the debris flow modeling are included in Appendix E.

3.4 Post-Wildfire Flood Risk Assessment

Post-fire flood impacts and hazards in the Fort Valley pilot watershed were determined for the 2-, 10-, and 100-year events with watershed conditions simulating post-fire conditions. One aspect of this study is to understand and quantify the impact of increased forest health due to forest treatments (thinning, control burns, etc.) on the downstream flood impacts. To accomplish this, the pilot area was modeled with the post-fire watershed condition scenarios described previously.

The 100-year modeling results for the Fort Valley Pilot Area indicate post-fire (no treatment) flows in the Rio de Flag downstream of Fort Valley are up to *4 times* higher than pre-fire discharges. Treating the watershed has the effect of reducing the post-fire discharges by 58% if the entire watershed including the wilderness area is treated, and 28% if the wilderness area is untreated. Discharges originating from Agassiz Peak are of interest because a large portion of the contributing watershed is wilderness. Post-fire (no treatment) discharges that cross Highway 180, originating from Agassiz Peak, are up to 8 *times* higher than pre-fire discharges. If the same watershed is fully treated, post fire discharges may be reduced by 77%. However, the wilderness area is a large portion of the Agassiz Peak contributing watershed and if the area is excluded from treatments (Post-fire, Treatment up to 8,200 feet), post-fire discharges may still be 6 *times* higher than pre-fire conditions, as shown in the graph below.



The Fort Valley flood depth results summarized below demonstrate that watershed treatment has the potential of significantly reducing the number of properties that would be threatened by post-wildfire flooding. No critical facilities shown in the Coconino County Multi-Jurisdictional Hazard Mitigation Plan experience flooding greater than 1 foot deep.

Table 5 - Fort Valley Impacted Buildings – Flooding >1 Foot

Event	Pre-Fire	Post-fire No Treatment	Post-fire Treatment up to 8200'	Post-fire All Treated
2-Year	20	63	48	26
10-Year	33	129	85	47
100-Year	87	222	185	119

Results from the flood modeling are presented in Figure 12 to Figure 14 below. The figures show the resulting areas with flooding depths of greater than 1 foot for the pre-fire and the multiple post-fire scenarios. Flood limits are presented in the following format:

***Pre-Fire* (existing condition)** flooding limits with depths greater than 1 foot. Includes all blue areas on the maps.

Post Fire (All Treated) flooding limits with depths greater than 1 foot. Indicates flooding if a fire burns the entire watershed with all areas treated. Includes all blue and green areas shown on map.

Post Fire (Treated to 8,200' elevation) flooding limits with depths greater than 1 foot. Indicates flooding if a fire burns the entire watershed with all areas treated, excluding the wilderness area. Includes all blue, green, and orange areas shown on map.

Post Fire (UnTreated) flooding limits with depths greater than 1 foot. Indicates flooding if a fire burns the entire watershed in its current, non-treated condition. Includes all blue, green, orange and red areas shown on map.

Large format maps showing the modeling results are provided in Appendix F.

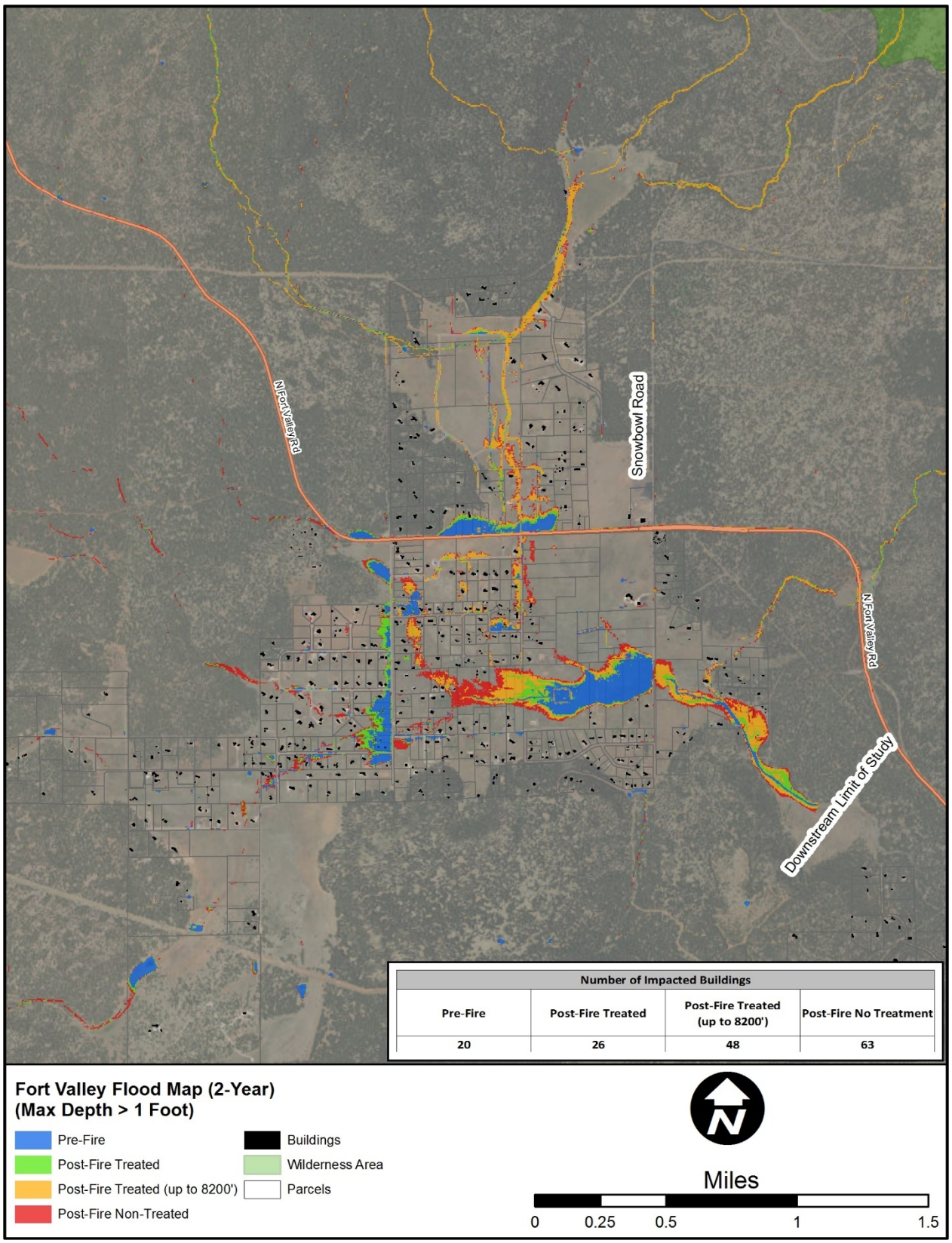


Figure 12 - Fort Valley 2-Year Flood Limit Map

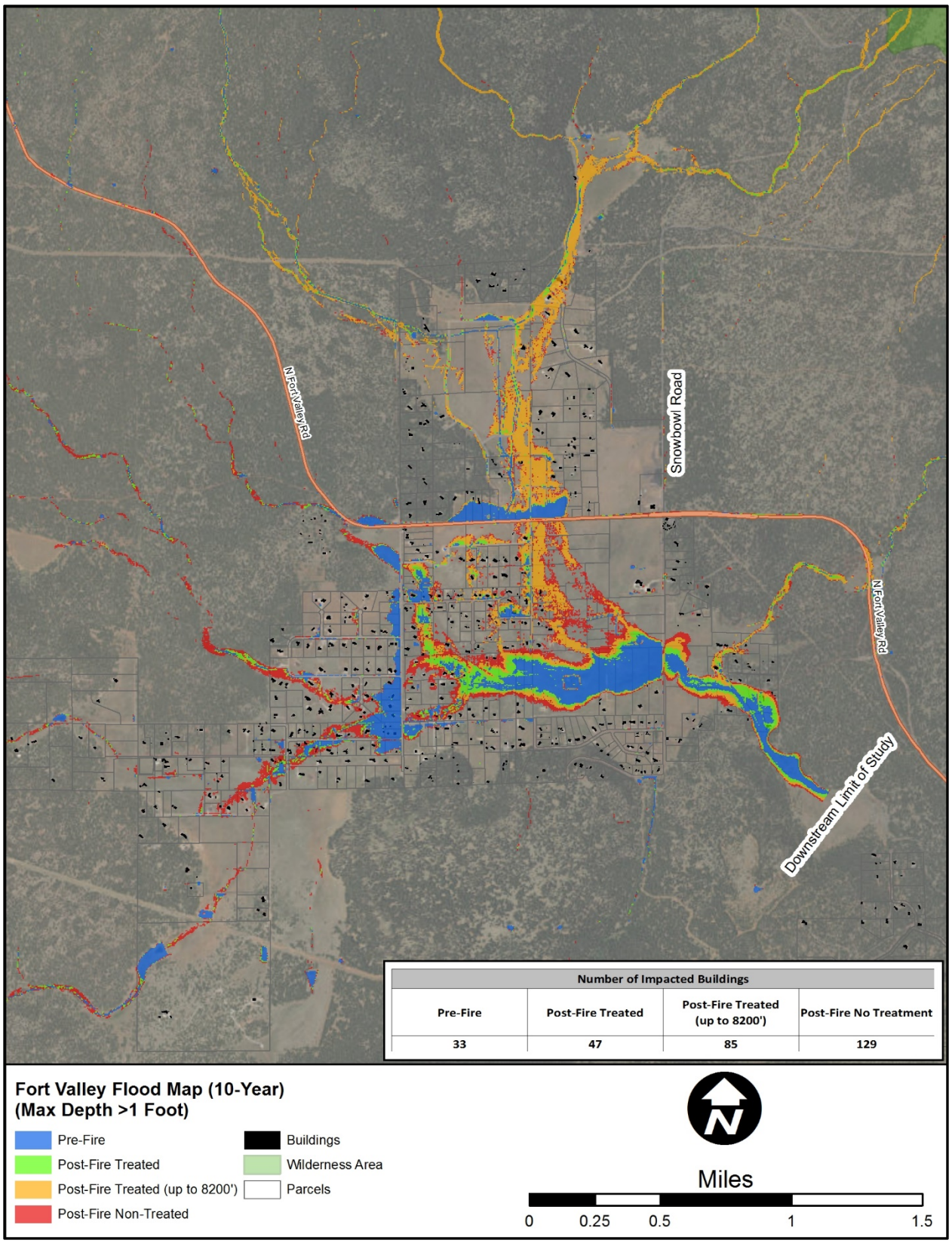


Figure 13 - Fort Valley 10-Year Flood Limit Map

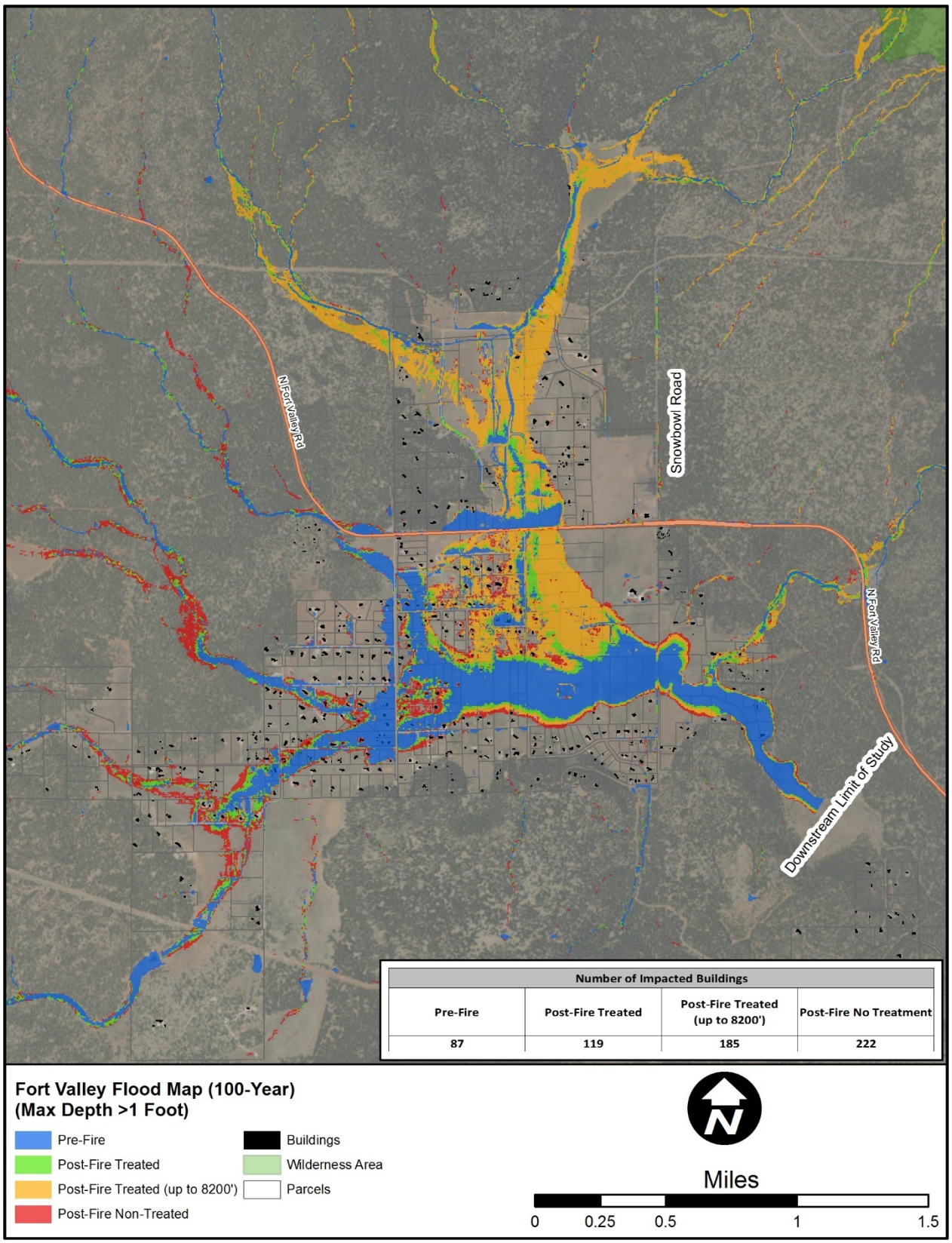


Figure 14 - Fort Valley 100-Year Flood Limit

3.5 Fort Valley Risk Zone Mapping

Findings from the pre- and post-fire flooding and debris flow assessments are summarized in the following non-regulatory risk zone maps. The risk zone maps presented in Figure 15 to Figure 17 indicate the type of hazard (pre-fire flood, post-fire flood, post-fire debris flow, etc.) for the 2-, 10-, and 100-year events. Large format maps are provided in Appendix F.

The types of risk zones are summarized below:

Existing Condition Flood – Areas which will potentially be inundated by floodwaters greater than 1 foot in depth if the referenced event occurred in the watershed in its current condition. The shallow flood limits may extend beyond the boundaries presented.

Potential Post-Fire Flood – Areas which will potentially be inundated by floodwaters greater than 1 foot in depth if the referenced event occurred in the watershed in post-fire, untreated conditions (fire burns the watershed in its current condition). The post-fire flood within the Fort Valley study area will most likely consist of hyperconcentrated flood flows (sediment, ash, rocks, debris), similar to the post-Schultz-Fire flooding. Shallow flood limits may extend beyond the boundaries presented.

Post-Fire Debris Flow – Areas which may be produce post-fire debris flows. Debris flows erode and scour channels as they travel downslope, releasing sediment for additional transport by hyperconcentrated flows and sediment-laden flood flows. While debris flows may not travel far enough to directly impact houses, infrastructure or other critical facilities, they will indirectly impact these areas of concern by eroding and transporting released sediments via hyperconcentrated and flood flows. Downstream areas will see a significant increase in flooding and sedimentation after wildfires.

Post-Fire Hyperconcentrated Flow – Areas downstream of debris flows which may experience severe erosion, and transport the sediment, water and debris from the base of the potential debris flow to the flood inundation area.

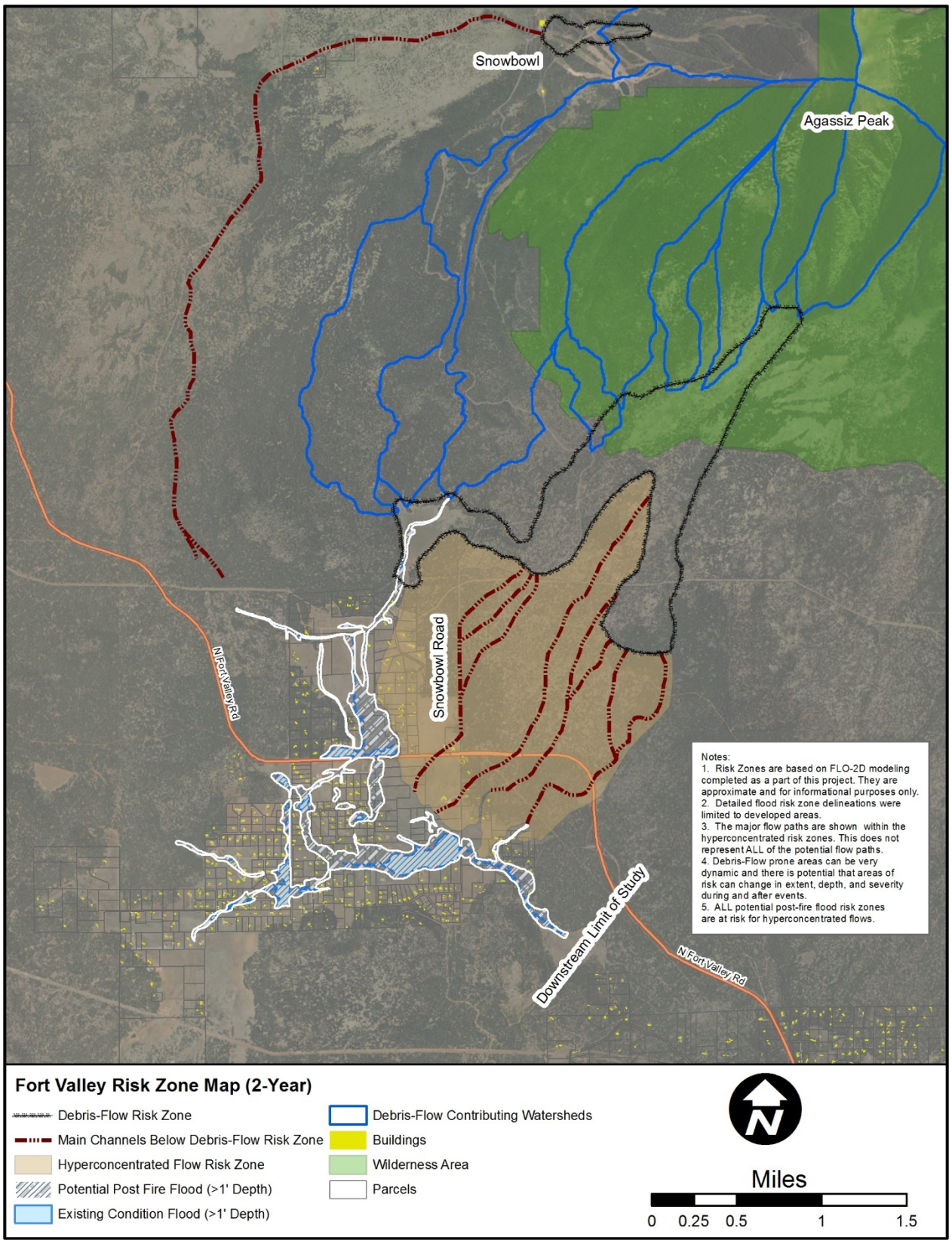


Figure 15 - Fort Valley 2-Year Risk Zone Map

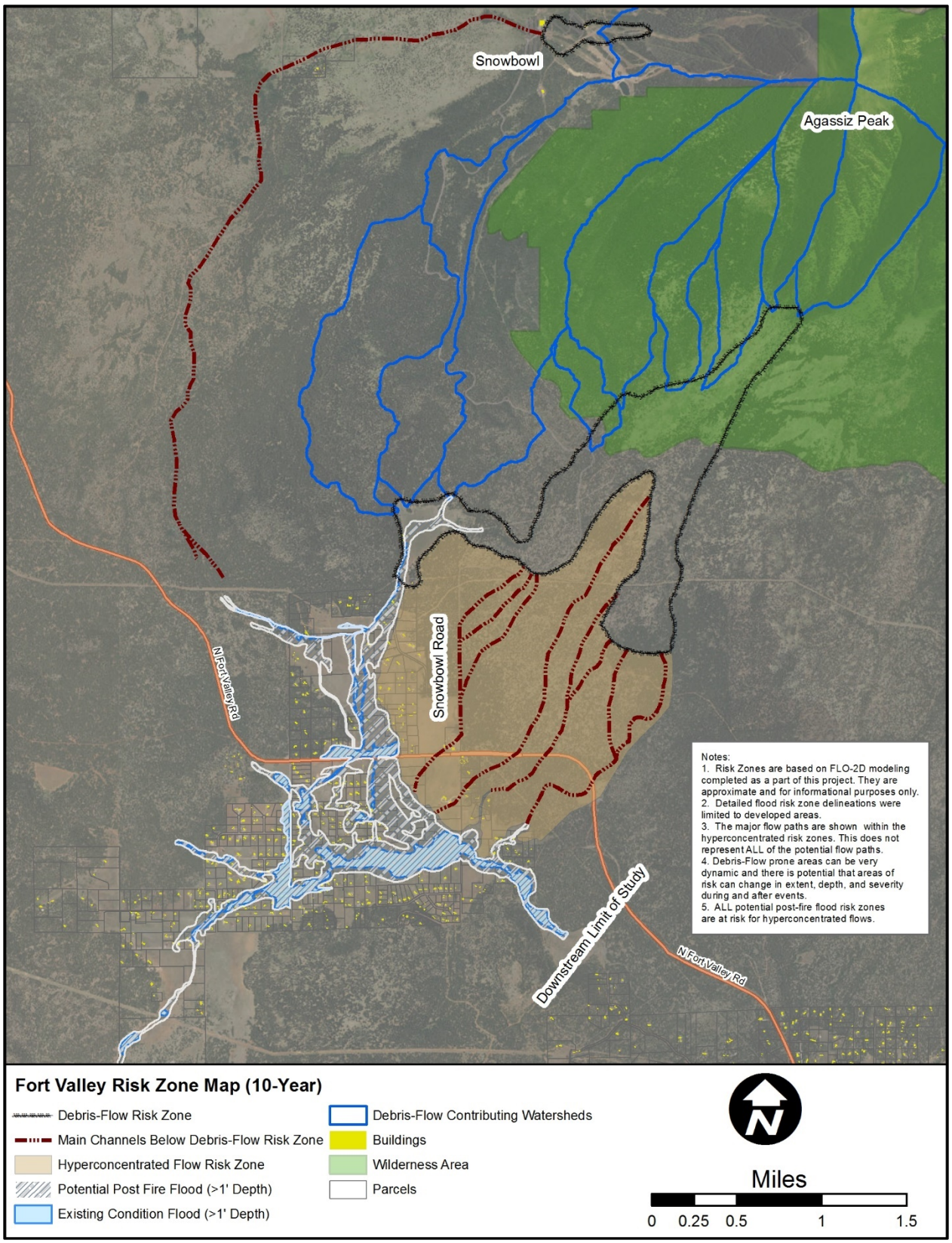


Figure 16 - Fort Valley 10-Year Risk Zone Map

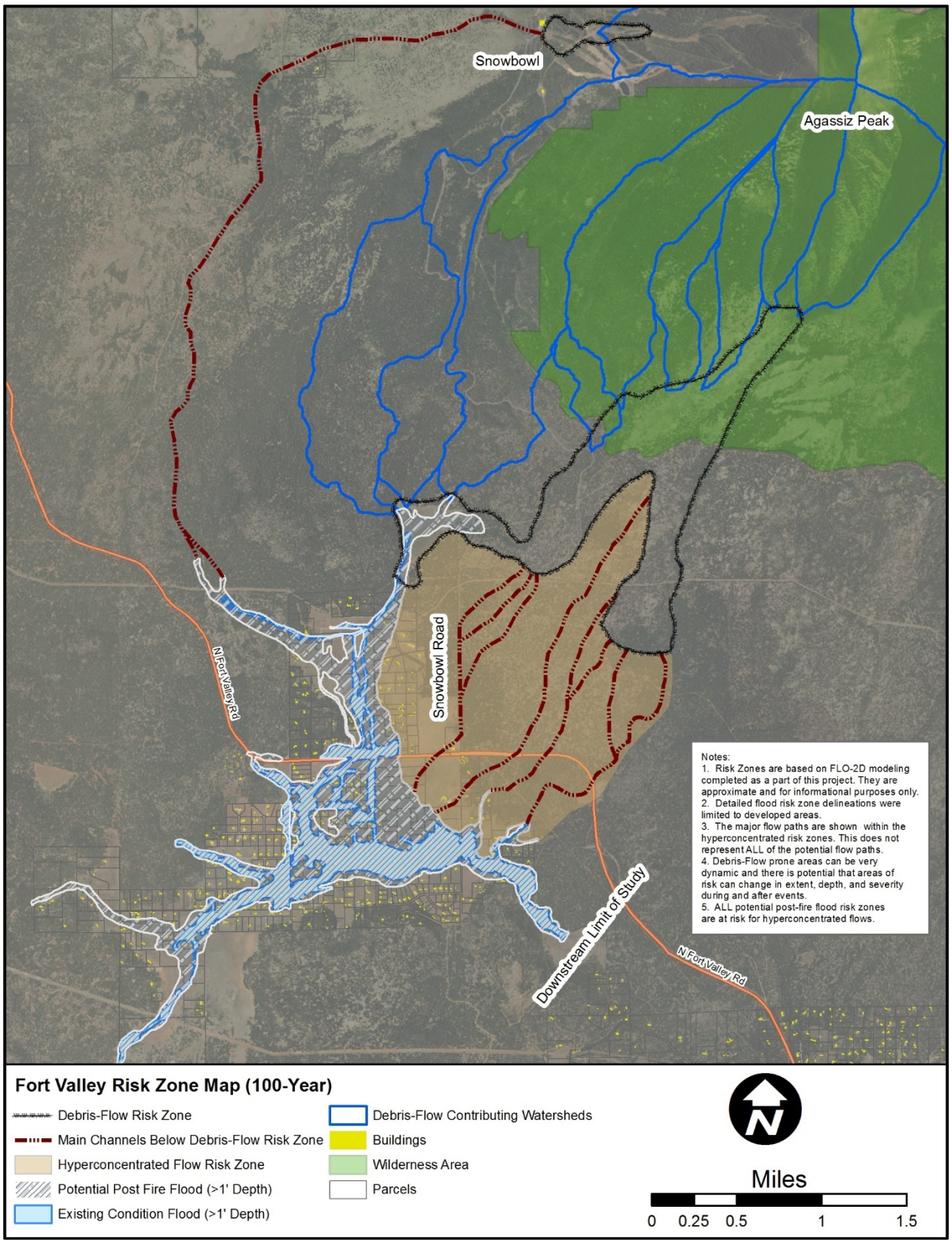


Figure 17 - Fort Valley 100-Year Risk Zone Map

4 WILLIAMS RISK ASSESSMENT

4.1 PRE-WILDFIRE DEBRIS-FLOW AND FLOODING ASSESSMENT

The Williams Pilot Area was studied to understand the pre- and post-wildfire risks associated with flooding and debris flows. To accomplish a full comparison of pre-and post-risks, the following watershed conditions were studied and are described in the following sections.

- Pre-Fire (unburned)
- Post-Fire, No Treatment
- Post-Fire, Treated

4.1.1 Assessment of Past Debris-Flow Occurrence

The goal of this phase of the study was to assess if the watersheds originating on Bill Williams Mountain could experience debris flows after wildfires. To do this, a reconnaissance field investigation was conducted in the main Cataract Creek drainage leading towards the City Dam Reservoir.

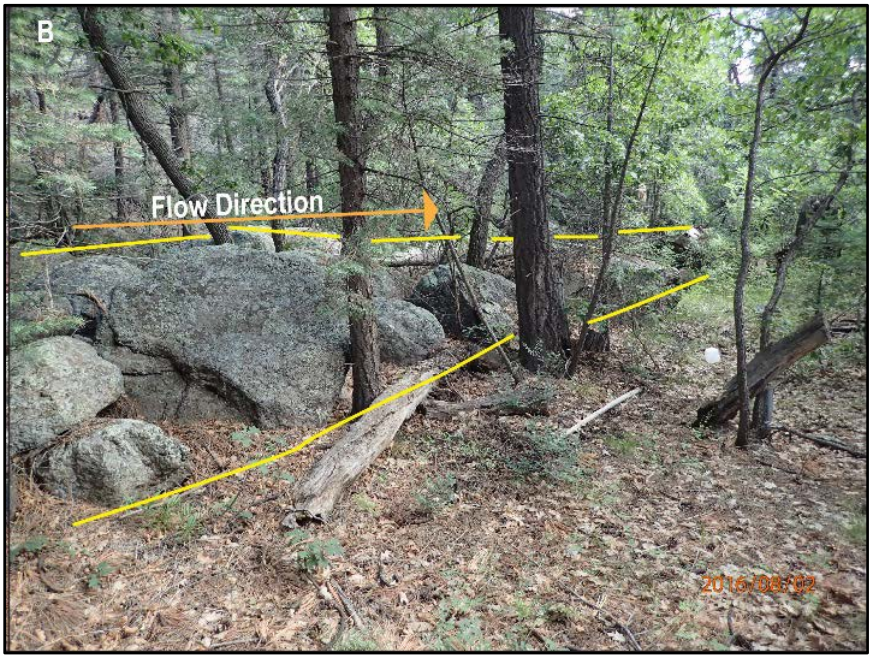


Figure 18 - Linear boulder deposits

Debris flow deposits were documented in the Williams pilot study area in the main Cataract Creek Channel (Figure 18 and Figure 19). The deposits appear to agree well with the assumptions made in countywide assessment. The presence of debris flow-like boulder deposits, however, strongly suggests that debris flows occurred in the past and can occur in the future. Importantly, all the channel sections visited had stored sediment available for transport should a debris flow initiate higher in the watershed.

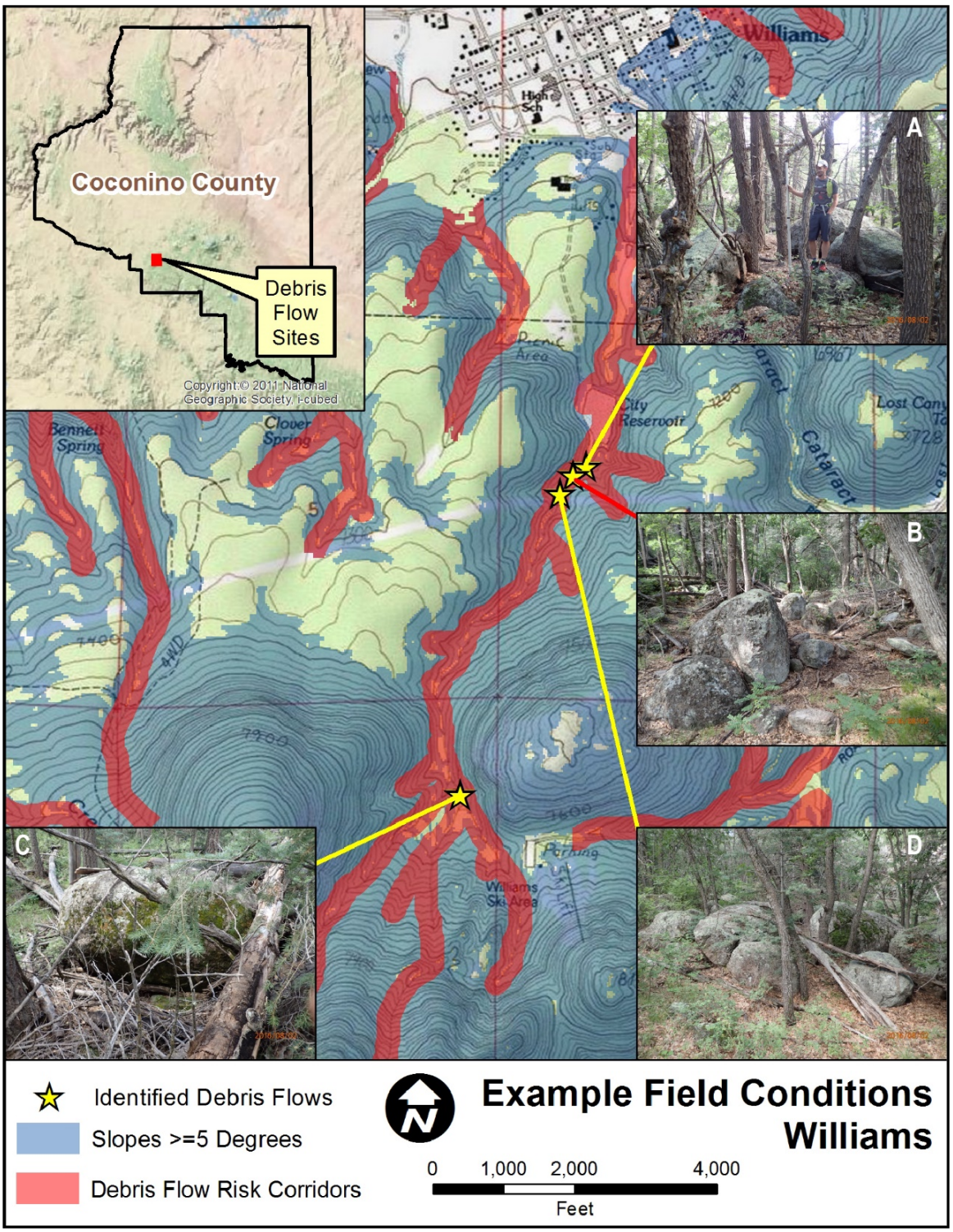


Figure 19 - Williams Pre-Wildfire Field Conditions

4.1.2 Pre-Wildfire Flooding Assessment

Pre-wildfire flooding risk was estimated for the 2-, 10-, and 100-year events in the Williams study area. The full results are not presented in this report, but a detailed description of the pre-fire flooding assessment is provided in Appendix B. Figure 20 shows the pre-wildfire 100-year depth results.

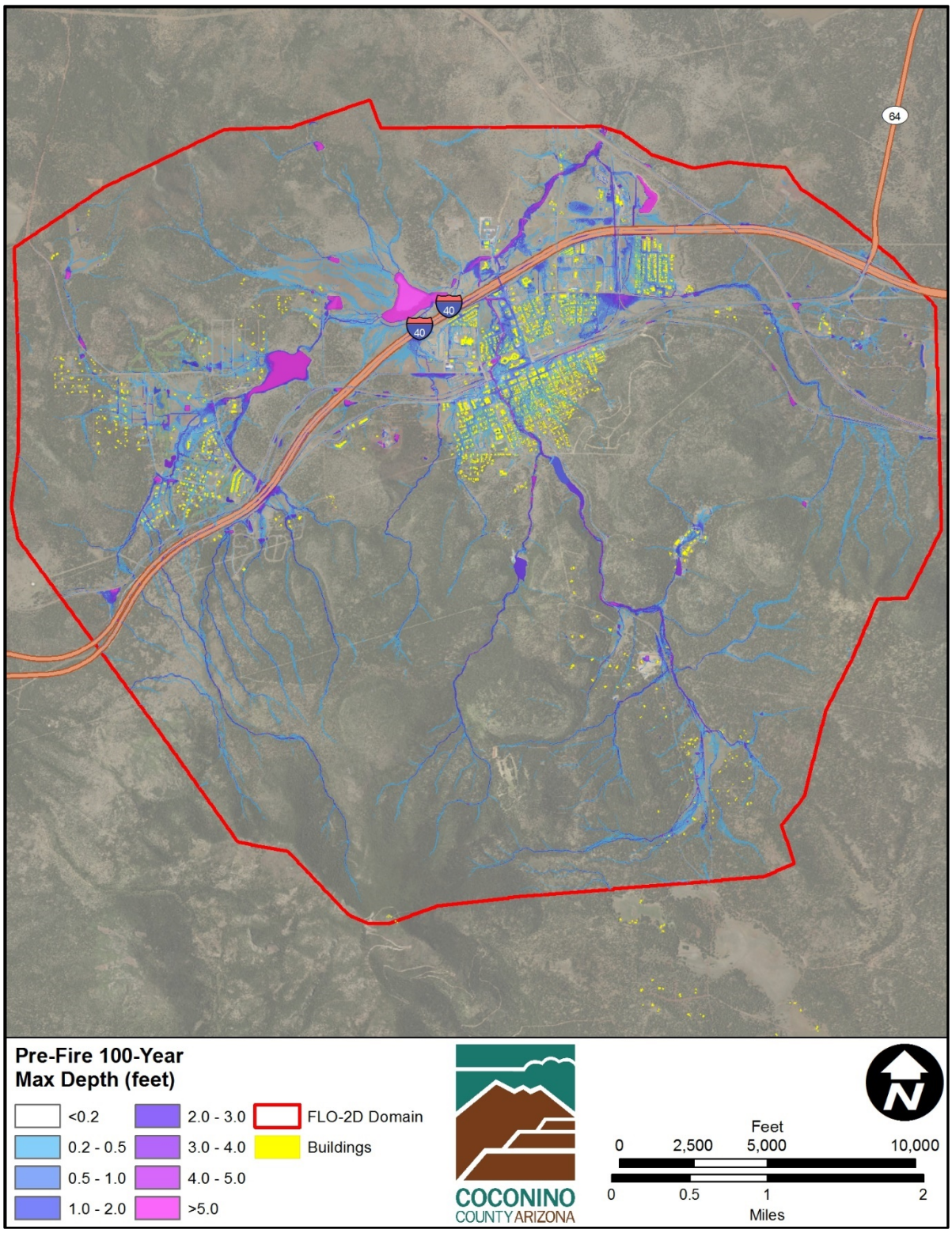


Figure 20 - Williams 100-Year Pre-Wildfire Max Flow Depth

4.2 Wildfire Burn Severity Modeling

The majority of the Williams pilot area was included in the USFS fire modeling prepared for the Bill Williams Mountain Restoration Project. Fire severity modeling completed for the USFS Environmental Impact Statement were used in this study. Appendix D contains a description of the USFS modeling.

The Bill Williams Mountain burn modeling included two scenarios.

- No Treatment
- Treatment (all areas)

Treatment refers to thinning and control burn efforts used to reduce the density of the trees and the fuel load on the ground. Results from the fire modeling were used to determine curve number adjustments included in the hydrologic modeling.

4.3 Post-Wildfire Debris-Flow Risk Assessment

The Williams debris flow contributing basins were modeled for debris flow probability and volumes based on three burn scenarios. Modeling results show that 15-minute rainfall intensities needed for a 50% probability that a debris flow would occur in the watershed (Table 6, Figure 21) are very low for both treated and untreated conditions. Results show that very minor storms can trigger debris flows in untreated conditions.

Table 6 - Williams 50% Debris Flow Probability

Modeled Scenario	15-minute rainfall Intensity (inches/hour)	Approximate Storm Event
Treated	1.0 – 2.0	≤1-year storm event
No Treatment	0.4 – 1.6	<1-year storm event

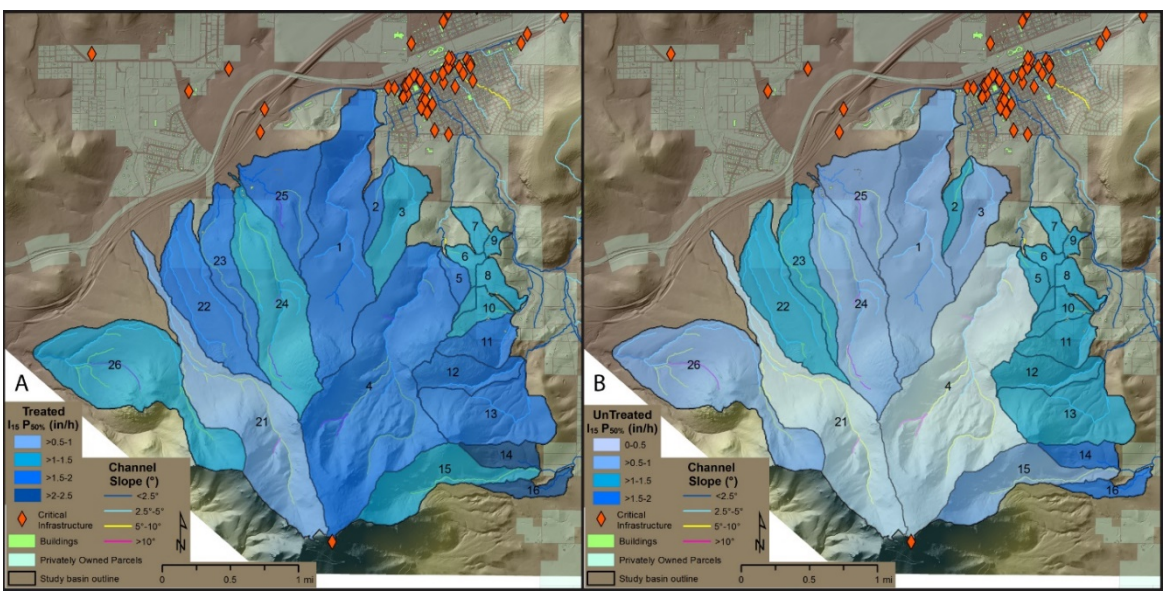


Figure 21 - 15 Min rainfall intensity required for a 50% probability of a debris flow for the Treated (A) and Untreated (B) scenarios.

Potential post-fire debris flow inundation zones were assessed in the Williams pilot area using LAHARZ (Figure 22). LAHARZ deposition points were selected based on the channel gradient change at or near the basin mouth, loss of channel confinement, and at the end of debris flow corridors developed during the countywide assessment.

LAHARZ model results from the Williams study area indicate that debris flows could directly or indirectly impact developed areas. Some basins are relatively small with lower gradient channels so debris flow volumes and runout distances are likely to be smaller, however they flow directly into developed areas. Many of these basins have a combined hazard ranking of medium, even for larger storms, due to their predicted limited volumes. They pose a risk, however, simply because of their proximity to developed areas. Adjacent and downstream areas could also be impacted by subsequent sediment-laden floods and hyperconcentrated flows that could carry large cobbles and small boulders. Downstream developed areas will probably be impacted similarly to the developed areas below the Schultz Fire.

There is a strong likelihood that post-wildfire debris flows could impact City Dam Reservoir. In addition to the main tributary of Cataract Creek that flows into City Dam Reservoir, there are several small side tributaries near the reservoir that could contribute significant sediment volumes during post-fire floods or debris flows above the reservoir. While it is unlikely there will be sufficient debris flow volume to overfill City Dam Reservoir (capacity ~$10^{5.5}$ m^3), the drinking water supply for Williams could be compromised and extremely expensive to mitigate[12].

[12] Horner et al., 2016

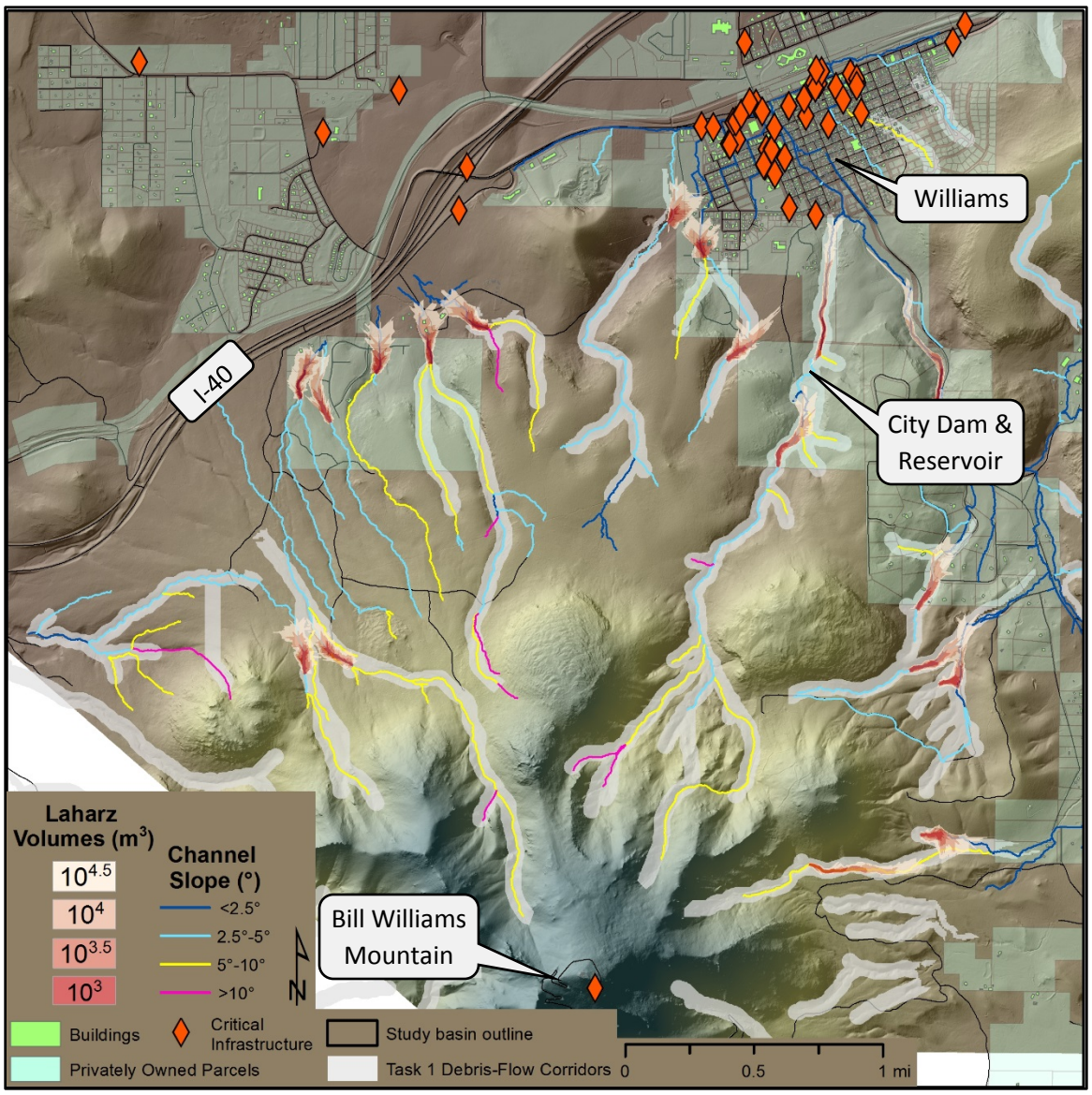


Figure 22 - LAHARZ Model Results for the Williams Pilot Area

Results from the 1-year storm show a response difference between the three scenarios. An important comparison is the probability that a debris flow will occur during a 1-year storm event (Table 7) and the hazard class ranking of the contributing basins (Figure 23).

Table 7 - Williams Debris Flow Probability

Modeled Scenario	Probability of Debris Flow in 1-Year Event	Basin Hazard Class Ranking
Treated	38% - 94%	Low to High
No Treatment	66% - 99%	Moderate to High

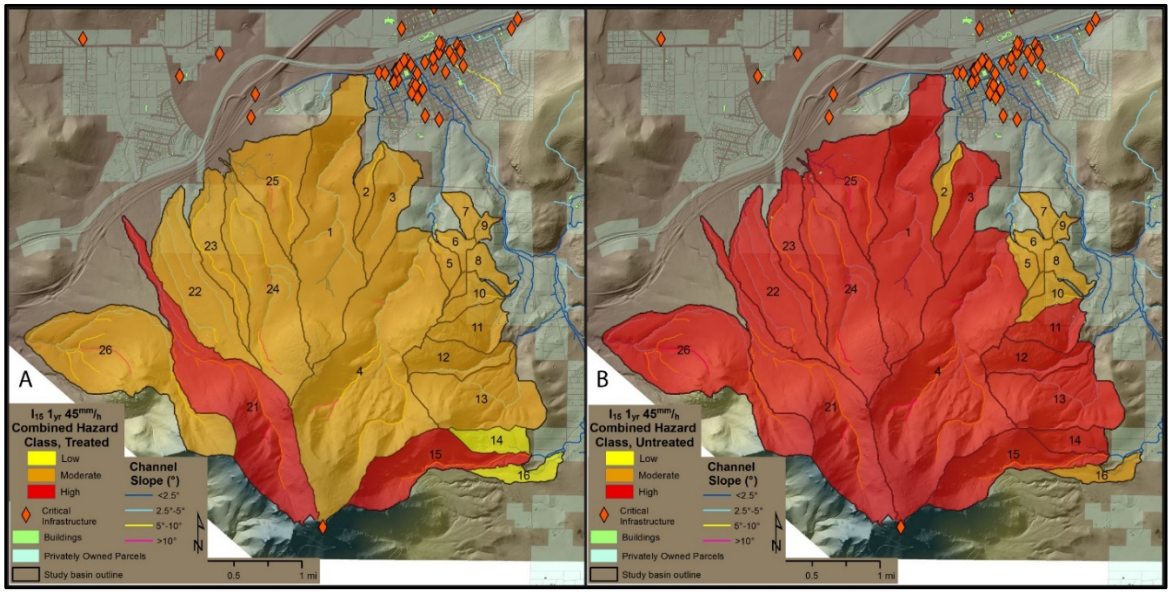


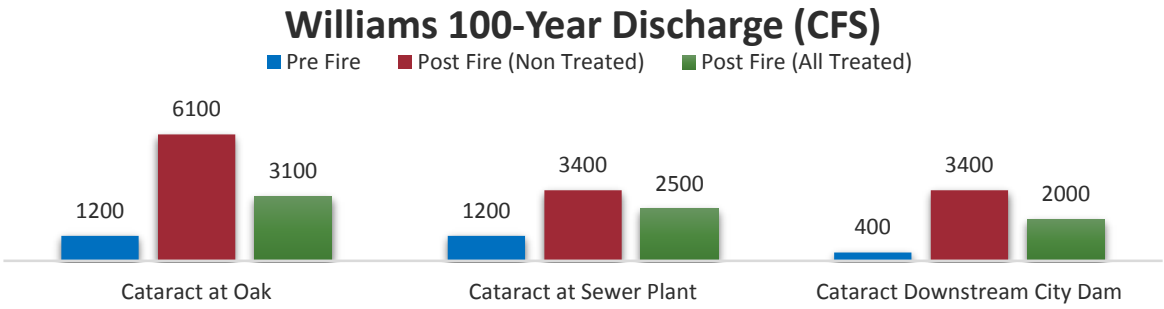
Figure 23 - Combined hazard ranking of the treated (A) and untreated (B) scenarios for the I_{15} 1-year storm.

Full modeling results are provided in Appendix E.

4.4 Post-Wildfire Flood Risk Assessment

Post-fire flood impacts and hazards in the Williams pilot area were determined for the 2-, 10-, and 100-year events for post-fire watershed conditions. One aspect of this study is to understand and quantify the impact of increased forest health due to forest treatments (thinning, control burns, etc.) on the downstream flood impacts. To accomplish this, the pilot area was modeled with several post-fire watershed condition scenarios.

The 100-year modeling results for the Williams Pilot Area indicate post-fire (no treatment) flows in Cataract Creek at the south end of Williams (Oak Street) increase by up to *5 times* the pre-fire discharges. Treating the watershed has the effect of reducing the post-fire discharges by 49%. Cataract Creek Discharges near the sewer treatment plant increase by up to *3 times* the pre-fire discharges. Treating the watershed has the effect of reducing the post-fire discharges by 27%. Some of the upper watersheds on Bill Williams Mountain that have the potential to burn the most severely experience significant increases in flows. Directly downstream of the City Dam, post-fire (no treatment) flows increase by up to 8 times the pre-fire discharges. Treating the watershed has the effect of reducing the post-fire discharges by 40%, as shown in the graph below.



The Williams area flood depth results summarized below demonstrate that watershed treatment has the potential of significantly reducing the number of properties that would be threatened by post-wildfire flooding.

Table 8 - Williams Impacted Buildings – Flooding >1 Foot

Event	Pre-Fire	Post-fire No Treatment	Post-fire All Treated
2-Year	26	117	34
10-Year	41	268	105
100-Year	147	515	318

Many critical facilities in the Williams area listed in the Coconino County Multi-Jurisdictional Hazard Mitigation Plan would be impacted by post-fire flooding.

Table 9 - Williams Impacted Critical Facilities – Flooding > 1 Foot

Event	Pre-Fire	Post-fire No Treatment	Post-fire Treated
2-Year	1	4	1
10-Year	1	7	4
100-Year	4	14	8

Results from the flood modeling are presented in Figure 24 to Figure 26 below. The figures show the resulting areas with flooding depths of greater than 1 foot for the pre-fire and the multiple post-fire scenarios. Flood limits are presented in the following format:

***Pre-Fire* (existing condition)** flooding limits with depths greater than 1 foot. Includes all blue areas on the maps.

Post Fire (Treated) flooding limits with depths greater than 1 foot. Indicates flooding if a fire burns the entire watershed with all areas treated. Includes all blue and green areas shown on map.

Post Fire (Non Treated) flooding limits with depths greater than 1 foot. Indicates flooding if a fire burns the entire watershed in its current, non-treated condition. Includes all blue, green, and red areas.

Large format maps are provided in Appendix F.

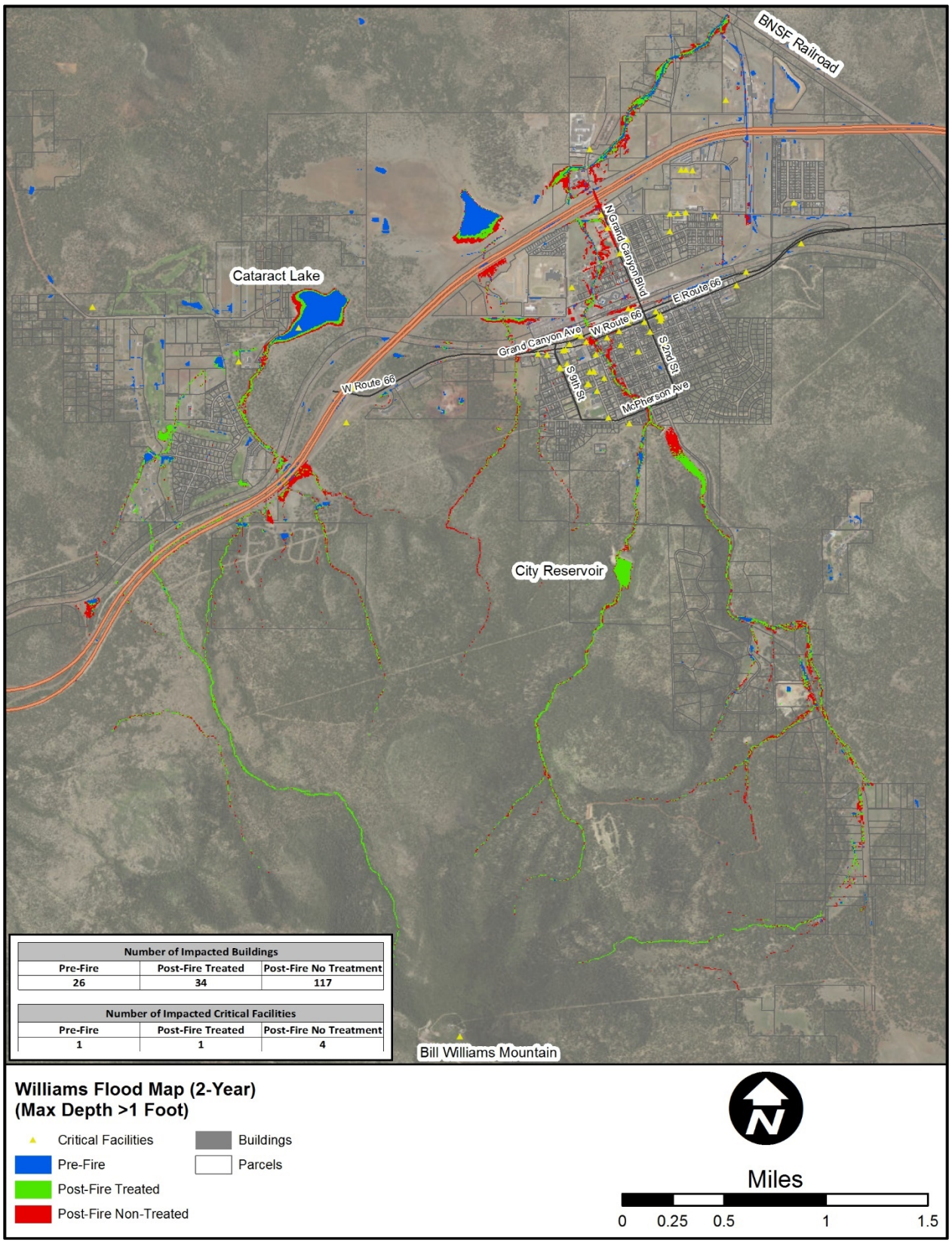


Figure 24 - Williams 2-Year Flood Limit Map

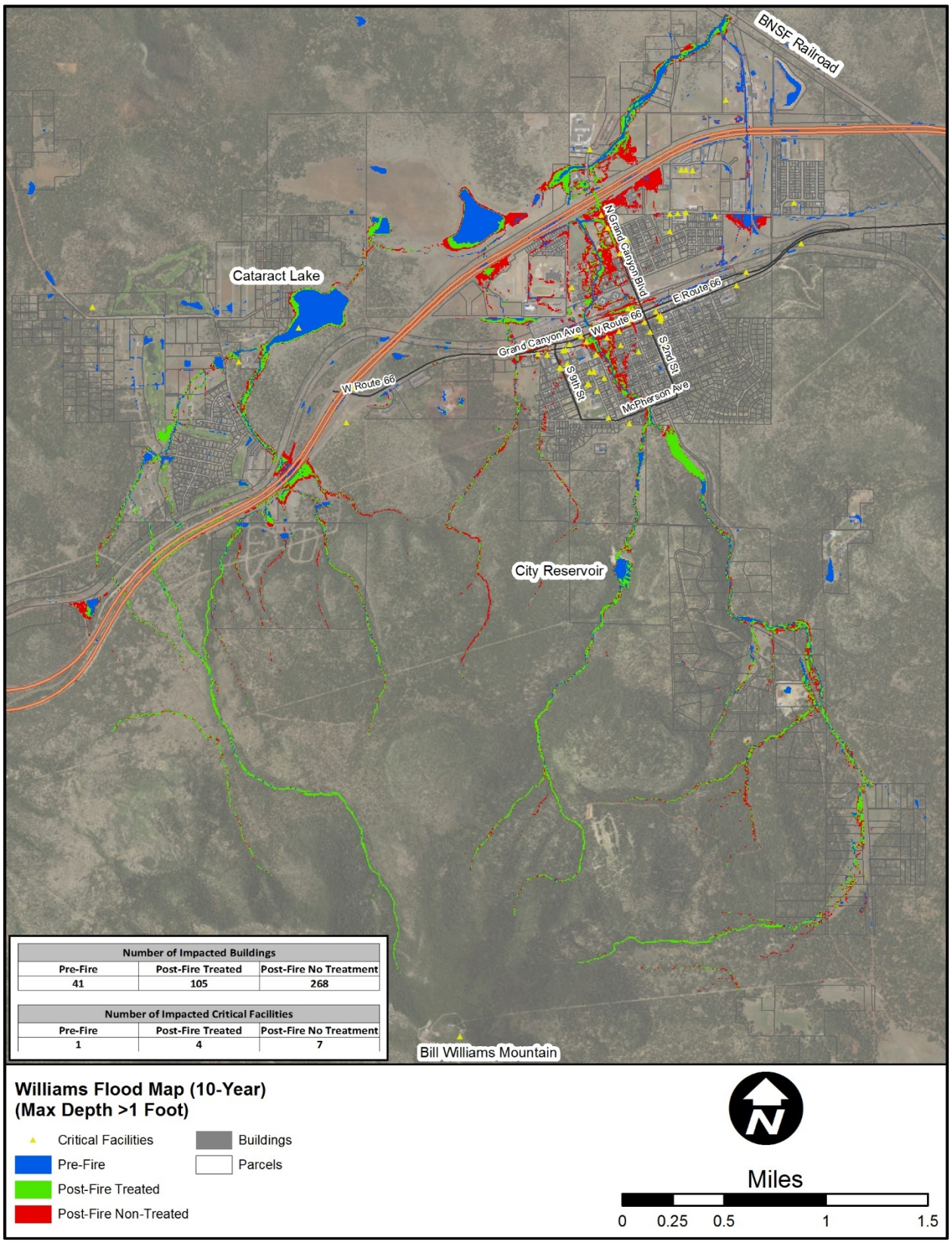


Figure 25 - Williams 10-Year Flood Limit Map

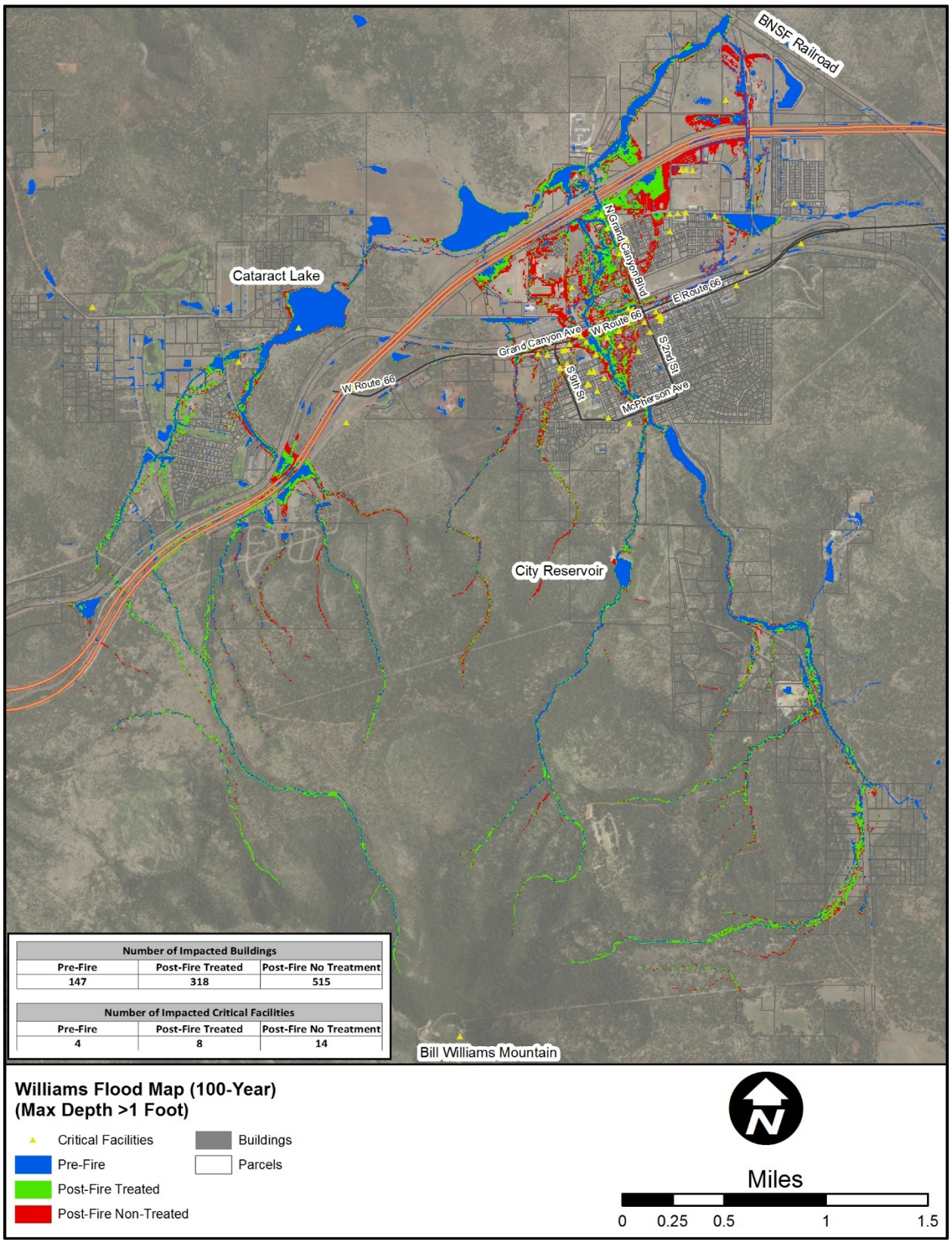


Figure 26 - Williams 100-Year Flood Limit Map

4.5 Williams Risk Zone Mapping

The findings from the pre- and post-fire flooding and debris flow assessments are summarized in the following non-regulatory risk zone maps. The risk zone maps presented in Figure 27 to Figure 29 indicate the type of hazard (pre-fire flood, post-fire flood, post-fire debris flow, etc.) for the 2-, 10-, and 100-year events. Large format maps are provided in Appendix F.

The types of risk zones are summarized below:

Existing Condition Flood – Areas which will potentially be inundated by floodwaters greater than 1 foot in depth if the referenced event occurred in the watershed in its current condition. The shallow flood limits may extend beyond the boundaries presented.

Potential Post-Fire Flood – Areas which will potentially be inundated by floodwaters greater than 1 foot in depth if the referenced event occurred in the watershed in post-fire, untreated conditions (fire burns the watershed in its current condition). The post-fire flood within the Fort Valley study area will most likely consist of hyperconcentrated flood flows (sediment, ash, rocks, debris), similar to the post-Schultz-Fire flooding. Shallow flood limits may extend beyond the boundaries presented.

Post-Fire Debris Flow – Areas which may be produce post-fire debris flows. Debris flows erode and scour channels as they travel downslope, releasing sediment for additional transport by hyperconcentrated flows and sediment-laden flood flows. While debris flows may not travel far enough to directly impact houses, infrastructure or other critical facilities, they will indirectly impact these areas of concern by eroding and transporting released sediments via hyperconcentrated and flood flows. Downstream areas will see a significant increase in flooding and sedimentation after wildfires.

Post-Fire Hyperconcentrated Flow – Areas downstream of debris flows which may experience severe erosion, and transport the sediment, water and debris from the base of the potential debris flow to the flood inundation area.

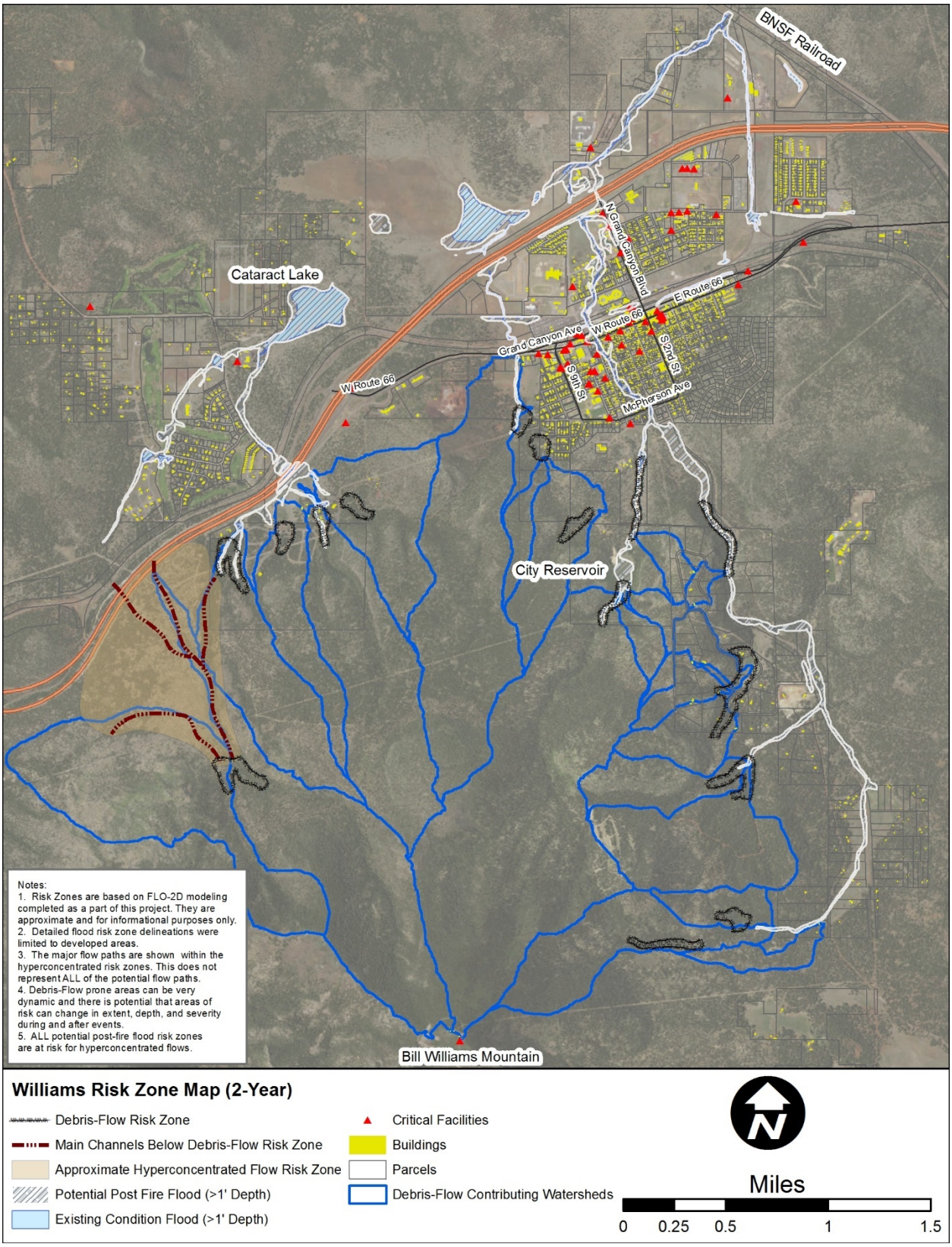


Figure 27 – Williams 2-Year Risk Zone Map

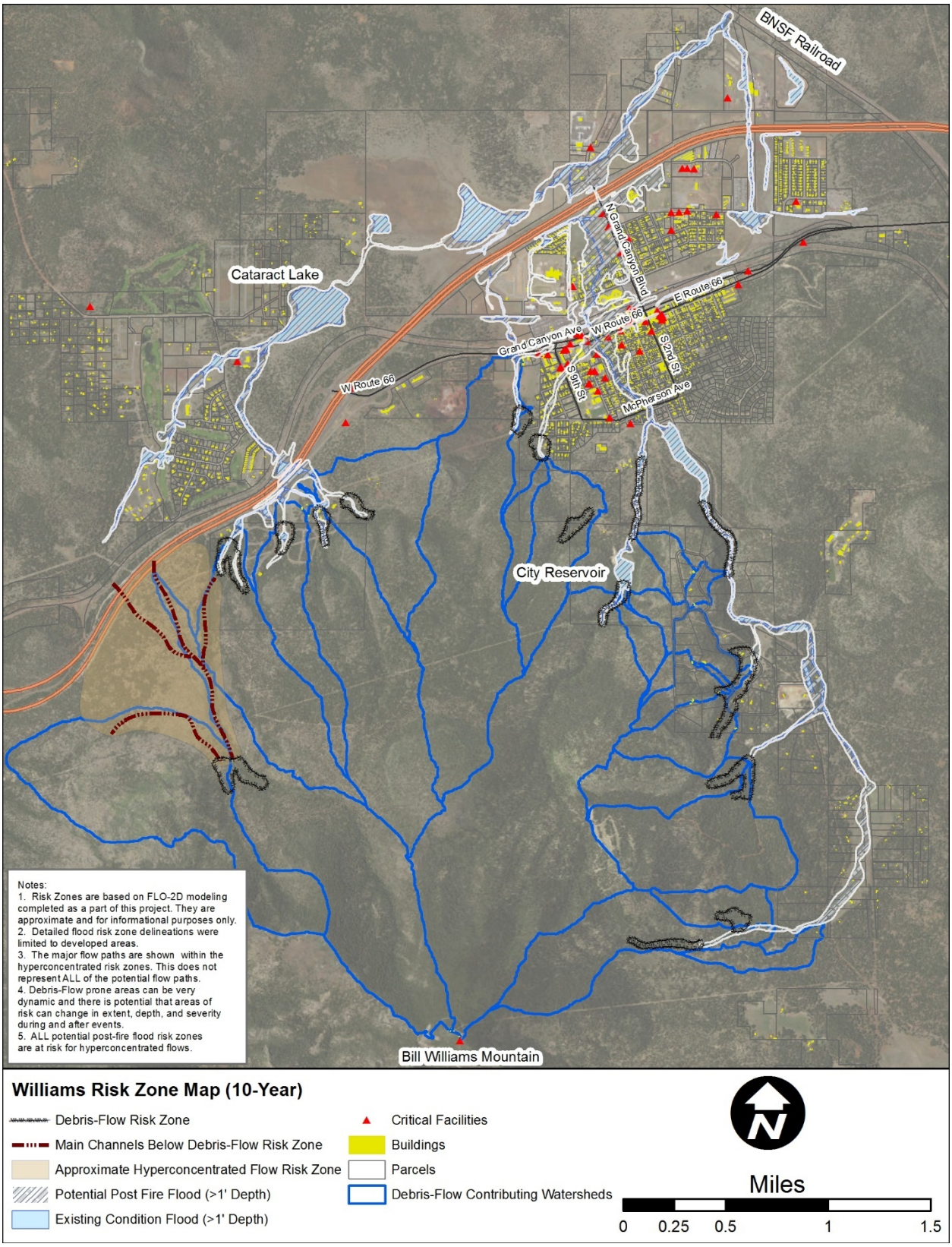


Figure 28 – Williams 10-Year Risk Zone Map

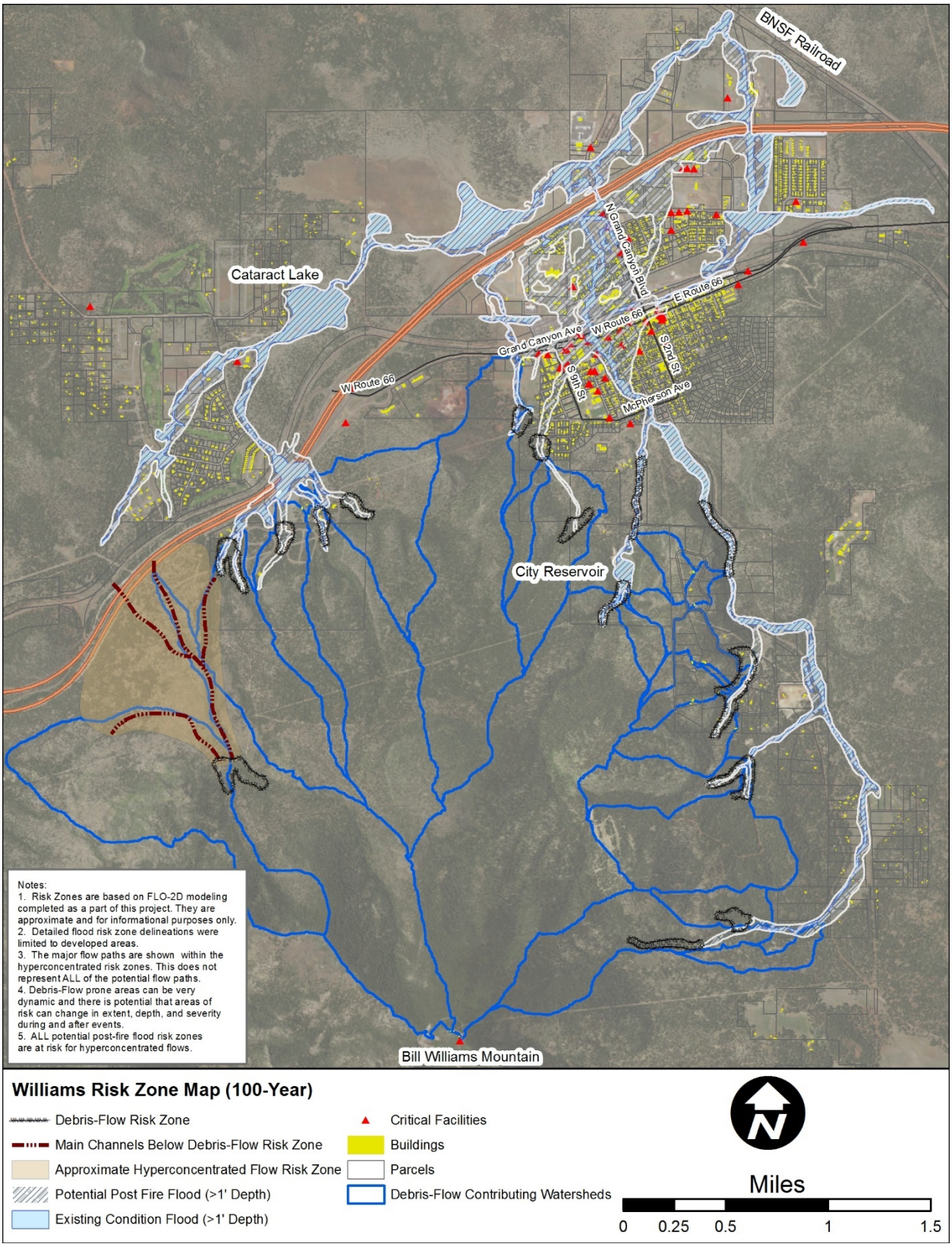


Figure 29 – Williams 100-Year Risk Zone Map

5 MITIGATION STRATEGIES AND IMPLEMENTATION

In their current condition, the flooding and debris flow risks in the Williams and Fort Valley watersheds are relatively well understood. Both watersheds show signs of past debris flows and the flood risks are noted on the current Flood Insurance Rate Maps and the pre-fire FLO-2D modeling completed as a part of this project. The challenge within these watersheds, which this study attempts to address, is identifying and quantifying the *potential* for increased flood and debris flow risk due to a wildfire. The increased risk is highly dependent upon many variables, and as such, mitigation strategies which reduce the risk potential can and must take many forms.

Figure 30 - Areas of Mitigation Interest

The focus of mitigation strategies identified within this study are *pre-wildfire* activities which will help to inform post-wildfire activities in the event of a wildfire. Mitigation activities identified within this study are referred to as Areas of Mitigation Interest (AoMI). Those AoMI described herein (Figure 30) have been identified and compiled by Coconino County, JE Fuller, Arizona Geological Survey, and other project stakeholders. Coconino County has a significant amount of forested lands which have the potential to burn and create risk for post-wildfire floods and debris flows. It is important to note that while this study is focused on the Fort Valley and Williams Pilot Areas, the AoMI listed within can be modified and applied to any watershed where there is potential for damages to a community due to post-fire flooding or debris flows.

5.1 Areas of Mitigation Interest

Six (6) AoMI have been identified and are described in the following sections.

5.1.1 Forest Health

Perhaps the most important and effective mitigation strategy within any watershed, and specifically the Williams and Fort Valley watersheds, is promotion of forest health. Wildfire has been suppressed for many years and in many locations. Current forest conditions include significant overgrowth and dead fuel loads on the ground (Figure 31). Due to these conditions, the path to achieving forest health is not easy and must include many stakeholders and public participation. There is a growing awareness of the need for forest health with the current trends of landscape-changing wildfires such as the Rodeo-Chedeski (2002), Wallow (2011), and Schultz (2010) Fires.

Figure 31 - Current Forest Conditions (Courtesy of Flagstaffwatershedprotection.org)

Figure 32 - Mechanical Thinning (Courtesy of Flagstaffwatershedprotection.org)

Forest treatment is one of the first steps towards promotion of forest health. Treatment may include mechanical thinning, control burns, or other methods to reduce the existing fuel load within the forest. Landscape-wide thinning efforts typically require machine-based methods similar to those currently being utilized for the Flagstaff Watershed Protection Project (Figures 31 and 32).

Current initiatives within Northern Arizona that may affect the pilot areas include:

- **Four Forest Restoration Initiative (4FRI)**. "The 4 Forest Restoration Initiative has been created to launch an accelerated restoration program that will restore watershed health and function, improve wildlife habitat, conserve biodiversity, protect old-growth, reduce the risk of uncharacteristic wildland fire and promote the reintroduction of natural fire, and restore natural forest structure and function so that forests are more resilient to climate change."[13] The overall project extents include the San Francisco Peaks (Figure 33), however, the majority of the Upper Rio de Flag Watershed that contributes to the flooding in Fort Valley is not included in the current proposed treatment plan (Figure 34). The wilderness area is excluded and a portion of the watershed is noted as being included in the Wing Mountain Project Area. Specific details about the treatment included in the Wing Mountain Project and the implementation schedule were not researched with this project.

[13] 4fri.org

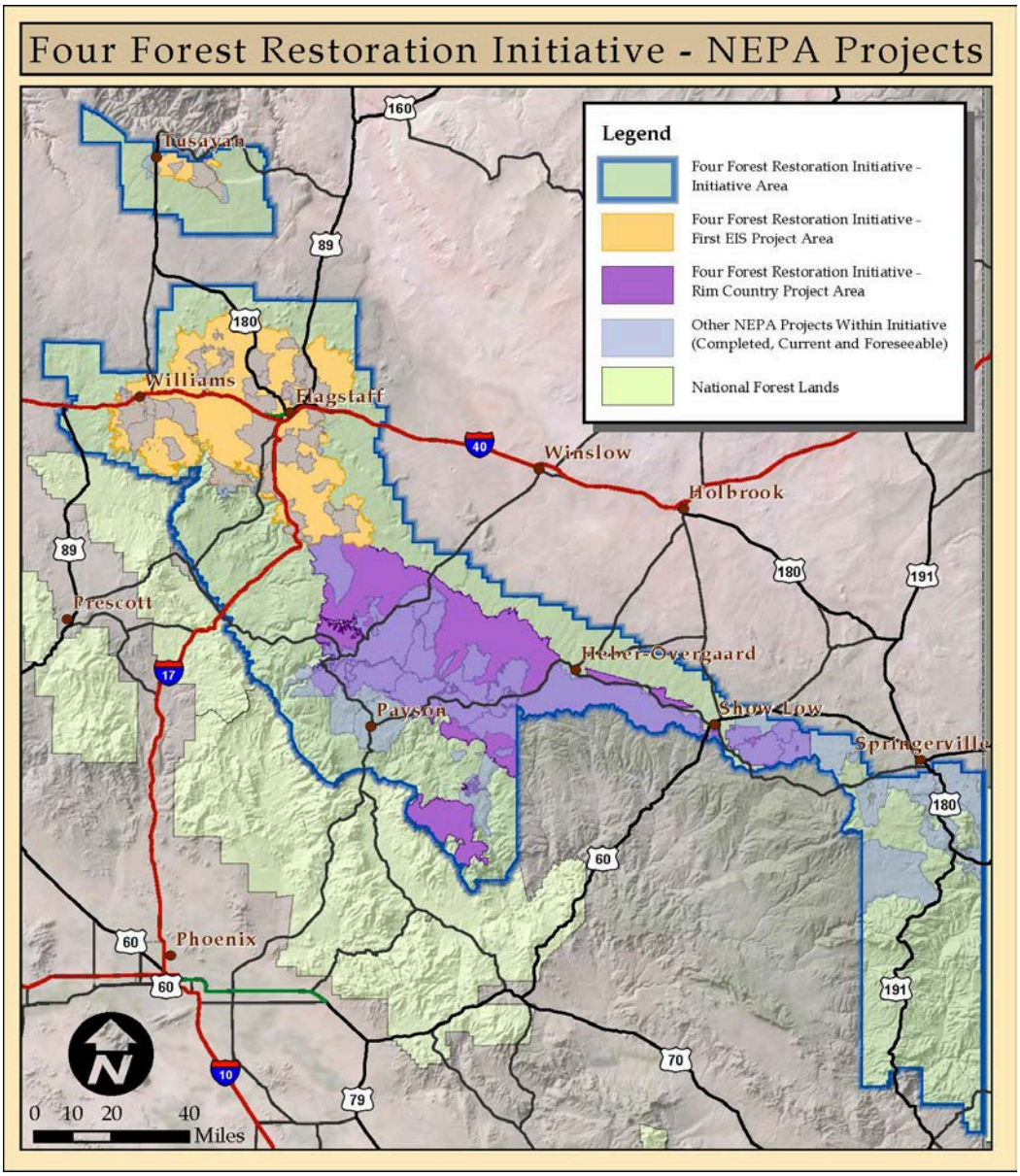


Figure 33 - 4FRI Map (Courtesy of 4fri.org)

- **Flagstaff Watershed Protection Project (FWPP)**. "A partnership effort between the State, City and Coconino National Forest to help reduce the risk of devastating wildfire and post-fire flooding in the Rio de Flag and Lake Mary watersheds." (flagstaffwatershedprotection.org). This includes the Dry Lake Hills area and is outside of the upper Rio De Flag Watershed.
- **Bill Williams Mountain Restoration Project(BWMRP)**. "The purpose of the project is to improve the health and sustainability of forested conditions on and surrounding Bill Williams Mountain by reducing hazardous fuels and moving vegetative conditions in the project area toward desired conditions." The final record of decision, approving the project, was issued on 12/11/15 although the implementation schedule is not yet set. The BWRP has a direct impact on the watershed that impacts the City of Williams and should be viewed as one of the most beneficial AoMI.

5.1.1.1 Fort Valley Forest Health

There are many forest health initiatives that are ongoing in the Fort Valley Watershed, including 4FRI and the Wing Mountain Project. It is recommended that Coconino County discuss the scope and implementation time frame of both projects with the USFS. Also of note within the Fort Valley Watershed, is the Kachina Peaks Wilderness Area. The wilderness area includes the majority of the steep portions of the Peaks where debris flows will tend to form. Although there are restrictions on forest health activities that can happen within the wilderness area, it is recommended the Coconino County begins to coordinate with the Coconino National Forest to determine if there are treatment possibilities (i.e. prescribed burning as opposed to mechanical thinning).

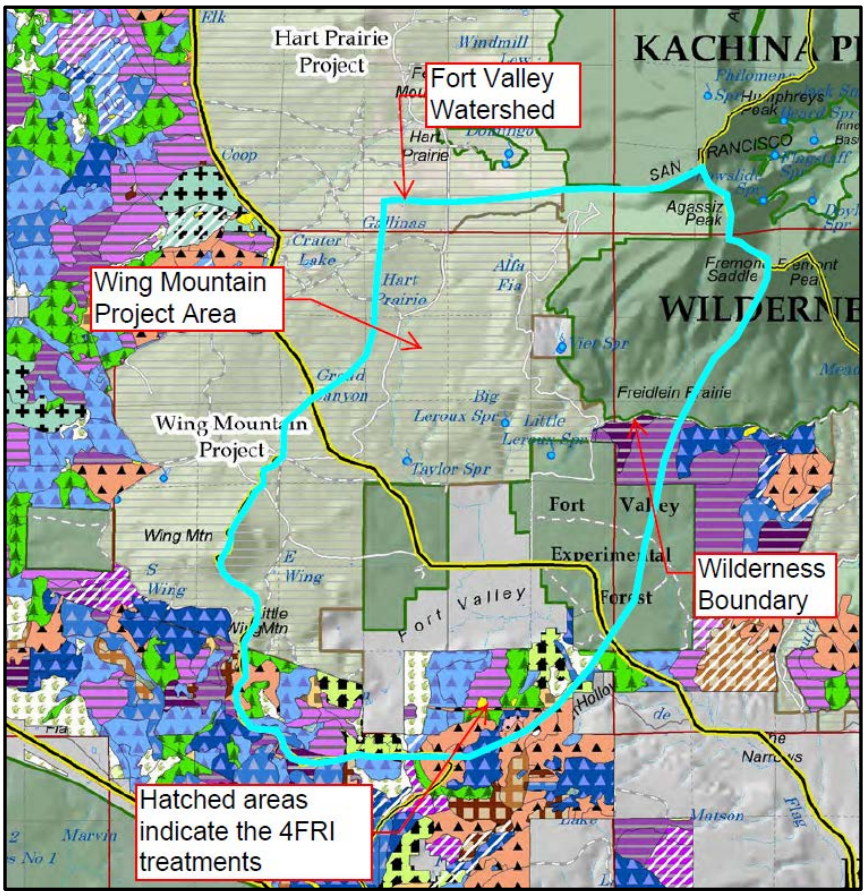


Figure 34 - Current Initiatives in the Fort Valley Area (Courtesy of 4FRI.org)

5.1.1.2 Williams Forest Health

The USFS has conducted and approved an Environmental Impact Statement (EIS) for the BWMRP. The main challenge is that treating the very steep upper slopes of the mountain is very difficult and will require cable or helicopter logging. Financing the thinning and finding a company to complete the task is a major challenge, and creation of funding partnerships between public and private project stakeholders is key to thinning moving forward. When the project moves forward, priority should be given to the highest priority watersheds that pose the greatest risk to the community. The upper Cataract Creek watershed which feeds into City Dam is one of those watersheds.

5.1.2 Development Guidelines

Reducing future flood and debris flow risk in the Fort Valley and Williams Areas can be in part mitigated by adopting new development guidelines and safe building practices that will make public and private infrastructure and homes more resilient to adverse impacts from future fires and floods. A question that communities should answer is: "How are we decreasing the future damage potential by NOT repeating past practices found to be vulnerable during past floods and fires?"

Figure 35 - Timberline Flooding

If communities intend to increase resiliency, guidelines should be specific to the potential flood risk in each pilot area and should be applied to both public and private development and infrastructure. In particular, the following observations are made in each pilot area.

5.1.2.1 Fort Valley Guidelines

Fort Valley is a rural area within the County that experiences development on a lot by lot basis. In general, the flow depths could increase up to 3 feet in the developed area of Fort Valley in post-wildfire conditions. Over 400 acres within Fort Valley are at risk for increased flood water depth during a post-fire 100-year storm, as shown in Figure 36. Current regulations are to set the finished floor at least one foot above the pre-fire 100-year water surface elevation. To prevent post-fire flooding of future development, the County may want to consider revising the minimum finished floor requirements in fire-impacted watersheds, and expand the area of enforcement beyond the existing 100-year floodplain to the 100-year post-fire floodplain footprint.

Additional development guidelines could include:

- Implementing new Finished Floor Elevation requirements based on post-fire flooding.
- Identification of flow corridors to keep open for flood conveyance.
- Fencing guidelines within flow corridors (no solid fencing) to prevent flow diversions and ponding.
- Defining road alignments perpendicular to flow to prevent capturing and redirecting flood flows.
- Aligning homes parallel to flow to minimize flood impacts.
- Identification of open space on each lot to provided conveyance and prevent diversions.
- Promotion of FireWise development practices – cut trees around home, clear brush, etc.

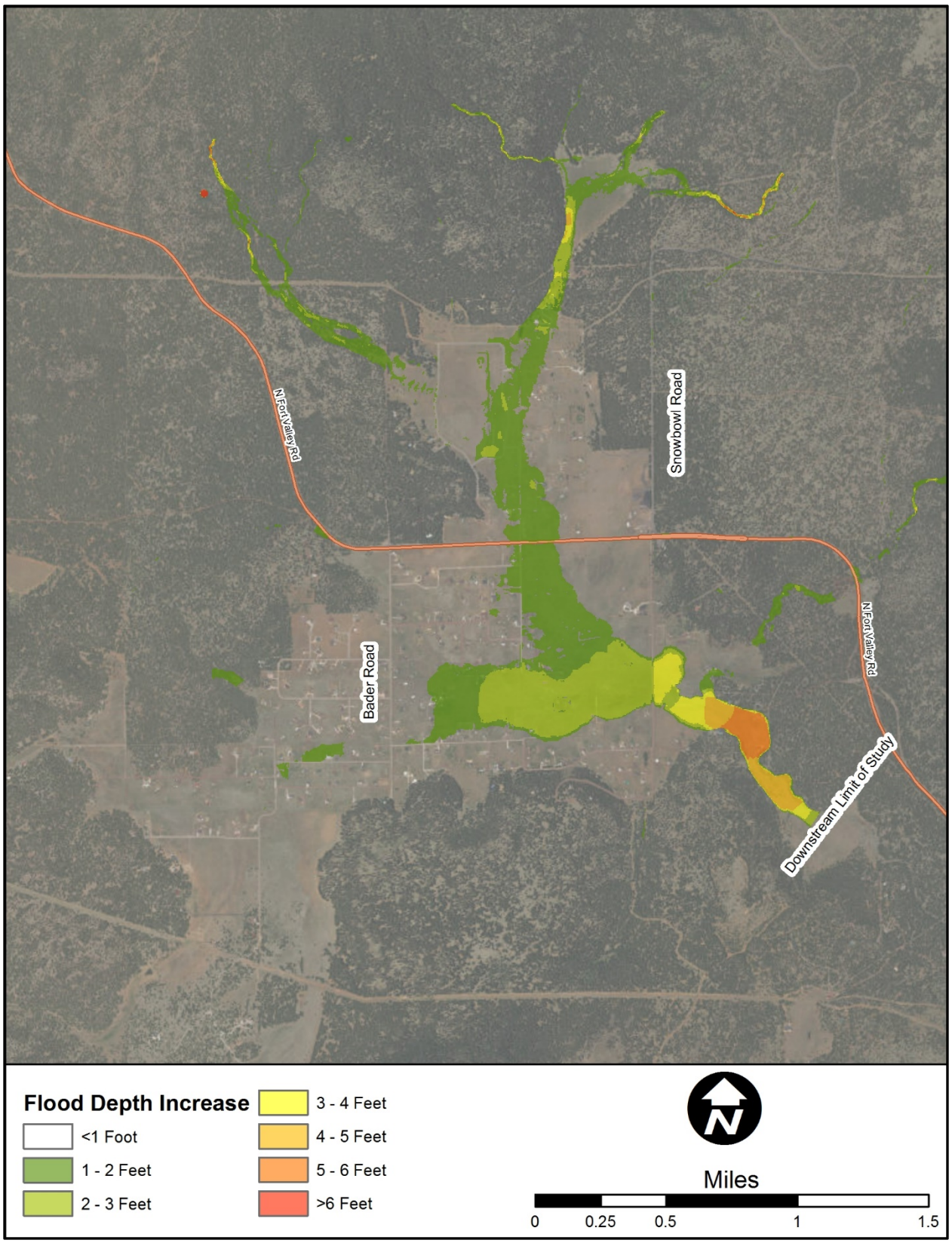


Figure 36 - Fort Valley 100-Year Flood Depth Increase Due to Fire

5.1.2.2 Williams Guidelines

Williams differs from Fort Valley in that is has denser development and is substantially built-out, resulting in higher post-fire flood risk. Within a large percentage of the downtown area, there is potential for the 100-year flood depths to increase by 1 to 2 feet due to wildfire (Figure 37). Certain locations south of I-40 may see a more severe increase in flood depths due to the limited capacity of the structures under the highway. The City may wish to consider the following:

- Implementing new Finished Floor Elevation requirements based on post-fire flooding for new structures.
- Establishing guidelines for remodels and substantial improvements. This could include floodproofing, lot grading, minimum finished floor elevation requirements.
- Future CIP projects should include upsizing structures to handle post-fire conditions.

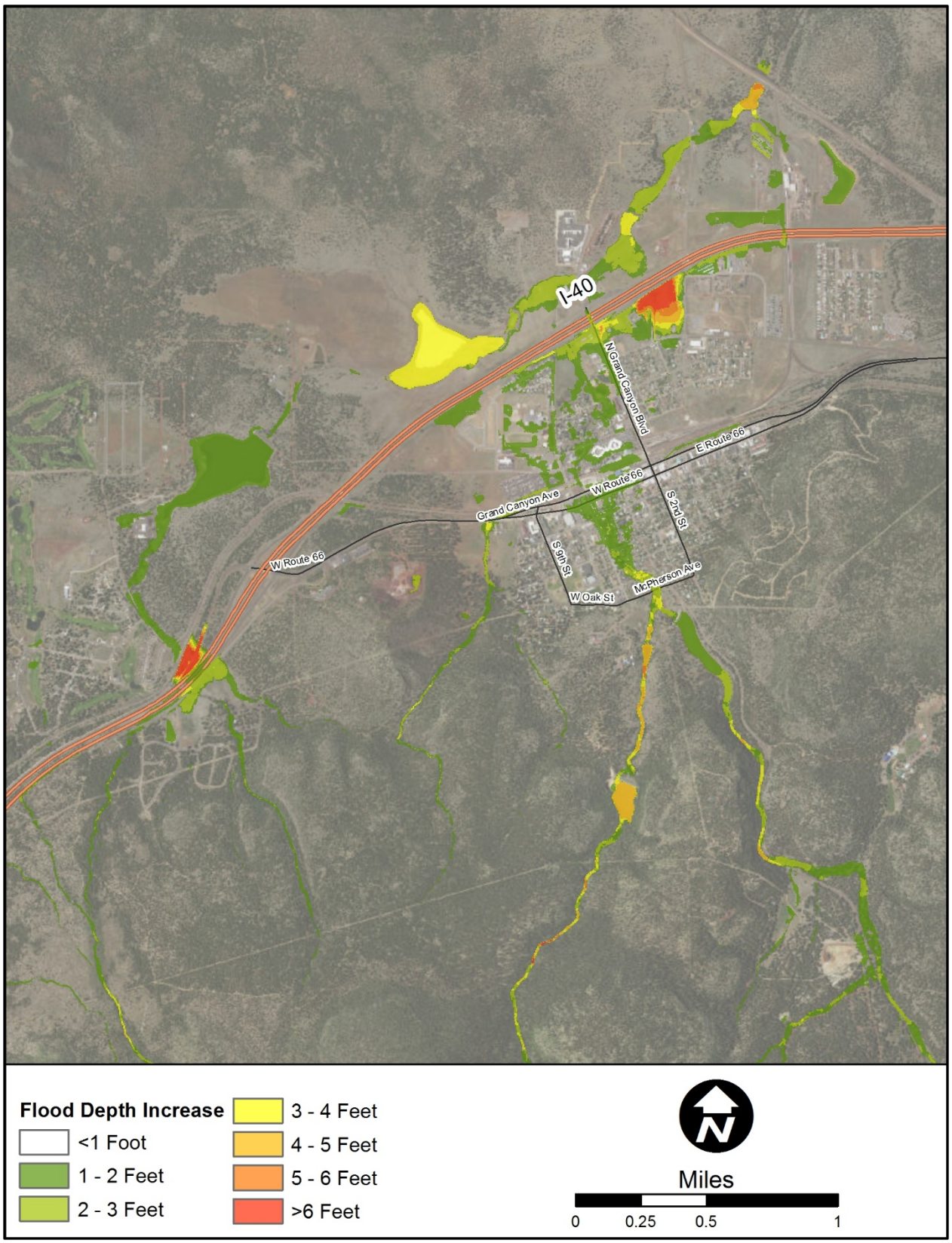


Figure 37 - Williams Flood Depth Increase Due to Fire

5.1.3 Community Awareness and Education

The risk posed by post-wildfire flooding and debris flows can be challenging to convey to the public because they are dependent on a wildfire taking place. Educating the public about the risk, and the many forms that it can take, is critical to taking steps to reduce the risk. The Schultz Fire and resulting flooding came as a surprise to many people since many of the drainages originating on the mountain rarely have water in them and may not look like a flood channel to untrained observers. These seemingly minor drainage paths became incised channels due to the debris flows and increased flooding after the fires. They transported sediment, debris, and flood water into the developed portions of Timberline, Doney Park, and areas downstream. Had the public, developers and regulatory agencies been aware of the potential for flooding due to a wildfire, planning and response to the flooding may have taken a different form. When the Schultz Fire and ensuing flooding began, Coconino County rose to the challenge and was very proactive in engaging the public and partnering agencies to protect life and property and develop mitigation solutions. The challenge now is to plan ahead in vulnerable areas to stay one step ahead of the post-fire risk by making the community aware of the risk and how to plan for it.

The National Flood Insurance Program(NFIP) provides guidelines for developing a Program for Public Information(PPI) which is credible towards the County's FEMA CRS Rating. The PPI must include at least five members and can include individuals from public agencies, community groups, local insurance agents, and/or local bank representatives. The purpose is to provide input from many different sources and convey information to the public in ways that everyone can understand.

Steps the County can take now may include the following:

- Education of the safest exit routes and safety zones.
- Development of PPI's for both Fort Valley and Williams to begin the process of educating the public to the potential risk.
- Develop an educational pamphlet to hand out with building permit.
- Beginning public service announcements in the most vulnerable areas.
- Encouraging homeowners in vulnerable areas to get flood insurance before or immediately when a fire starts.
- Engaging and partnering with Arizona Department of Forestry and Fire Management through their Prevention Programs[14] is another path for educating the public in the wildland-urban interface.

5.1.4 Flood Warning System

A flood warning system within a burnt watershed can be a tool to monitor the potential for debris flow or flood risk. As experienced after the Schultz Fire, there was very little time to install rainfall gages between the end of the fire and the first rainfall events. If the equipment is not on hand at the time of the fire, there is potential that installations will not happen prior to rainfall events. Strategically placed rainfall gages that are installed within vulnerable watersheds before a fire can provide beneficial information to the County or City. Because there is a risk that gages can be damaged during the fire, it is recommended that the County develop a plan for immediate post-fire rainfall gage installation. This plan could include identifying potential locations, maintaining a surplus of equipment, and understanding

[14] https://dffm.az.gov/fire/prevention

easements or permitting that may be required. A plan could be developed specifically for the Williams and Fort Valley Watersheds and modified as necessary if a fire occurs in a different location.

Currently there are two rainfall gages on Bill Williams Mountain; one at City Dam which is owned by the Arizona Department of Water Resources (ADWR), and one at the summit owned by Yavapai County. Three additional locations at the Williams Ski Area, USFS Work Center, and Perkinsville Road are recommended and noted on Figure 38 and may be beneficial to flood warning in the event of a fire.

The Fort Valley Watershed currently does not have any rainfall gages. There are two locations that are both easily accessible and may be beneficial to post-fire flood warning. The first location is at Arizona Snowbowl and the second is at the lower reclaimed water pump station on Snowbowl Road as noted on Figure 39. The National Weather Service should be involved in the discussion of the final placements.

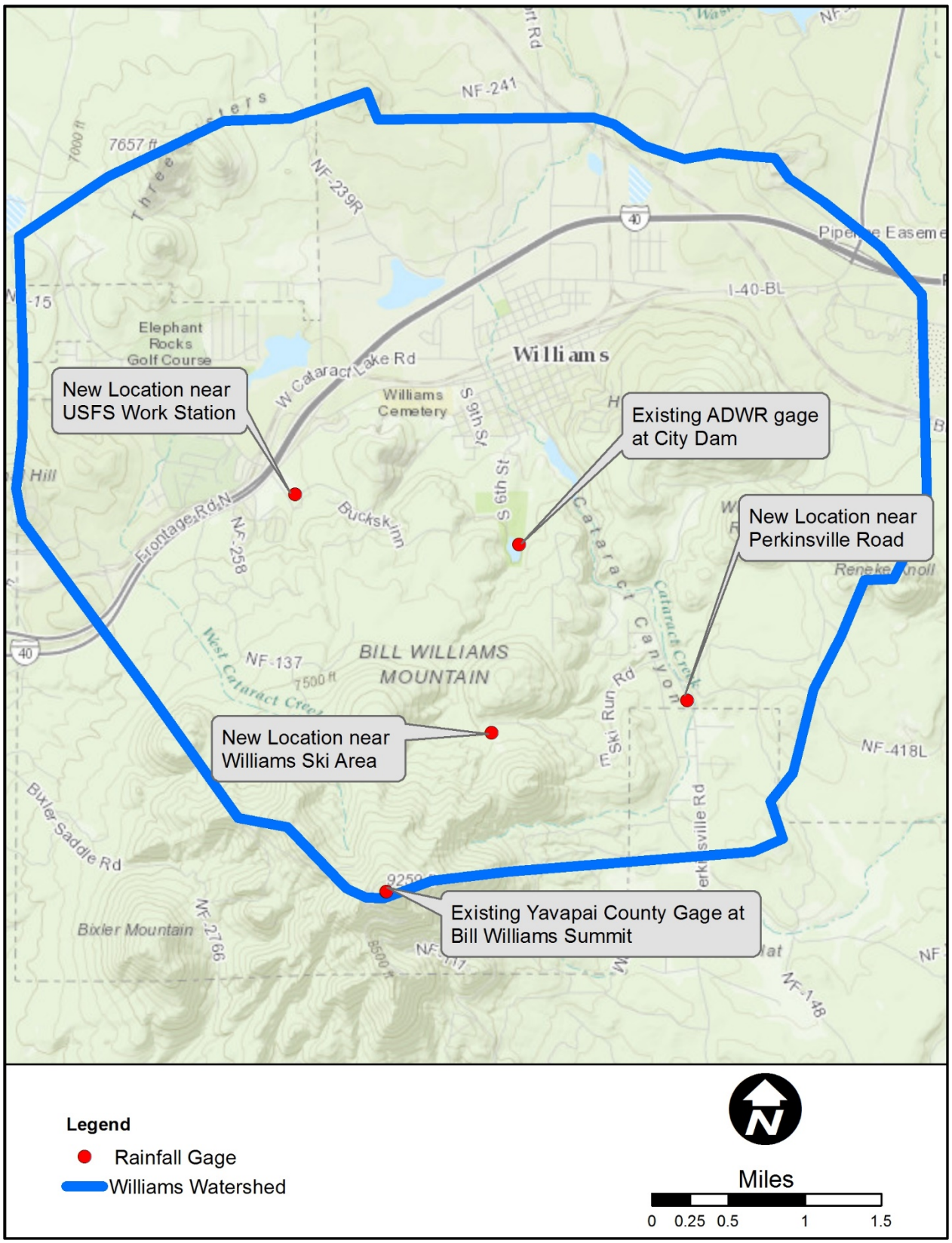


Figure 38 - Williams Rainfall Gage Locations

Figure 39 - Fort Valley Rainfall Gage Locations

5.1.5 Post-Wildfire Emergency Action Plan

The US Forest Services utilizes Burned Area Emergency Response Teams (BAER) to assess post-fire conditions and determine emergency stabilization or treatments to protect life and property. These teams often rely on information provided by local communities to develop and implement a plan. They are however restricted to assessments and treatments on forest land only.

Coconino County or the City of Williams could proactively prepare a Post-Wildfire Emergency Action Plan (EAP) that can be provided to a BAER team to better coordinate the emergency work directly after a fire and implement treatments on non-forest land. The EAP could include:

- Potential flood and debris flow risk maps.
- Evacuation plan and major evacuation route identification.
- Identification of major utilities, critical facilities, and infrastructure in the area that should be protected.
- Community Outreach Plan to help homeowners understand the risk and how to plan for it.
- Creation of a plan to update hydrologic models after a fire begins to understand the risk potential.
- Coordination with the National Weather Service to identify critical rainfall intensities and durations that trigger specific warnings for flood and for debris flow. The warnings could include watches, warnings, evacuations, etc.)

The plan can also list the critical steps that the County needs to take once a fire begins. Figure 40 presents a flow chart for possible action once a fire has begun in a critical watershed.

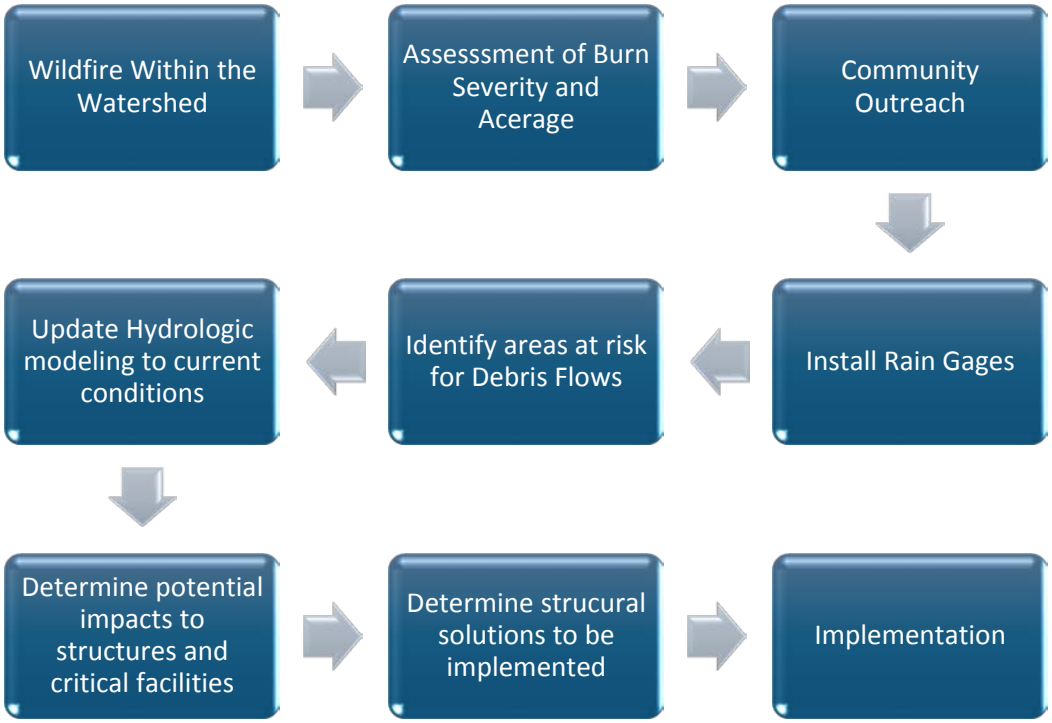


Figure 40 - Post-Wildfire Emergency Action Plan

Integrated within the emergency action plan is updating the hydrologic conditions of a watershed once a fire begins and assessing the flooding potential in real time as a fire progresses. This can be a critical component of planning for where barriers need to be installed or other improvements constructed prior to potential flood events. Post-Wildfire hydrology has been developed as a part of this project and those parameters could be applied to other watersheds within Coconino County that area affected by wildfire.

5.1.6 Building and Infrastructure Resiliency

In both pilot areas there are a significant number of buildings that may be subject to post-wildfire flooding. One of the most important keys to reducing the risk of post-wildfire flooding is increasing the resiliency of those existing buildings and the infrastructure that serves them. Even if buildings are not impacted, protection of life and property is often contingent upon critical infrastructure providing evacuation routes, emergency access, and utility service to the areas affected by post wildfire flooding. Ways to improve the existing developments resiliency include:

- Post-flood repair guidelines (don't put it back the way it was, make it better).
- Elevate and floodproof additions and substantial improvements.
- Regrade lots to divert drainage away from structures.
- Relocate driveways and fences out of identified flow corridors.
- Re-landscape lots to provide flood protection to existing structures.

5.1.6.1 Fort Valley Building and Infrastructure Risk

As summarized in the previous sections, many buildings may be inundated in a post-wildfire flood. In addition, there are two main pieces of infrastructure that may be impacted in a debris flow and flood event. Highway 180 crosses through the meadow and has the potential to be damaged in the event of post-fire flooding, which could create access issues for the south and west sides of Fort Valley. There is also a high pressure Transwestern Gas line that crosses the north part of Fort Valley and has a spur that runs south along South Snowbowl Road. Results from the modeling show that post-wildfire flooding would be deeper and faster than existing conditions, creating potential for scour where the flow crosses the line. The pipeline crosses many flowpaths that originate on the upper slopes of the peaks. Experience in the Timberline area after the Schultz Fire showed that small or non-incised channels can become very large with initial post-fire flood events.

Table 10 shows pre-and post-wildfire flow characteristics. Figure 41 shows locations where the pipeline or Highway could be impacted by post fire flooding and debris flows. There are many private roads and infrastructure which may be impacted as well which are not shown on the figure.

Table 10 - Fort Valley Infrastructure Impacts

Infrastructure	**Pre-Fire**		**Post-Fire (untreated watershed)**	
	Depth	Max Velocity	Max Depth	Max Velocity
Highway 180	< 1 foot	< 3 ft/sec	2 feet	7 ft/sec
Transwestern Pipeline (North end of Fort Valley)	< 2 feet	5 ft/sec	4 feet	8 ft/sec
Transwestern Pipeline (S. Snowbowl Road Crossing)	< 2 feet	5 ft/sec	4 feet	6 ft/sec

Another consideration in the Fort Valley area is the presence of shallow wells and septic systems. There is not a public water or sewer system, and each home has an individual well and septic systems. Post-fire flooding has the potential to carry ash, debris, and sediment which will negatively impact both the water quality of shallow wells and the functionality of the existing septic systems.

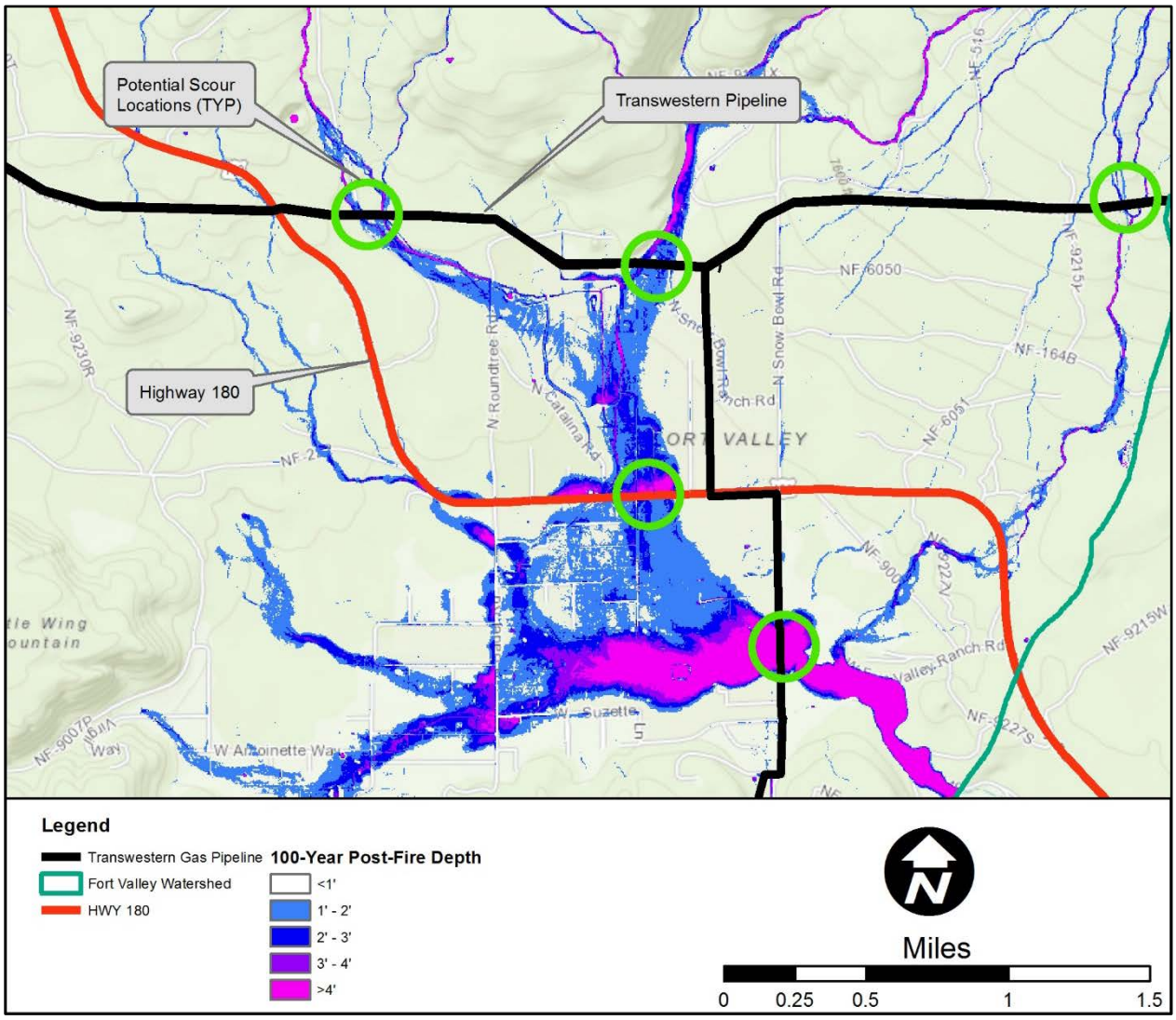


Figure 41 - Fort Valley Infrastructure

5.1.6.2 Fort Valley Pre-Fire Infrastructure Resiliency Planning

The following recommendations should be considered by public agencies, private entities, and homeowners to plan for post-wildfire impacts and increase the resiliency of existing buildings and infrastructure:

- Transwestern Pipeline. Evaluate the need for additional scour protection at major drainage crossings potentially impacted by post-fire floods.
- State Route 180. Evaluate the need for additional erosion protection at major drainage crossings potentially impacted by post-fire floods.
- Private Homeowners. Develop guidelines for barriers to protect buildings, water wells and septic systems.
- Flow Corridors. Identify critical flow corridors for potential property acquisition or zoning restrictions to preserve flood conveyance.
- Fort Valley Channel. Evaluate potential for developing a flood channel and corridor sized to safely convey post-wildfire flood events through the developed area. The plan may include easement acquisition for the channel so that it could be implemented rapidly in the event of a fire.
- Sediment Basins. Identify possible locations for upstream sedimentation basins and scour prevention similar to methods used after the Schultz Fire, and begin coordination for easements, permitting and access for implementation after wildfires.

It is recommended that ADOT, Transwestern, public utilities, and individual homeowners be informed of the post-fire modeling results to assist them in planning for future development and maintenance of existing structures.

5.1.6.3 Williams Building and Infrastructure Risk

Post-fire flooding impacts to the Williams area have the potential to be severe. Not only would post-fire flows have a direct impact on a significant number of structures, but they may also impact a number of critical facilities, such as dams, public utilities, the public drinking water system, and roads.

Figure 42 - Schultz Scour Protection and Sedimentation Basin

One of the major sources of drinking water for Williams is the City Reservoir. Post-wildfire runoff into the reservoir is at risk because of the potential for impacts to the water quality due to ash and sediment. The focus of this study is a landscape-sized fire and the ensuing impacts. However, the reservoir is vulnerable to water quality problems even with a small fire in its watershed. Based on the modeling results, there is potential for the reservoir to partially fill with debris and sediment. Although this may not affect the structure of the dam, it will decrease the overall storage volume.

In addition, water velocities within Cataract Creek have the potential to increase by as much as 50%, with greater flow depths. These increases may put public and private utility lines at risk due to increased scour both within the channel as well as in areas immediately adjacent to the channels (e.g., power poles). Similarly, public road crossings may also be at risk due to scour. Possibly a more important consideration than the damage to public roadways, is the potential loss of emergency access routes. Many channels on the west side of Williams also have the potential to be impacted by flood water. Channel scour could lead to the loss of access to several neighborhoods near the Forest Service Work Center and damage existing infrastructure. It is even possible that I-40 would be overtopped in a post-fire flood event and experience scour and damage (Figure 44).

Finally, a significant number of buildings in downtown Williams may be adversely impacted by post-wildfire flood water. Not only would this directly affect the structures and possibly place lives in danger, but it would also have a significant economic impact on tourism, one of Williams' primary sources of revenue.

Figure 43 - Cataract Creek where it enters Williams

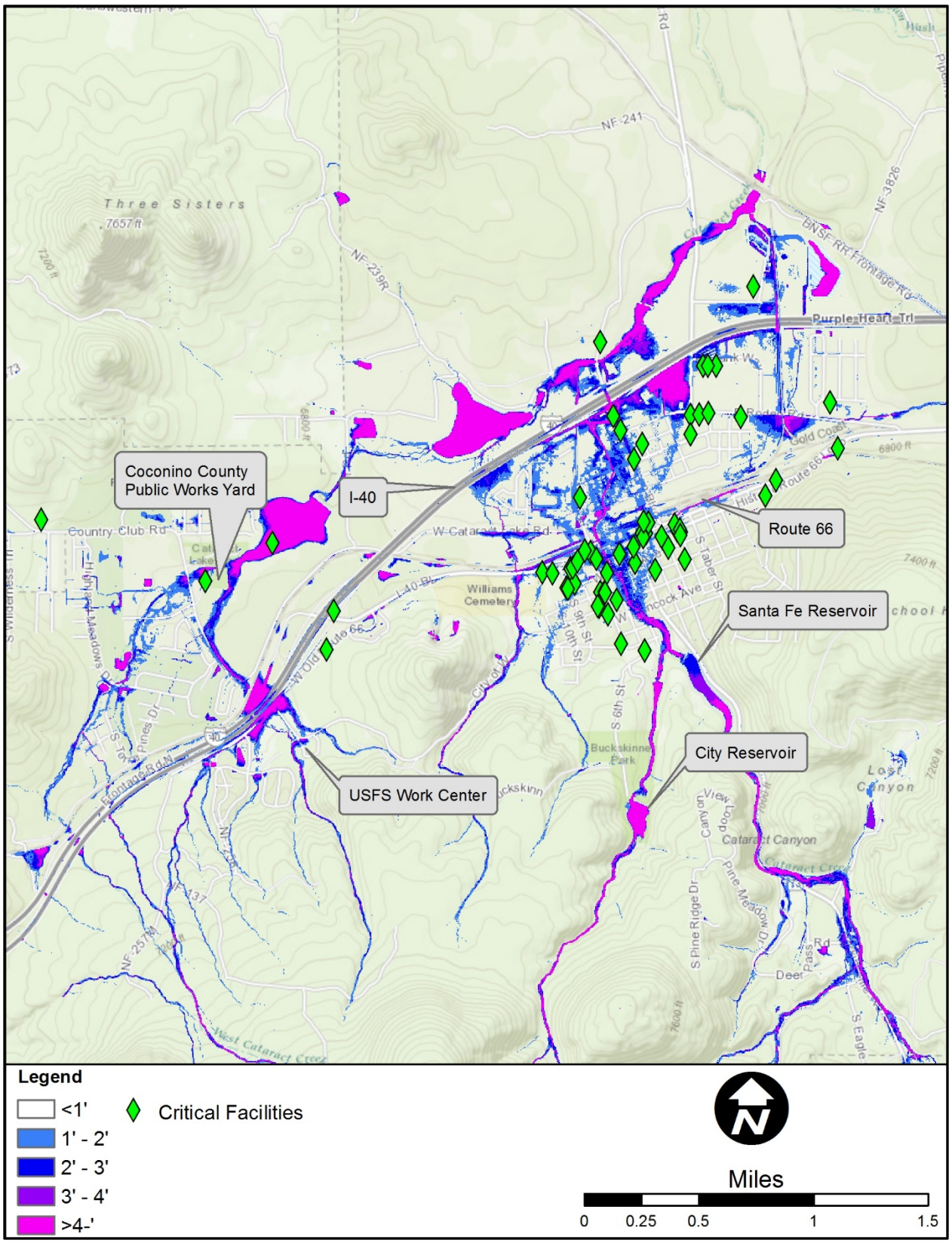


Figure 44 – Williams Infrastructure Impact

5.1.6.4 Williams Pre-Fire Infrastructure Resiliency Planning

The following recommendations should be considered by public agencies, private entities, and homeowners to plan for post-wildfire impacts and increase the resiliency of existing buildings and infrastructure:

- Protect Critical Infrastructure. Develop flood barrier installation plans specific to each piece of critical infrastructure within Williams, based on post-fire flood depths, velocities and debris flow potential.
- I-40 Erosion Protection. Evaluate the need for additional erosion protection on I-40 where post-fire flood modeling indicates potential overtopping (near the USFS work center).
- Water Supply.
    - Investigate alternative and emergency sources of drinking water.
    - Research potential water filtration units that could protect the existing water treatment plant from ash and sediment laden water if the City Reservoir is impacted. Denver and Fort Collins, CO are good resources for the City of Williams.
- Private Homeowners. Develop guidelines for barriers to protect buildings, water wells and septic systems.
- Utility Crossing Protection. Evaluate the need for scour protection for utility crossings along Cataract Creek within the City of Williams.
- Flood Conveyance Channel(s). Evaluate potential for developing a flood channel and corridor sized to safely convey post-wildfire flood events through the City of Williams. The plan may include easement acquisition for the channel so that it could be implemented rapidly in the event of a fire.
- Sediment Basins. Identify possible locations for upstream sedimentation basins and scour prevention similar to methods used after the Schultz Fire, and begin coordination for easements, permitting and access for implementation after wildfires.

5.2 Community Outreach and Implementation

This study is a high-level investigation into the impacts of post-wildfire flooding and debris flows on the communities of Fort Valley and Williams. To date there have not been major fires in either of these watersheds and the challenge faced by local communities is to find reasonable *pre-fire* answers to the following questions.

- What should the County/City's role be in mitigating or minimizing post-wildfire risk?
- What should the private homeowner's/business owner's role be in mitigating or minimizing post-wildfire risk?
- To what extent should structural solutions be implemented in a pre-wildfire condition?
- To what standard should development be regulated in these areas?

With the information presented in this study, potentially impacted stakeholders have the tools to begin the discussion of these questions. Since these are high level policy type decisions, some smaller scale ideas for implementation area as follows:

- Create PPI groups in Fort Valley and Williams.
- Determine a Community Outreach Plan which may include annual public meetings, mailings, etc.
- Do additional detailed modeling to identify the size/scope of improvements that would need to be implemented in certain areas. Perhaps there are smaller scale improvements that will go a long way in increasing the resiliency of the communities.
- Determine easement the extent of easement acquisition necessary to implement some mitigation solutions.

6 CONCLUSION

Coconino County has the unique opportunity to plan for and take steps to mitigate the potential risk posed by post-wildfire flooding and debris flows. Post-fire flood and debris flow hazard areas can be mapped and identified prior to fires as planning tool and as this study shows, significant land areas, structures, critical facilities, and major infrastructure in County are vulnerable to these hazards. A reconnaissance-level countywide FLO-2D analysis completed with this study indicated that approximately **34 percent of buildings and 26 percent of critical facilities** within the County are vulnerable to some type of impact from post-wildfire flooding. In addition, 10 critical facilities and 593 buildings are directly within debris flow risk zones.

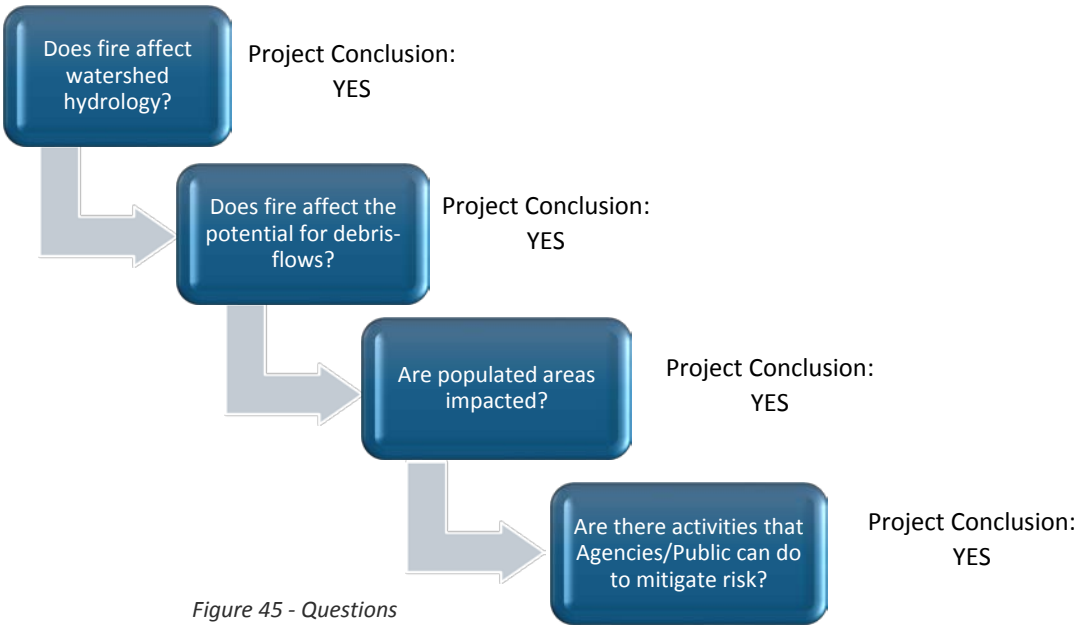


Figure 45 - Questions

To better understand the specific impacts to local communities, two pilot areas were selected for a detailed pre- and post- wildfire flood and debris flow analysis. These detailed studies sought to determine an answer to the questions in Figure 45 and understand the severity and implications of those answers. In all cases the answer is **YES**.

Post-fire debris flows are likely in both pilot study areas if a wildfire with enough high to moderate burn severity on upper slopes of watersheds occurs. In addition, debris flows erode and scour channels as they travel downslope, releasing sediment for additional transport by hyperconcentrated flows and sediment-laden flood flows. While debris flows may not travel far enough to directly impact houses, infrastructure or other critical facilities, they will indirectly impact these areas of concern by eroding and transporting released sediments via hyperconcentrated sediment and flood flows.

In the Williams study area, debris flows entering and impacting City Dam reservoir is a major concern. Post-fire sediments could significantly decrease the capacity of the reservoir and compromise water quality. Downstream areas will see a significant increase in flooding and sedimentation. The number of structures and critical facilities impacted by flood depths greater than 1 foot in the 100-year event could increase by 350% in the event of a fire.

Within the Fort Valley study area, the major concern is hyperconcentrated sediment and flood flows entering developed areas, similar to the post-Schultz-Fire flooding. Channels on the fans at the base of the San Francisco Peaks could erode and evolve with each storm, resulting in unexpected flood pathways and newly eroded channels. Sediment from newly eroded channels could impact developed areas via hyperconcentrated sediment and flood flows, or perhaps by minor debris flows if temporary debris dams form and breach in the upstream channels. Downstream areas will see a significant increase in flooding and sedimentation. The number of structures impacted by flood depths greater than 1 foot in the 100-year event can increase by 255% in the event of a fire.

In both areas, post-fire flood hazards differ significantly from no-fire flood hazards, and include large amounts of land currently not mapped as floodprone.

Coconino County has the opportunity to partner with other stakeholders to affect change within the watersheds and reduce risk to the public and existing infrastructure. Potential stakeholders may include:

- **City of Williams –** A significant portion of the City is at risk.
- **City of Flagstaff –** Future studies may indicate similar impacts to portion of Flagstaff.
- **United States Department of Agriculture (USDA) – Coconino and Kaibab National Forests –** Wildfire poses a significant risk to the health and management of the existing forest.
- **Arizona Department of Emergency and Military Affairs (DEMA)/ Federal Emergency Management Agency (FEMA)** - Possible Pre-Disaster Mitigation (PDM) Grant funding that can help with pre-fire mitigation implementation.
- **Arizona Department of Environmental Quality (ADEQ) – Water Infrastructure Finance Authority of Arizona (WIFA) -** Possible partnering opportunity to maintain the water quality of the Williams Water System.
- **Arizona Department of Transportation (ADOT)** – Several ADOT facilities have the potential to be impacted in the event of a post-wildfire flood.
- **Energy Transfer (Owns Transwestern Pipeline**) – A portion of the pipeline may be impacted by post-wildfire flooding and debris flows.

Other potential partners include public and private utilities (gas, water, electric, cable, phone, etc.), the Federal Highways Administration, FEMA, and the BNSF Railroad.

In Northern Arizona, trends of increasing wildfire size and severity have placed many people and the infrastructure that serves them at risk from wildfires and the aftermaths of fires. Forest treatments to restore forest health are critical to the reduction of fire risks and the potential for post-wildifre flooding and debris flows. Forest treatments which are planned as a part of the Bill Williams Mountain Restoration Project can reduce the potential for a severe wildfire fire if they are implemented before a fire happens. In the Fort Valley area, however, modeling suggests that treatment efforts will reduce risks only if treatments can occur on the whole mountain, including within the wilderness area. Debris flows are generated on the steep upper slopes of burned basins which, in this study area is within the wilderness area. This will require coordination with environmental organizations, Congress and USFS.

Coconino County has been proactive in understanding the general risks within the County and the specific risks within the pilot watersheds. Wildfires will continue to be a risk to other areas within the County and the extent of that risk should be identified in subsequent studies.

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The Economic Impact of Post Fire Flooding: Bill Williams Mountain

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This study was prepared by the Economic Policy Institute at the request of the Coconino County Board of Supervisors and Coconino County Flood Control District.

The authors would like to thank the following people and organizations for their input:

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Overview

Potential damages from a catastrophic wildfire and the post-fire flooding in the Bill Williams Mountain watershed are estimated to be between $379 million and $694 million. This study estimates the post-fire flood impacts on the City of Williams located directly north of the Bill Williams watershed. The US Forest Service Bill Williams Ranger District has completed the NEPA process to conduct fuel reduction forest treatments in the watershed, which is critical to the City of Williams and was a recommendation from the *Coconino County Post-Wildfire Debris-Flow and Flooding Assessment*. By thinning unnaturally dense vegetation and using prescribed fire in the watershed, the risk of intense wildfire and post-fire impacts will be significantly reduced.

The primary risks of wildfire are two-fold: damage from the fire and damage from resulting floods. Severe, uncharacteristic fire destroys trees, wildlife and recreation values and threatens homes and infrastructure in its path. Because forest soils are baked during catastrophic wildfire the soils become hydrophobic, and thus temporarily unable to absorb water. As a result, floods occur in areas downstream of burns and cause severe damage to areas located at a distance from the fire itself. Research from the University of Wyoming College of Agriculture and Natural Resources indicates that increased runoff and erosion after intense wildfires on steep hillsides can increase peak runoff by up to 100 times the average flow[1]. This happens after moderate to severe fires that burn the soil to the point that it is hydrophobic and can no longer absorb water. After the 2010 Schultz Fire, that burned adjacent to the City of Flagstaff, flooding caused millions of dollars of damages to properties downstream of the watershed. The study concluded that post-fire flows would be up to 5 times the pre-fire flows through the City of Williams. A small (2-year) storm on a burnt Bill Williams watershed has the potential to produce flows similar to the 100-year pre-fire conditions.

This study assumes that post-fire impacts would be similar to a 100 year flood in the drainages below Bill Williams Mountain after a fire of similar intensity and coverage. The Bill Williams Mountain Watershed is located south and uphill from The City of Williams' cultural, tourist, retail, residential and

governmental core. The watershed is heavily used for outdoor recreation including a ski area, residential housing, and summer camps. It is also unnaturally dense with ponderosa pine and mixed-conifer forests and characterized by steep slopes, making this area vulnerable to an intense catastrophic wildfire and post-wildfire flooding that would devastate its scenic and recreation value as well as devastating the City of Williams water supplies. Based on the example of the Schultz Fire, hydrophobic soils are likely to impair the slopes ability to retain moisture, funneling previously unseen amounts of storm runoff through downtown Williams. The runoff would threaten the heart of Williams' tourist industry including retail shops, government buildings, schools, residential neighborhoods, critical infrastructure, hotels and the signature Grand Canyon Railway. The floods could potentially exacerbate the potable water supply issues for Williams as the town depends on both City and Dogtown Reservoirs for surface water. The lack of a constant potable water supply has plagued the City especially during times of drought and any interruption of the water supply could be very costly to the city, its businesses and residents. Burned hillsides would no longer absorb monsoon rains, polluting both reservoirs waters with silt, ash, debris and mud, and reducing storage capacity. The City Reservoir is also subject to debris flows according to the Arizona Geological Survey (AZGS) as discussed in the Coconino County Post-Wildfire Debris-Flow and Flooding Assessment. The result would be a water supply no longer useable until the reservoir is dredged to remove sediment and debris, and the water treatment plant is re-engineered/upgraded to handle the known chemical changes in the water itself. Both of these processes would be expensive. An immediate solution could be the costly process of drilling new wells. However, previous drilling attempts in Williams have proven to be a difficult process. Several efforts to drill new water wells have failed.

This study uses data from the Army Corps of Engineers' *Rio De Flag, Flagstaff, Arizona, Economic Reevaluation Report*[2], The Ecological Restoration Institute's *Full Cost Accounting of the 2010 Schultz Fire*[3], and the *Coconino County Post-Wildfire Debris-Flow and Flooding Assessment*[4], JE Fuller Hydrology & Geomorphology, Inc., and the Arizona Rural Policy Institute's *Flagstaff Watershed Protection Project Cost Avoidance Study*[5].Bill Williams Mountain Watershed

Methods

The *Coconino County Post-Wildfire Debris-Flow and Flooding Assessment* by JE Fuller provides the platform for the analysis of the costs to properties, content and structures within the City of Williams resulting from post-fire flooding events. The JE Fuller analysis examines the impacts of post-fire flooding by developing non regulatory risk zone maps analyzing the potential impacts of post-fire flooding and debris flow in the City. The risk zones are summarized below:

> "Existing Condition Flood – Areas which will potentially be inundated by floodwaters greater than 1 foot if the event occurred in the watershed in its current condition.
>
> Potential Post-Fire Flood – Areas which will potentially be inundated by floodwaters greater than 1 foot in depth if the flooding occurs after the watershed burns with the forest in its current condition.
>
> Post-Fire Debris Flow – Areas which may be produce post-fire debris flows. Debris flows erode and scour channels as they travel downslope, releasing sediment for additional transport by hyperconcentrated flows and sediment-laden flood flows. Downstream areas will see a significant increase in flooding and sedimentation after wildfires.
>
> Post-Fire Hyperconcentrated Flow – Areas downstream of debris flows which may experience severe erosion, and transport the sediment, water and debris from the base of the flow to the flood inundation area.

The Williams 100 year risk zone map (Figure 1) is the basis for calculating the costs to structures and properties in this analysis. JE Fuller provided a file of potential flood depths by square meter for the entire risk zone to the Coconino County GIS division. JE Fuller also developed a flood depth map Figure 2, which indicates estimated flood depths within the identified zone. The flood depth layer was then joined to Appraiser Parcel Numbers and the County Assessor's Office provided the Economic Policy Institute with a final database containing parcel numbers, square footage of parcels and improvements, and flood depths that was used for all flood damage related calculations. Other data sources were provided by the United States Forest Service, local businesses, the City of Williams sales tax collections and the Corps of

Engineers and FEMA documents. Where necessary descriptions of the data used and the methods applied will be included with the cost estimates.

Cost Summary

Table 1 lists the high and low estimated damages that may occur from catastrophic fire and post-fire flooding in the Williams watershed. The estimates are in 2018 dollars and include a majority of costs for the events summarized. Potential financial damages range from $379 million to $694 million. Details for each cost estimate is discussed below.

Table 1. Summary of Potential Impacts

	Low	High
Remediation	$74,000,000	$93,000,000
Flood Damages	$93,000,000	$124,000,000
BNSF Railroad Damages	$12,000,000	$23,000,000
I-40 Freight Delays (6 flood events/3 years)	$27,000,000	$53,000,000
Lost Property Value	$24,000,000	$27,000,000
Williams Water Supply	$5,000,000	$10,000,000
Mexican Spotted Owl	$100,000	$3,400,000
Communications Towers and structures	$39,000,000	$94,000,000
Revenue Loss - Fire event	$1,200,000	$11,900,000
Revenue Loss - Flooding events	$13,000,000	$72,000,000
Tourism Revenue Losses - reduced tourism demand	$85,000,000	$170,000,000
Sales Tax Revenue lost to all events	$5,000,000	$12,000,000
Total	$379,000,000	$694,000,000

Figure 1. Williams Risk Zones (100 Year Flood)

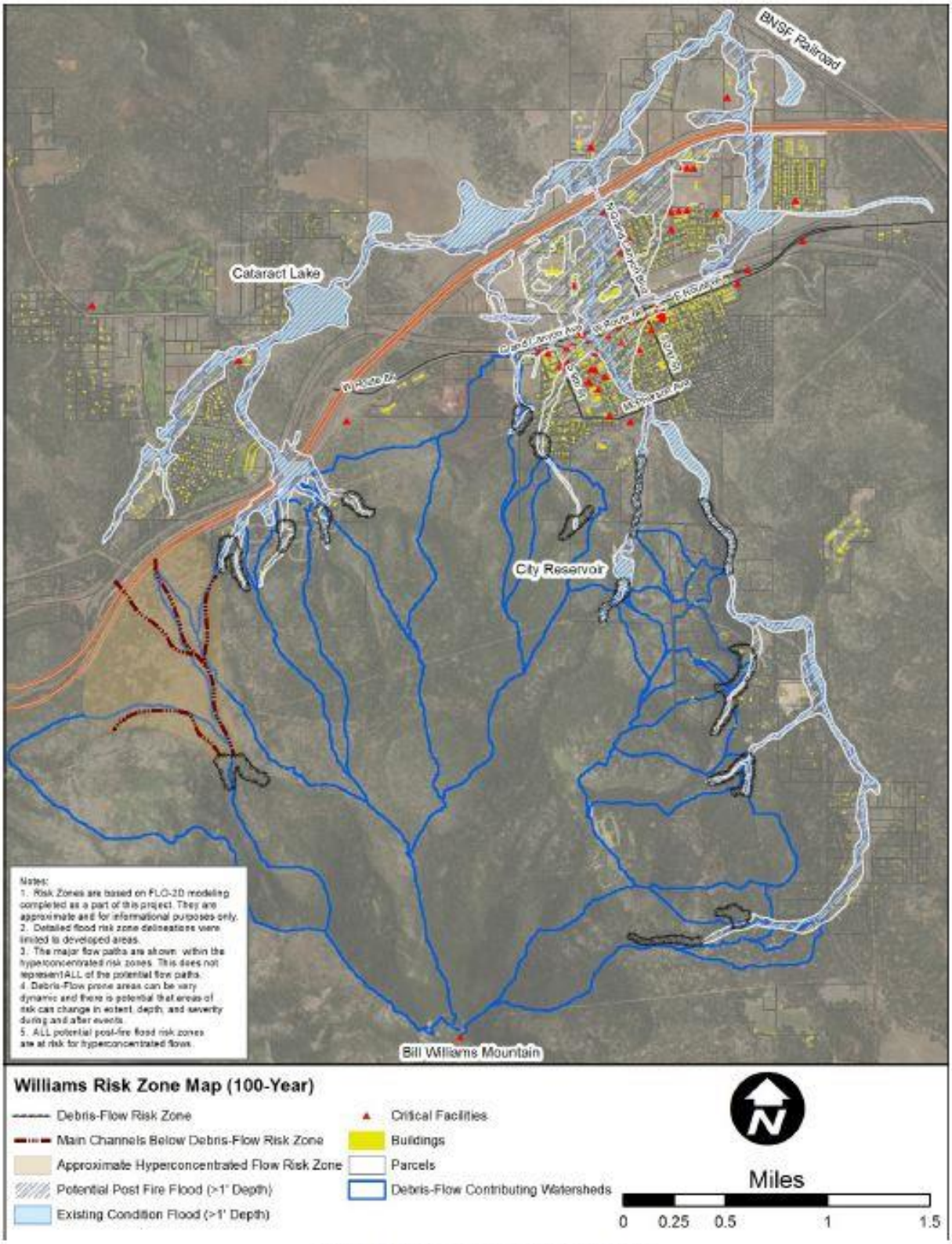
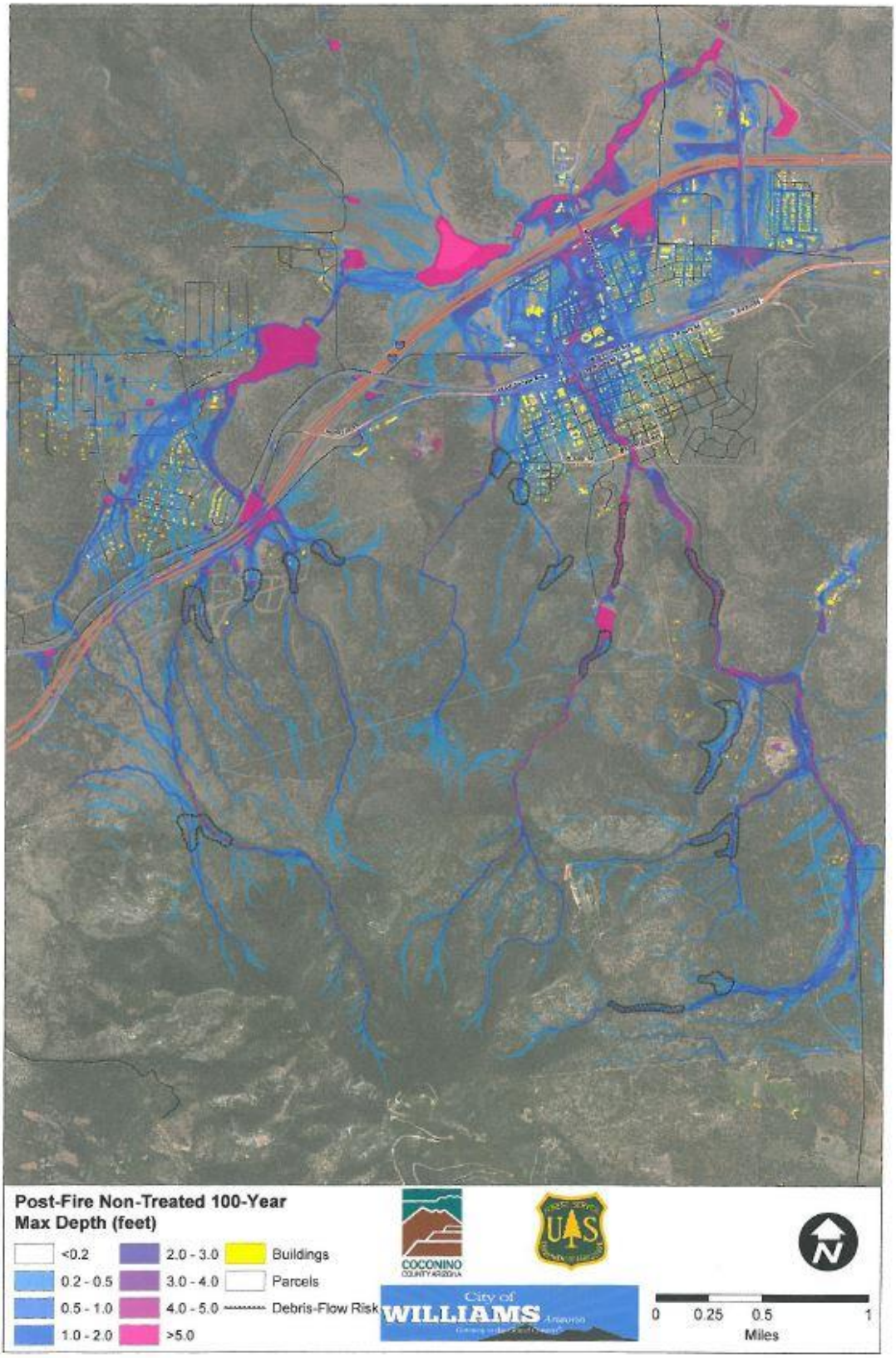


Figure 29 – Williams 100-Year Risk Zone Map

Figure 2. Williams Flooding Depths Post-Fire (100 Year Flood)



Response & Remediation Costs

The response to a fire would incur immediate expenses, including suppression, post-fire rehabilitation, evacuation, and repair costs. This analysis uses as a proxy the costs incurred during the Schultz Fire of 2010. The figures in Table 2 shows the expenditures by state, county, city, and federal government agencies and a variety of utilities after the Schultz Fire and flood. The costs include actual expenditures for suppression and flood mitigation in 2010-2012: mitigation went through 2015 and totaled $30 million. This did not include response costs. The fire modeling of a catastrophic wildfire on Bill Williams closely approximates the scope and size of the Schultz Fire and are therefore used as a proxy. All costs in Table 2 are adjusted to 2018 dollars.

Table 2. Response and Remediation Costs, based on the Schultz Fire 2010.

Funding Agency	Low Estimate	High Estimate
City of Flagstaff	$6,000,000	$7,000,000
Coconino County	$16,000,000	$17,000,000
Arizona Division of Emergency Management (ADEM)	$2,000,000	$3,000,000
Arizona Department of Transportation (ADOT)	$4,000,000	$5,000,000
Fire Department	$1,000,000	$2,000,000
Natural Gas Utilities	$1,000,000	$2,000,000
Electrical Utilities	$2,000,000	$5,000,000
Water Utilities	$3,000,000	$9,000,000
Federal Emergency Management Agency (FEMA)	$7,000,000	$8,000,000
US Forest Service (USFS)	$16,000,000	$17,000,000
Natural Resources Conservation Service (NRCS)	$9,000,000	$10,000,000
Federal Highway Administration (FHWA)	$7,000,000	$8,000,000
Total adjusted to 2018 dollars	$74,000,000	$93,000,000

(Based of FWPP, 2014)

The actual costs estimates related to items in Table 2 may differ significantly from those of the Schultz Fire on which the table is based. Flooding effects in Williams may be quite different as the topography of the two sites differ greatly. The topography of the Schultz Fire allowed for a relatively long gradient that

dispersed flooding over a wider area and limited scour and other effects. On the other hand the potential flooding and debris flow from the Williams watershed is considerably steeper and shorter potentially affecting the velocity and reach of the water. The Schultz Flood affected many houses that were on large lots whereas the flood path in Williams goes directly through built up residential neighborhoods and the developed downtown increasing damage and remediation costs. The impact of flooding is likely to be considerably larger in Williams as the central business district, hotels and the Grand Canyon Railway properties will be directly impacted, when compared to the Schultz flood where virtually no commercial property was damaged.

Assets at Risk

All assets falling within the 100 year flood zone depth map were aggregated to provide the basis for the evaluation of risk. There are 947 buildings in total in the flood zone, a majority (80%) are residential, followed by retail (5%) and accommodations (4%). Residential properties have the highest full cash value ($135 million), whereas accommodations have the highest full cash value ($91 million) for the fewest properties. Retail ($24 million) also has a high full cash value compared to a small number of establishments.

Table 3. Structures and Full Cash Value in 100 Year Flood Zone.

Type of structure	Structures	Total full cash value of parcels
Residential	756	$135,000,000
Office	22	$12,000,000
Retail	46	$24,000,000
Services	14	$8,000,000
Restaurants/Food	25	$10,000,000
Industrial-Agricultural	31	$7,000,000
Public	13	$6,000,000
Accommodations	40	$91,000,000
Structure Full Cash Value	947	$293,000,000

Source: Coconino County Assessor, J.E. Fuller

The total value of structures in the 100 year flood zone was estimated to be approximately $293 million in 2018 dollars. Maps showing the flood zone are included in the Appendix.

Structure and Content Damage

The projected flood damages in these areas were calculated using the Army Corps of Engineers' Flood Damage parameters of damage to properties and structures resulting from specific levels of flood inundation. Property and content damage were assessed to properties based on the flood depth levels from the JE Fuller map. Parcels with structures that fell within the flood zone were assigned the level of damage based on the actual anticipated height of the flood waters. This method is somewhat more conservative than applying one property and structure damage factor across the flood zone. This figure also represents expectations during one flood event. To provide a range the low estimate assumes that only 75% of the calculated damages actually occur while the high estimate assumes 100% of the damages occur. The figure in the table are for both content and structure losses adjusted by flood water height. Market value of properties is used as opposed to full cash value from assessor parcels. This is consistent since market value is the true potential value that will be damaged by the floods. Market value is considered to be 35% higher than assessor's full cash value.

Table 4. Expected Damages to Structures in the 100 Year Flood Zone.

Expected Damages	Low (75% damages)	High (100% damages)
Residential	$49,000,000	$65,000,000
Office	$4,000,000	$5,000,000
Retail	$11,000,000	$15,000,000
Services	$3,000,000	$4,000,000
Restaurants/Food	$4,000,000	$5,000,000
Industrial-Agricultural	$2,000,000	$3,000,000
Public	$2,000,000	$2,000,000
Accommodations	$21,000,000	$28,000,000
Total	$93,000,000	$124,000,000

Railroad Damages

The ACE Economic Reevaluation Study for Flagstaff projected costs incurred by the Burlington Northern Santa Fe Railway if its tracks were damaged volume and flow of floodwater. Between physical damages and the cost of delayed rail traffic, a total financial impact to the BNSF was estimated between $11 million and $22 million. These numbers were estimated by a consultant hired by the City of Flagstaff (for publication in the Economic Reevaluation Study). These numbers are used as a proxy for Williams. The calculation of such estimates is beyond the scope of this analysis.

Table 5. Expected Damages and Interruptions to BNSF railroad operations (inflation adjusted).

	Low Estimate	High Estimate
Railroad Damages	$12,000,000	$23,000,000

Source: Army Corps of Engineers

As with many other figures borrowed from the Army Corps of Engineers', this range indicates expectations during one flood event. Experience suggests that following catastrophic fires, such events would occur sporadically and with high-intensity during the monsoon season.

I-40 Damages and Transportation Delays

The potential exists for a 100 year post-fire flood to overtop Interstate 40 west of the Country Club Exit. The extent of the damage to I-40 will depend upon the depth and strength of the water flow as it comes off the mountain and tries to find a path to Cataract Lake via Cataract Creek and the BNSF Railway underpass. The flood zone models indicate a depth between 1 and 2 foot of potential water which will inundate both east and westbound lanes of the Interstate, ponding depths adjacent to the pavement is greater. A study 2007-2008 study by Washington State University titled "Storm-Related Closures of I-5

and I-90: Freight Transportation Economic Impact Assessment Report," studied the impact of flooding in Washington in the winter of 2007. Both I-5 and I-90 were closed for 4 days each as the result of winter snow melt flooding, and avalanche dangers. As a result of truck traffic disruption and truck delays in the two corridors total loss was almost $75 million. More than $47 million of the total loss is attributable to the I-5 closure, with almost $28 million attributable to the I-90 closure. Sales tax revenues lost are estimated at $3.81 million, and reduction in personal income is estimated at $23.15 million[6]. While this study was instructive in producing comparable metrics for I-40 the scale of the I-5 and I-90 closure (20 miles of I-5 under water) is far larger and more complex than the potential closure of I-40 from post-fire flooding.

Using an alternative method also originating in the Washington State report, the first task is to determine the number of trucks passing east and westbound of the flooded area. It is estimated from Arizona Department of Transportation Traffic Counts that there are 8,558 trucks per day that will be potentially impacted by the flooding. Next calculate the mileage of a detour around the closure for both east and west bound truck traffic, the most direct route for eastbound traffic is from Ash Fork to Prescott Valley to I-17 and back to Flagstaff to carry on eastbound on I-40. Conversely, westbound traffic would reverse the route going back to Flagstaff, down I-17 to Prescott Valley and back to Ash Fork. Using Google Maps it was determined that the average roundtrip was 153 miles. The WDOT study estimated the value of time cost for the Washington detours as $500 per truck per-detour. This yields a total loss of $4,280,000 per day, and making the assumption that the interstate will stay closed for two days the total cost for the first post-fire flood event is $8,600,000. Based on the Schultz Fire it is estimated that the first post-fire year will have 3 flood events, year 2 will have 2 flood events and year 3 will have 1 flood event. There are no anticipated damages after year 3 as a result of remediation efforts. The table below presents the cumulative losses due to disruption of truck traffic three years after the fire.

Table 6. Expected Damages and Interruptions to I-40 Resulting from Flooding.

Flood Events	Low (1 Day)	High (2 Days)
3 100 year events year#1	$13,000,000	$26,000,000
2 100 year events year#2	$9,000,000	$18,000,000
1 100 year events year#3	$5,000,000	$9,000,000
Total 100 year flood events years 1-3	$27,000,000	$53,000,000

Loss of Property Value

Perhaps the largest financial consequence of a wildfire in the Bill Williams watershed would be the subsequent loss of property values. Residents, businesses, and governments would feel these impacts and losses throughout the city. Multiple factors, ranging from water damage to the loss of a forested backdrop, would depress the existing property market. The resulting loss in property owners' personal wealth would be staggering. For many residents, home equity is a major portion of net worth and the same is true of many businesses. The impact of flooding on government assets is also important, impacting cost of borrowing and the ability to acquire new assets. Because Williams' property values include a premium based on intangibles such as natural beauty and access to adjacent forest land, all parcels in the city would likely see some loss of property value. In the study of the impact of the Schultz Fire the overall percentage of loss is conservatively assumed as 6.7%. The rate was calculated using the drop experienced by homeowners in the neighborhoods north of Flagstaff affected by the 2010 Schultz Fire floods. It is an average built both on properties inundated and damaged, and those in the region that lost value due to intangible commodities such as degraded views and buyer uncertainty.

According to records supplied by the Coconino County Assessor's Office (2018), the aggregate full cash value (FCV) for properties in the flood zone is $293 million. As stated above, decreases within all city properties are very likely. However, to provide a more conservative comparison, impacts are only calculated on the smaller footprint that will be inundated in the 100 year flood. Within that reach are

1,707 parcels, 947 of which have structures, and 760 parcels without structures. The lost market value is only calculated for those parcels in the flood zone that have structures, as the value of undeveloped parcels should not be affected by property loss.

The county reports the FCV of properties for tax purposes. However, these figures are usually lower than actual market value. According to the County Assessor the market value of properties is approximately 135% of their full cash value. The expected drop in property value was taken from the 2010 Schultz Fire. The study estimated that property in selected neighborhoods north of Flagstaff had lost an average of 6.7% of their value after the fire and subsequent flooding. The 6.7% decline in market value is considered conservative, since the area damaged by the Schultz flooding was exclusively residential, whereas the potential area affected by the Bill Williams watershed contains a mix of residential and business properties. The low estimate is calculated only for structures with flood damage and the high estimate is calculated with all parcels including those without improvements.

Table 7. Estimate of lost Market Value

	FCV	Market Value	Loss (6.7%)
Low estimate (parcels with structures)	$259,000,000	$350,000,000	$24,000,000
High estimate (parcels with structure and undeveloped land)	$294,000,000	$396,000,000	$27,000,000

Williams Water Supply

The primary motivation for the watershed improvements on Bill Williams Mountain is the protection of the Williams water supply. The main surface water supplies for Williams is the City Reservoir (116.6 acre feet) and Dog Town Reservoir (1037.3 acre feet). A burdensome side effect of many fires in recent years has been the pollution of water sources by post-fire runoff and loss of reservoir storage capacity.

For example, the aftermath of two Colorado wildfires – 1996's Buffalo Creek Fire and 2002's Hayman Fire – sent over 1 million cubic yards of sediment into Strontia Reservoir, a major municipal water source

for the cities of Denver and Aurora. Dredging the reservoir in order to restore it to a useable state cost the City of Denver $26 million. According to Brad Hill, City of Flagstaff Utilities Director, a fire in the Upper Lake Mary Watershed would require either drilling 11 new wells, dredging Lake Mary as well as expanding the capacity of water treatment facility, or both[4]. The cost estimates for the redesigning the water treatment facility are based on adjustments made by the Salt River Project after the Rodeo-Chideski fire in 2002. Then, many cities in Maricopa County were forced to make design changes in their filtration processes.

Table 7. Cost to William's Water Supply

Low	**$**	**5,000,000**
High	$	10,000,000

(Source: FWPP)

These costs are conservative; they do not reflect the time required to make the changes, borrowing costs, or increased production costs (pumping costs). Drilling new well sites in Williams has not always been successful in prior years (personal conversation, Joe Loverich, J.E. Fuller).

Mexican Spotted Owl

A value is placed on the habitat of the Mexican Spotted owl. The treatment area on Bill Williams Mountain includes all or portions of one protected activity centers (PAC's), for a total of approximately 1,018 acres of protected habitat within the project area. Economists use various methods to attach dollar amounts to habitat loss. The two methods referenced here are found on page 19 in a Full Cost Accounting of the 2010 Schultz Fire. The first is funds spent in conservation efforts. If the United States Fish and Wildlife Service (USFWS) will spend $100 million on spotted owl recovery projects, and 1,000 units of owl habitat exist, then the value per unit of owl habitat according to the USFWS is $100,000. A second method used is willingness to pay, from a random survey of American households Loomis and Ekstrand[5]

solicited respondents willingness to pay on an annual basis for conservation efforts specific to the Mexican spotted owl was $3.6 million ($3.8 million in 2018 dollars).

Assuming the loss per PAC is between $100,000 and $3,843,000, and assuming that damage to any portion of a PAC incurs these losses, the total cost of one lost Mexican spotted owl PAC's would be between $100,000 and $3,843,000.

Table 8. Estimated Value of Mexican Spotted Owl Habitat

Estimate	Low	High
Bill Williams Mountain	$100,000	$4,000,000

(Source: USFS, Kaibab National Forest, Loomis et.al.)

Estimated Loss of Communications and Communication Tower Infrastructure

The communication towers located atop Bill Williams Mountain are vulnerable to uncharacteristic, stand replacing wildfires. A precedent for the destruction of these facilities was set in June 1977, when the Radio Fire burned on Mount Elden's peak, destroying millions of dollars' worth of communication equipment and interrupting regional communications. The top of Bill Williams Mountain holds an array of towers and buildings. Among the users of these facilities structures and their contents are television stations, FM radio broadcasters, cellular phone service providers, 2-way radio users (including county law enforcement), telephone and internet providers. Kelly Cullen, President of the Bill Williams Mountain Users' Group, estimates that the cost per day for data transmission alone from their group is $3 million. Replacement costs for the buildings are assumed to be similar to those in the cited in the Flagstaff Watershed Protection Project Cost Avoidance Study[4] where low cost estimate to replace towers and buildings contents and structure range from a low estimate of $3 million to a high estimate of $8 million per structure.

Table 9. Estimated loss of Communications and Replacement Cost of Facilities

Location	Buildings/ Towers	Low (5 days, $3 million /structure)	High (10 days, $8 million/structure)
Loss of communications/day	$3,000,000	$15,000,000	$30,000,000
Bill Williams Mountain	8	$24,000,000	$64,000,000
Total		$39,000,000	$94,000,000

However, this range does not reflect the impacts of communications losses in the area. Were these facilities to burn, many services including cell phone service, internet, radio, and public safety (law enforcement, fire, emergency medical services) communications would be severely impacted. The results would be disastrous across the community, from business operations to fire suppression and emergency services.

Revenue Loss Resulting from Fire & Post-Fire Flooding

Retail sales, especially sales to tourists are critical for the City of Williams, providing both much needed employment and sales tax revenues. Williams is one of three gateway cities to Grand Canyon National Park (GCNP) a world renowned crown jewel in the US National Park system. The City of Williams is a tourist destination as well, with several renowned attractions including the Grand Canyon Railway, Bearizona, and a revitalized tourist dependent downtown. In order to account for tourism losses from fire and flooding the analysis needs to consider the entire regional tourism economy. Economic losses to the tourism economy occur in the form of reduced expenditures and sales taxes collections occur at varying levels depending upon the post-fire timeline. This study will examine business revenue losses at three specific points in time:

- losses during the fire event,
- losses during flood events

- reductions in tourism expenditure post fire and flooding in Williams resulting from reduced GCNP visitation based on uncertainty caused by news reports and perceptions of fire and flooding.

Business Revenue – Catastrophic Fire Event

The first losses to be examined are the loss of tourism revenue and sales tax resulting from a catastrophic fire on Bill Williams Mountain. Based on fire behavior models and the 2010 Schultz Fire it is assumed that the fire will take between 5 to 10 days to contain. Estimating fire behavior is difficult but based on the Schultz Fire and a geographic and topographic similarity the Schultz Fire took 10 days to contain. Therefore, the length to containment will be 5 days at the low estimate and 10 days at the high estimate.

The next step in the process of estimating impacts is to determine a daily estimate of tourist expenditure from City of Williams' tax data. Averaging daily estimated expenditures over a 5 month period from April to August (these are the months with the highest fire potential) yields daily tourism revenues of $1,200,000, and sales tax revenues of $42,000. Extrapolated over the low estimate of 5 days to contain the fire, the estimate of revenues lost is $6,000,000 while the estimate for a 10 day fire (the norm based on the Schultz Fire) is $11,900,000. Lost sales tax revenues range from $42,000 per day to $416,000 for ten days.

Table 10. Retail business Revenue at Risk from the Fire Event

	Revenues Lost	Sales Taxes Lost
1 day Fire	$1,200,000	$42,000
5 days Fire	$6,000,000	$208,000
10 days Fire	$11,900,000	$416,000

Source: City of Williams

Business Revenue Loss – Post-Fire Flooding Event

Using the same estimates for losses as the previous section, assuming that the economic loss from a flood event would approximate the losses from a fire event. Assuming that the duration of the flooding events would be shorter than that of a fire it is assumed that each flooding event and the impact would last 5 days for a low estimate and 10 days for a high estimate. Based on the Schultz Fire, there were three 100 year flood events in year one, followed by two 100 year flood events in year 2 and one event in year three before remedial actions were taken. Cumulative losses from post-fire flooding account for $13 million at the low end of the estimate and $72 million at the high estimate.

Table 11. Retail business Revenue at Risk from Flooding Events

Flood Events	Revenue Lost Low Estimate (5 Days)	Revenue Lost High Estimate (10 Days)
3 100 year events year#1	$8,000,000	$36,000,000
2 100 year events year#2	$3,000,000	$24,000,000
1 100 year events year#3	$2,000,000	$12,000,000
Total 100 year flood events years 1-3	$13,000,000	$72,000,000

Tourism Revenue Loss Resulting from Post Fire and Flooding Effects

Finally, the analysis needs to consider the post wildfire and flooding outcomes on the Williams' long term tourist economy. There are numerous articles in the tourism academic literature that examine the impacts of natural disasters such as hurricanes and flooding on tourism communities. None of the literature however, has examined the impacts of these disasters on gateway communities or the impact of fire and post-fire flooding in the west. An analog for what may happen in Williams is the examine the effects that the Slide Fire which burned a large portion of the western slope of Oak Creek Canyon in May 2014, had

on the tourist economy of Sedona. According to a presentation from the Sedona Chamber of Commerce and Tourism Bureau, $7.6 million in visitor spending was lost during the 10 days of the fire. After the fire when the press was concentrating on stories about the Slide Fire the official Sedona Visitor Center saw a 40% reduction in visitors in June and July. At the same time the community saw a 14% decrease in restaurant and bar sales, and a 25 % reduction in retail taxes. The Chamber estimates that reduced tourism resulted in $3.4 million in lost tax revenues during June and July and an overall loss of $100 million dollars in total visitor spending over the period May to July. Visitor volumes for Sedona returned to normal by the end of August, 2014 four months after the fire. The Slide Fire and its impact on Sedona is therefore a reasonable analog to use for estimating potential impacts on Williams. The impacts are also likely to occur in the summer months which coincide with Williams' peak tourist season. The following section estimates the potential impact of visitors who will not travel to Grand Canyon National Park because of the spill-over effects of the fire and perceptions that the Park may not be open.

Williams, Flagstaff and Tusayan all benefit as gateway communities to Grand Canyon National Park (GCNP), providing lodging, transportation and tourism services to visitors traveling by road to the GCNP. Almost four-fifths (79%) of visitors to GCNP arrive at the south entrance with 75% of vehicles entering the park from I-17 and Williams on State Route 64, and 25% traveling from Flagstaff on Highway 180[7]. In 2017, official NPS statistics indicate that 4,918,710 visitors that entered the park through the south entrance in 2017, with 79% arriving via SR64 and Williams (3,689,032 visitors). Some portion of these 3.7 million visitors stay in Williams during, before or after their trip to GCNP and therefore might not go to the park because of the fire and flood.

The monthly average of GCNP visitors was calculated from entrance statistics and per-person, per-car statistics from GCNP were used to convert vehicles to visitors. In order to be conservative in developing the estimates, the potential lost visitation is based on the average visitation from May to August multiplied by average per-person per-trip expenditures of ($292) from the GCNP from the NPS Money Generation Model[8]. The estimates of loss are reported as a range from 20% to 40% for the four months

and are similar to those of the Slide Fire impacts. It is assumed that after 4 months that visitation will return to its normal pattern based on previous NPS entrance counts.

Table 12. Estimates of Lost Retail Sales and Tax Collections Post Fire and Flooding

	Low Estimate	Sales Tax Revenue	High Estimate	Sales Tax Revenue
Reduction in tourism	20%	20%	40%	40%
Average Tourist Revenue Loss per month	$21,200,000	$800,000	$42,400,000	$1,500,000
Total losses (May to August)	$84,800,000	$3,000,000	$169,500,000	$6,000,000

Tax Revenue Lost From All Events

The City of Williams will see a reduction in anticipated tax revenues resulting from all fire, post-fire flooding and reduced tourism scenarios. Sales tax revenues are very important to the City and help to fund city programs, departments and services. The reduction in potential sales taxes are determined by estimating the sales tax portion of the event costs. Sales taxes for the County are also calculated. Sales taxes are not estimated on damages and their repairs but only on potential retail sales during the flood and fire and tourist losses thereafter. The tax estimates are outlined in the tables below.

Table 13. Estimates of Lost Retail Sales Tax Collections all Events

	City of Williams		County	
Events Resulting in Sales Tax losses	Sales Tax Lost Low Estimate	Sales Tax Lost High Estimate	Sales Tax Lost Low Estimate	Sales Tax Lost High Estimate
5 day and 10 day fire estimated sales tax loss	$208,000	$416,000	$78,000	$155,000
3 100 year events year#1	$280,000	$1,260,000	$104,000	$468,000
2 100 year events year#2	$105,000	$840,000	$39,000	$312,000
1 100 year events year#3	$70,000	$420,000	$26,000	$156,000
Total tourism losses (May to August)	$2,967,000	$5,933,000	$1,102,000	$2,204,000
Total Sales Tax Losses	$3,630,000	$8,869,000	$1,348,000	$3,294,000

It is estimated that $5 million in combined city and county potential sales taxes are lost for the low estimate and $12 million dollars of sales taxes are lost for the high estimate.

Conclusion

While the potential damages from a catastrophic wildfire and the post-fire flooding identified in this study range from $379 million to $694 million, some costs have not been accounted for, therefore the estimate is **conservative**. Several omissions that would surely carry costs include:

- Lost payroll for retail and tourist attractions, during both fire & flooding and post fire events
- Damage to utilities (electric, sewer, etc.)
- Health problems, both physical and mental
- Evacuation costs during both fire and flooding
- Negative impacts on outdoor recreation
- Negative impacts on air quality
- Damage to residential streets
- Vehicles damaged or destroyed by flooding
- Increased travel time for residents and visitors

These costs and others could be calculated if the data were readily available and added to the total. Regardless, the impact as shown in this study to thin the forest on Bill Williams Mountain makes the case for such a restoration. It is estimated to cost between $4 and $8 million to thin this forest. This seems like a small investment compared to even the lower end of the potential damage estimate of $379 million.

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United States Department of Agriculture
Forest Service
Williams Ranger District
742 South Clover Road
Williams, AZ 86046
928-635-5200
Fax: 928-635-5680

File Code: 2500
Date: August 31, 2018

Rueben Teran
Executive Director
Arizona Water Protection Fund

Dear Mr. Teran:

I am writing in strong support of the National Forest Foundation's application to the Arizona Water Protection Fund, for the 2019 Granting Cycle, to help fund forest restoration on Bill Williams Mountain which improves watershed function and resiliency in the Verde River watershed. The National Forest Foundation (NFF) is the congressionally chartered official nonprofit partner to the Forest Service, and has helped bring community support, funding, and technical expertise to projects across the Kaibab National Forest as part of the Northern Arizona Forest Fund.

The work proposed by the NFF on Bill Williams Mountain is part of a 15,000-acre watershed restoration and improvement project that aims to reduce the risk of high-severity and post-fire flooding that threaten water quality and long-term sustainability in the Verde Watershed, and more immediately to the Town of Williams including town residents and businesses should the mountain experience a severe wildfire. In this landscape, forest thinning prescriptions are expected reduce the risk of high-severity fire by 30%-50%. The National Forest Foundation is focusing their work on approximately 2,000 of the 15,000 acres that represent the *highest risk, steepest slopes and most costly acres to treat*. The Kaibab National Forest has prioritized these acres for treatment due to the risk and consequence of a post-fire flood originating on the steep slopes at the top of the watershed.

The Kaibab National Forest fully supports this work and appreciates the innovative approaches the NFF brings to the program by leveraging and matching other Federal funds to help broaden and catalyzing the number of acres that can be restored and improved on the landscape, thereby better protecting the watershed and its services to local communities and downstream cities in the Phoenix Metropolitan Area.

The National Forest Foundation has been a strong supporter and partner of the Forest Service and has assisted in completing restoration projects across northern Arizona that have improved watershed health and function by minimizing fire risk and post-fire flooding risk, by decreasing downstream erosion and sedimentation and by improving function of wetlands, meadows and spring systems. The Forest Service looks forward to continuing its partnership with the NFF through this project. This grant proposal's approach in restoring and maintaining healthy forests and watersheds on National Forest lands is unique and admirable: working closely with the local communities, the county, and other beneficiaries of the work while embracing the stewardship and restoration goals of the Kaibab National Forest.

Sincerely,

DANELLE D. HARRISON
District Ranger, Williams and Tusayan Ranger Districts

COCONINO
COUNTY ARIZONA
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Jim Parks
District 4

Lena Fowler
District 5

Rueben Teran, Executive Director
Arizona Water Protection Fund

Dear Mr. Teran,

Coconino County is writing to strongly support the efforts of the National Forest Foundation (NFF) to obtain grant funding through the Arizona Water Protection Fund's 2019 Granting Cycle to reduce the threat of wildfire and post wildfire flooding from Bill Williams Mountain, and to protect the watershed resources both locally and further downstream in the Verde Watershed.

Coconino County recognizes that wildfire and post-wildfire flooding are the greatest public safety threats to its residents, businesses, economy and financial solvency. The Northern Arizona University's Economic Policy Institute's *Economic Impact of Post Fire Flooding: Bill Williams Mountain*, and the FEMA funded *Post Wildfire Flooding and Debris Flow* studies identified Bill Williams Mountain as a critical watershed for the City of Williams with a potential economic impact of $379 million to $694 million from post-wildfire flooding, including the loss of the city's main water sources. Because the Williams area has been identified as the County's highest risk area for post-wildfire debris flows and flooding, the County is partnering with the NFF and the Forest Service to take immediate steps to minimize the imminent threat of wildfire on Bill Williams Mountain.

The only effective way to address the threats of wildfire and post-wildfire flooding on Bill Williams Mountain is through forest restoration. By focusing on the steepest slopes and hardest to access acres on the mountain, the NFF, and its partners, will catalyze additional restoration work and leverage additional financial and staff resources to get even more work accomplished across the mountain. On behalf of the County, we want to emphasize the importance and immediacy of the need, and the value to the watershed; for protecting local stream hydrology and groundwater infiltration benefits, decreasing erosion, sedimentation and debris flows, decreasing overall risk to degraded water quality, and for ensuring long-term watershed and fish and wildlife benefits are resilient far into the future.

The proposal submitted by the NFF has been developed in cooperation with USFS staff, and is in support of County priorities. We are excited about this community effort around the Bill Williams Forest Restoration and Watershed Protection Project, and we fully support NFF's role in implementing the work to protect these irreplaceable resources.

Sincerely,

Matt Ryan
Chair, Board of Supervisors
Coconino County Supervisor, District 3

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National Forest Foundation Act

Public Law 101-593—Title IV—Nov. 16, 1990
As Amended by Public Law 103-106—Oct. 12, 1993

NATIONAL FOREST FOUNDATION

NATIONAL FOREST FOUNDATION ACT

SECTION 401.SHORT TITLE.

This title may be cited as the National Forest Foundation Act Amendment Act of 1990.

SEC. 402. ESTABLISHMENT AND PURPOSES OF FOUNDATION 16 USC 583j

(a) ESTABLISHMENT.-There is established the National Forest Foundation (hereinafter referred to as the "Foundation") as a charitable and nonprofit corporation domiciled in the District of Columbia.

(b) PURPOSES.-The purposes of the Foundation are to-

(1) encourage, accept, and administer private gifts of money, and of real and personal property for the benefit of, or in connection with, the activities and services of the Forest Service of the Department of Agriculture;

(2) undertake and conduct activities that further the purposes for which units of the National Forest System are established and are administered and that are consistent with approved forest plans; and

(3) undertake, conduct and encourage educational, technical and other assistance, and other activities that support the multiple use, research, cooperative forestry and other programs administered by the Forest Service.

(c) LIMITATION AND CONFICTS OF INTERESTS-

(1) The Foundation shall not participate or intervene in a political campaign on behalf of any candidate or public office.

(2) No director, officer, or employee of the Foundation shall participate, directly or indirectly, in the consideration or determination of any question before the Foundation affecting-

(A) the financial interests of the director, officer, or employee, or

(B) the interests of any corporation partnership, entity, or organization in which such director, officer, or employee-

(i) is an officer, director, or trustee; or

(ii) has any direct or indirect financial interest

SEC. 403. BOARD OF DIRECTORS OF THE FOUNDATION. 16 USC 583j-1.

(a) ESTABLISHMENT AND MEMBERSHIP.-The Foundation shall have a governing Board of Directors (hereinafter referred to as the "Board"), which shall consist of fifteen Directors, each of whom shall be a United States citizen. At all times, a majority of members of the Board shall be educated or have actual experience in natural or cultural resource management, law, or research.

To the extent practicable, members of the Board shall represent diverse points of view relating to natural and cultural resource issues. The Chief of the Forest Service shall be an ex officio nonvoting member of the Board.

(b) APPOINTMENT AND TERMS.-Within one year from the date of enactment of this title, the Secretary of Agriculture (hereinafter referred to as the "Secretary") shall appoint the Directors of the Board. Directors shall be appointed for terms of six years; except that the Secretary, in making the initial appointments to the Board, shall appoint one-third each of the Directors to terms of two, four, and six years respectively. A vacancy on the Board shall be filled within sixty days of such vacancy in the manner of which the original appointment was made. No individual may serve more than twelve consecutive years as a Director.

(c) CHAIRMAN.-The Chairman shall be elected by the Board from its members. A chairman shall serve for a two-year term, and may be re-elected to the post during his tenure as a Director.

(d) QUORUM.-A majority of the current voting membership of the Board shall constitute a quorum for the transaction of business.

(e) MEETINGS.-The Board shall meet at the call of the Chairman at least once a year. If a Director misses three consecutive regularly scheduled meetings, that individual may be removed from the Board by majority vote of the Board of Directors and that vacancy filled in accordance with subsection (b) of this section.

(f) REIMBURSEMENT OF EXPENSES.-Voting members of the Board shall serve without pay, but may be reimbursed for the actual and necessary traveling and subsistence expenses incurred by them in the performance of their duties for the Foundation. Such reimbursement may not exceed such amount as would be authorized under section 5703 of title 5, United States Code, for the payment of expenses and allowances for individuals employed intermittently in the Federal Government service.

(g) GENERAL POWERS.-The Board may complete the organization of the Foundation by appointing employees, adopting a constitution and bylaws consistent with the purposes of the Foundation and the provisions of this subtitle, and undertaking other such acts as may be necessary to function and to carry out the provisions of this title.

(h) OFFICERS AND EMPLOYEES.-Officers and employees may not be appointed until the Foundation has sufficient funds to pay their services. Officers and employees of the Foundation shall be appointed without regard to the provisions of title 5, United States Code, governing appointment in the competitive service, and may be paid without regard to the provisions of chapter 51 and subchapter III of chapter 53 of such title relating to classification and General Schedule pay rates.

SEC. 404. CORPORATE POWERS AND OBLIGATIONS. 16 USC 583j-2.

(i) IN GENERAL.-The Foundation-
   a. shall have perpetual succession;
   b. may conduct business throughout the several States, territories, and possessions of the United States and in foreign countries;
   c. shall have its principal offices in the Washington, D.C. metropolitan area; and
   d. shall at all times maintain a designated agent in the District of Columbia authorized to accept services of process for the Foundation.

(j) NOTICE AND SERVICE OF PROCESS.-The serving of notice to, or service of process upon, the agent required under this paragraph, or mailed to the business address of such agent, shall be deemed as service upon or notice to the Foundation.

(k) SEAL.-The Foundation shall have an official seal selected by the Board which shall be judicially noticed.

(l) POWERS.-To carry out its purposes, the Foundation shall have, in addition to powers otherwise authorized under this title, the usual powers of a corporation in the District of Columbia, including the power to-
   a. accept, receive, solicit, hold, administer and use any gift, devise, or bequest, either absolutely or in trust, or real or personal property or any income therefrom or other interest therein;
   b. acquire by donation, gift, devise, purchase or exchange any real or personal property or interest therein;
   c. unless otherwise required by the instrument of transfer, sell, donate, lease, invest, reinvest, retain or otherwise dispose of any property or income therefrom;
   d. borrow money and issue bonds, debentures, or other debt instruments;
   e. sue and be sued, and complain and defend itself in any court of competent jurisdiction (except that the Directors of the Board shall not be personally liable, except for gross negligence);
   f. enter into contracts or other arrangements with public agencies, private organizations, and persons and to make such payments as may be necessary to carry out the purposes thereof; and
   g. do any and all acts necessary and proper to carry out the purposes of the Foundation.

(m) PROPERTY.-(1) The Foundation may acquire, hold and dispose of lands, waters, or other interests in real property by donation, gift, devise, purchase or exchange. For the purposes of this title, an interest in real property shall include, but not be limited to, mineral and water rights, rights of way, and easements, appurtenant or in gross. A gift, device, or bequest may be accepted by the Foundation even though it is encumbered, restricted, or subject to beneficial interests of private persons if any current or future interest therein is for the benefit of the Foundation.

(2) No lands or waters, or interest therein, that are owned by the Foundation and are determined by the Chief of the United States Forest Service to be valuable for purposes established in this title shall be subject to condemnation by any State or political subdivision, or any agent of instrumentality thereof.
(3) The Foundation and any income or property received or owned by it, and all transactions relating to such income or property, shall be exempt from all Federal, State, and local taxation with respect thereto.
(4) Contributions, gifts, and other transfers made to or for the use of the Foundation shall be treated as contributions, gifts, or transfers to an organization exempt from taxation under section 501(c)(3) of the Internal Revenue Code of 1986.

SEC. 405. ADMINISTRATIVE SERVICES AND SUPPORT. 16 USC 583j-3.

(n) STARTUP FUNDS.-For the purposes of assisting the Foundation in establishing an office and meeting initial administrative, project, and other startup expenses, the Secretary is authorized to provide to the Foundation $500,000, from funds appropriated pursuant to section 410(a), per year for the two years beginning October 1, 1992. Such funds shall remain available to the Foundation until they are expended for authorized purposes.
(o) MATCHING FUNDS.-In addition to the startup funds provided under subsection (a) of this section, for a period of five years beginning October 1, 1992, the Secretary is authorized to provide matching funds for administrative and project expenses incurred by the Foundation as authorized by section 410(b) of this title including reimbursement of expenses under section 403, not to exceed the current Federal Government per diem rates.
(p) ADMINISTRATIVE EXPENSES.-At any time, the Secretary may provide the Foundation use of the Department of Agriculture personnel, facilities, and equipment, with partial or no reimbursement, with such limitation and on such terms and conditions as the Secretary shall establish.

SEC. 406. VOLUNTEERS. 16 USC 583j-4.

The Secretary may accept, without regard to the civil service classification laws, rules, and regulations, any director, officer, employee or agent of the Foundation as a volunteer for purposes of the Volunteers in the National Forests Act of 1972 (16 U.S.C. 558a through 558d, 86 Stat. 147).

SEC. 407. AUDITS AND REPORT REQUIREMENTS. 16 USC 583j-5.

(q) AUDITS.-For the purposes of the act entitled "An Act for audit of accounts of private corporations established under Federal law," approved August 30, 1964 (36 U.S.C. 1101 through 1103; Public Law 88-504) the Foundation shall be treated as a private corporation established under Federal law.

(r) ANNUAL REPORTS.-The Foundation shall, transmit each year to Congress a report of its proceedings and activities of the previous year, including a full and complete statement of its receipts, expenditures, and investments.

SEC. 408. UNITED STATES RELEASE FROM LIABILITY. 16 USC 583j-6.

The United States shall not be liable for any debts, defaults, acts of omissions of the Foundation nor shall the full faith and credit of the United States extend to any obligations of the Foundations.

SEC. 409. ACTIVITIES OF THE FOUNDATION AND UNITED STATES FOREST SERVICE. 16 USC 583j-7.

The activities of the Foundation authorized under the provisions of this Act shall be supplemental to and shall not preempt any authority or responsibility of the United States Forest Service under any other provision of law.

SEC. 410. AUTHORIZATION OF APPROPRIATIONS. 16 USC 583j-8.

(a) START-UP FUNDS.-For the purposes of section 405 of this title, there are authorized to be appropriated $1,000,000.

(b) MATCHING FUNDS.-For the purposes of section 405 of this title, during the five-year period beginning October 1, 1992, there are authorized to be appropriated $1,000,000 annually to the Secretary of Agriculture to be made available to the Foundation to match, on a one-for-one basis, private contributions made to the Foundation.

Approved November 16, 1990.
Amended October 12, 1993.

FS Agreement No. 18-CS-11030701-010

Cooperator Agreement No. _____

CHALLENGE COST SHARE AGREEMENT
Between The
NATIONAL FOREST FOUNDATION
And The
USDA, FOREST SERVICE
KAIBAB NATIONAL FOREST

This CHALLENGE COST SHARE AGREEMENT is hereby made and entered into by and between the National Forest Foundation , hereinafter referred to as "NFF," and the USDA, Forest Service, Kaibab National Forest hereinafter referred to as the "U.S. Forest Service," under the authority: Department of the Interior and Related Agencies Appropriations Act of 1992 Pub. L. 102-154.

Title: Twin Springs Fuels Reduction Project

I. PURPOSE:

The purpose of this agreement is to document the cooperation between the parties to thin and hand pile in the Upper Hell Canyon area (Phase 1) which is a portion of the Bill Williams project area on the Williams Ranger District. Optional work may include hand thinning and piling in a project area east of Twin Springs that was not completed with NFF funds in 2017, or new project area north of Twin Springs called Bixler Saddle. Additional optional work may consist of machine and hand falling of conifers as well as skidding, processing, and decking the cut material near a road, machine piling activity slash, and hand piling material in areas on steep slopes. The last type of optional work would include aspen exclosure fence repair and maintenance, as well as tree felling in and around aspen stands and/or fences where trees impact growth of aspen or sustainability of fences (see Attachment A, proposal; B, map; C, detailed sheet) in accordance with the following provisions and the hereby incorporated Operating and Financial Plan, attached as Attachment D.

II. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

The mission of the U. S. Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

The National Forest Foundation, chartered by Congress, engages Americans in community-based and national programs that promote the health and public enjoyment of the 193 million-acre National Forest System, and administers private gifts of funds and land for the benefit of the National Forests.

This project will reduce forest tree densities by thinning conifers on up to in the Twin Springs area of the Williams RD, Kaibab NF. Located on the southern and western slopes of Bill Williams Mountain, the project would thin conifer trees to improve wildlife habitat, increase forest health, and reduce wildfire potential. There are ~200 acres of required hand thinning and piling in a goshawk nest stand to improve forest health by reducing quantities of dwarf mistletoe, maintain habitat desired characteristics such as a healthy herbaceous understory of grasses and forbs, promote browsing species such as cliff-rose, and protect old trees and desired tree densities from potential crown fire. Optional treatments may include an additional 500 acres of hand thinning and piling, mechanical treatments for cutting, skidding, and decking, and/or aspen restoration treatments.
In Consideration of the above premises, the parties agree as follows:

III. NFF SHALL:

A. LEGAL AUTHORITY. NFF shall have the legal authority to enter into this agreement, and the institutional, managerial, and financial capability to ensure proper planning, management, and completion of the project, which includes funds sufficient to pay the nonfederal share of project costs, when applicable.

B. Provide and fund a contractor to complete the project work in accordance to silviculture and fuels prescription specified in Attachment A.

C. Provide contract administration for this project work and quality control in accordance to Attachment A.

D. Coordinate with the U. S. Forest Service on any project issues or concerns.

E. Follow safety requirements as described in the provided Job Hazard Analysis (JHA).

F. Provide project progress reports semiannually (twice per year) every December 1st and May 1st for the duration of the Agreement.

G. Provide an accomplishment report due by July 31, 2022.

IV. THE U.S. FOREST SERVICE SHALL:

A. PAYMENT/REIMBURSEMENT. The U.S. Forest Service shall reimburse NFF for the U.S. Forest Service's share of actual expenses incurred, not to exceed $0.00, as shown in the Financial Plan. The U.S. Forest Service shall make payment upon receipt of NFF's quarterly invoice. Each invoice from NFF must display the total project costs for the billing period, separated by U.S. Forest Service and NFF's share. In-kind contributions must be displayed as a separate line item and must not be included in the total project costs available for reimbursement. The final invoice must display NFF's full match towards the project, as shown in the financial plan, and be submitted no later than 90 days from the expiration date.

Each invoice must include, at a minimum:

1. NFF's name, address, and telephone number.
2. Forest Service agreement number.
3. Invoice date.
4. Performance dates of the work completed (start & end).
5. Total invoice amount for the billing period, separated by Forest Service and NFF share with in-kind contributions displayed as a separate line item.
6. Display all costs, both cumulative and for the billing period, by separate cost element as shown on the financial plan.
7. Cumulative amount of Forest Service payments to date.
8. Statement that the invoice is a request for payment by "reimbursement."
9. If using SF-270, a signature is required.
10. Invoice Number, if applicable.

The invoice shall be forwarded to:

EMAIL: asc_ga@fs.fed.us

FAX: 877-687-4894

POSTAL: USDA Forest Service
Albuquerque Service Center
Payments – Grants & Agreements
101B Sun Ave NE
Albuquerque, NM 87109

Send a copy to: The U.S. Forest Service Program Manager

B. Coordinate with NFF on any project issues or concerns.

C. Provide specifications as per U. S. Forest Service requirements.

D. Provide project oversight to see that all specifications are followed.

E. Provide the appropriate Job Hazard Analysis (JHA) and safety information to promote a safe working environment.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

A. PRINCIPAL CONTACTS. Individuals listed below are authorized to act in their respective areas for matters related to this agreement.

Principal Cooperator Contacts:

Cooperator Program Contact	Cooperator Administrative Contact
Rebecca Davidson Director, Southern Rockies National Forest Foundation 7324 E. 6th Avenue Scottsdale, AZ 85251 Phone: 720-749-9008 Email: rdavidson@nationalforests.org	Sheree Bombard Director Administration National Forest Foundation Bldg. 27, Suite 3|Fort Missoula Rd, Missoula, MT 59804 Phone: 406-830-3359 Email: sbombard@nationalforests.org

Principal U.S. Forest Service Contacts:

U.S. Forest Service Program Manager Contact	U.S. Forest Service Administrative Contact
Joshua Giles Silviculturist Williams Ranger District, Kaibab NF 742 S. Clover Road Williams, AZ, 86046 Phone: 928-635-5616 FAX: 928-635-5681 Email: jgiles02@fs.fed.us	Susan L. Brown Grants Management Specialist Kaibab National Forest 800 S. 6th Street Williams, AZ, 86046 Phone: 928-635-8302 FAX: 928-635-8208 Email: susanlbrown@fs.fed.us

B. NOTICES. Any communications affecting the operations covered by this agreement given by the U.S. Forest Service or NFF are sufficient only if in writing and delivered in person, mailed, or transmitted electronically by e-mail or fax, as follows:

To the U.S. Forest Service Program Manager, at the address specified in the agreement.

To NFF, at the address shown in the agreement or such other address designated within the agreement.

Notices are effective when delivered in accordance with this provision, or on the effective date of the notice, whichever is later.

C. PARTICIPATION IN SIMILAR ACTIVITIES. This agreement in no way restricts the U.S. Forest Service or NFF from participating in similar activities with other public or private agencies, organizations, and individuals.

D. ENDORSEMENT. Any of NFF's contributions made under this agreement do not by direct reference or implication convey U.S. Forest Service endorsement of NFF's products or activities.

E. USE OF U.S. FOREST SERVICE INSIGNIA. In order for NFF to use the U.S. Forest Service insignia on any published media, such as a Web page, printed publication, or audiovisual production, permission must be granted from the U.S. Forest Service's Office of Communications (Washington Office). A written request will be submitted by the U.S. Forest Service, Kaibab National Forest to the Office of Communications Assistant Director, Visual Information and Publishing Services prior to use of the insignia. The U.S. Forest Service Kaibab National Forest will notify the NFF when permission is granted.

F. NON-FEDERAL STATUS FOR COOPERATOR PARTICIPANT LIABILITY. NFF agree(s) that any of their employees, volunteers, and program participants shall not be deemed to be Federal employees for any purposes including Chapter 171 of Title 28, United States Code (Federal Tort Claims Act) and Chapter 81 of Title 5, United States Code (OWCP), as NFF hereby willingly agree(s) to assume these responsibilities.

Further, NFF shall provide any necessary training to NFF's employees, volunteers, and program participants to ensure that such personnel are capable of performing tasks to be completed. NFF shall also supervise and direct the work of its employees, volunteers, and participants performing under this agreement.

G. MEMBERS OF U.S. CONGRESS. Pursuant to 41 U.S.C. 22, no member of, or delegate to, Congress shall be admitted to any share or part of this agreement, or benefits that may arise therefrom, either directly or indirectly.

H. NONDISCRIMINATION. In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program

Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. USDA is an equal opportunity provider, employer, and lender.

I. ELIGIBLE WORKERS. NFF shall ensure that all employees complete the I-9 form to certify that they are eligible for lawful employment under the Immigration and Nationality Act (8 USC 1324a). NFF shall comply with regulations regarding certification and retention of the completed forms. These requirements also apply to any contract awarded under this agreement.

J. SYSTEM FOR AWARD MANAGEMENT REGISTRATION REQUIREMENT (SAM). NFF shall maintain current information in the System for Award Management (SAM) until receipt of final payment. This requires review and update to the information at least annually after the initial registration, and more frequently if required by changes in information or agreement term(s). For purposes of this agreement, System for Award Management (SAM) means the Federal repository into which an entity must provide information required for the conduct of business as a Cooperative. Additional information about registration procedures may be found at the SAM Internet site at www.sam.gov.

K. STANDARDS FOR FINANCIAL MANAGEMENT.

1. Financial Reporting

NFF shall provide complete, accurate, and current financial disclosures of the project or program in accordance with any financial reporting requirements, as set forth in the financial provisions.

2. Accounting Records

NFF shall continuously maintain and update records identifying the source and use of funds. The records shall contain information pertaining to the agreement, authorizations, obligations, unobligated balances, assets, outlays, and income.

3. Internal Control

NFF shall maintain effective control over and accountability for all U.S. Forest Service funds. NFF shall keep effective internal controls to ensure that all United States Federal funds received are separately and properly allocated to the activities described in the award/agreement and used solely for authorized purposes.

4. Source Documentation

NFF shall support all accounting records with source documentation. These documentations include, but are not limited to, cancelled checks, paid bills, payrolls, contract documents. These documents must be made available to the U.S. Forest Service upon request.

L. LIMITATION OF FUNDS. U.S. Forest Service funds in the amount of $ 0.00 are currently available for performance of this agreement through September 30, 2022. The U.S. Forest Service's ability to provide additional funding is contingent upon the availability of appropriated funds from which payment can be made. There is no legal liability on the part of the Forest Service for any payment above this amount until NFF receives notice of availability confirmed in a written modification by the Forest Service.

M. OVERPAYMENT. Any funds paid to NFF in excess of the amount entitled under the terms and conditions of this agreement constitute a debt to the Federal Government. The following must also be considered as a debt or debts owed by NFF to the U.S. Forest Service:

- Any interest or other investment income earned on advances of agreement funds; or

- Any royalties or other special classes of program income which, under the provisions of the agreement, are required to be returned;

If this debt is not paid according to the terms of the bill for collection issued for the overpayment, the U.S. Forest Service may reduce the debt by:

1. Making an administrative offset against other requests for reimbursement.
2. Withholding advance payments otherwise due to NFF.
3. Taking other action permitted by statute (31 U.S.C. 3716 and 7 CFR, Part 3, Subpart B).

Except as otherwise provided by law, the U.S. Forest Service may charge interest on an overdue debt.

N. AGREEMENT CLOSEOUT. Within 90 days after expiration or notice of termination the parties shall close out the agreement.

Any unobligated balance of cash advanced to NFF must be immediately refunded to the U.S. Forest Service, including any interest earned in accordance with 2 CFR Part 200, Subpart D, 200.305.

Within a maximum of 90 days following the date of expiration or termination of this agreement, all financial performance and related reports required by the terms of the agreement must be submitted to the U.S. Forest Service by NFF.

If this agreement is closed out without audit, the U.S. Forest Service reserves the right to disallow and recover an appropriate amount after fully considering any recommended disallowances resulting from an audit which may be conducted later.

O. PROGRAM PERFORMANCE REPORTS The parties to this agreement shall monitor the performance of the agreement activities to ensure that performance goals are being achieved.

Performance reports must contain information on the following:

- A comparison of actual accomplishments to the goals established for the period. Where the output of the project can be readily expressed in numbers, a computation of the cost per unit of output, if applicable.

- Reason(s) for delay if established goals were not met.

- Additional pertinent information.

NFF shall submit annual performance reports to the U.S. Forest Service Program Manager. These reports are due 90 days after the reporting period. The final performance report shall be submitted either with NFF's final payment request, or separately, but not later than 90 days from the expiration date of the agreement.

P. RETENTION AND ACCESS REQUIREMENTS FOR RECORDS. NFF shall retain all records pertinent to this agreement for a period of no less than 3 years from the expiration or termination date. As used in this provision, records includes books, documents, accounting procedures and practice, and other data, regardless of the type or format. NFF shall provide access and the right to examine all records related to this agreement to the U.S. Forest Service Inspector General, or Comptroller General or their authorized representative. The rights of access in this section must not be limited to the required retention period but must last as long as the records are kept.

If any litigation, claim, negotiation, audit, or other action involving the records has been started before the end of the 3-year period, the records must be kept until all issues are resolved, or until the end of the regular 3-year period, whichever is later.

Records for nonexpendable property acquired in whole or in part, with Federal funds must be retained for 3 years after its final disposition.

Q. FREEDOM OF INFORMATION ACT (FOIA). Public access to agreement records must not be limited, except when such records must be kept confidential and would have been exempted from disclosure pursuant to Freedom of Information regulations (5 U.S.C. 552).). Requests for research data are subject to 2 CFR 215.36.

Public access to culturally sensitive data and information of Federally-recognized Tribes may also be explicitly limited by P.L. 110-234, Title VIII Subtitle B §8106 (2009 Farm Bill).

R. TEXT MESSAGING WHILE DRIVING. In accordance with Executive Order (EO) 13513, "Federal Leadership on Reducing Text Messaging While Driving," any and all text messaging by Federal employees is banned: a) while driving a Government owned vehicle (GOV) or driving a privately owned vehicle (POV) while on official Government business; or b) using any electronic equipment supplied by the Government when driving any vehicle at any time. All cooperators, their employees, volunteers, and contractors are encouraged to adopt and enforce policies that ban text messaging when driving company owned, leased or rented vehicles, POVs or GOVs when driving while on official Government business or when performing any work for or on behalf of the Government.

S. PURCHASE OF EQUIPMENT. U.S. Forest Service funds may be used by NFF to purchase equipment necessary to accomplish activities described in this agreement. The available funding is displayed in the financial plan. Title to the equipment rests with the U.S. Forest Service, but may be transferred to NFF on completion of the project, if appropriate.

T. FUNDING EQUIPMENT. Federal funding under this agreement is not available for reimbursement of NFF's purchase of equipment. Equipment is defined as having a fair market value of $5,000 or more per unit and a useful life of over one year.

U. PROPERTY IMPROVEMENTS. Improvements placed on National Forest System land at the direction or with the approval of the U.S. Forest Service becomes property of the United States. These improvements are subject to the same regulations and administration of the U.S. Forest Service as would other National Forest improvements of a similar nature. No part of this agreement entitles NFF to any interest in the improvements, other than the right to use them under applicable U.S. Forest Service regulations.

V. CONTRACT REQUIREMENTS. Any contract under this agreement must be awarded following NFF's established procurement procedures, to ensure free and open competition, and avoid any conflict of interest (or appearance of a conflict). NFF must maintain cost and price analysis documentation for potential U.S. Forest Service review. NFF is/are encouraged to utilize small businesses, minority-owned firms, and women's business enterprises.

W. OFFSETS, CLAIMS AND RIGHTS. Any and all activities entered into or approved by this agreement will create and support afforestation/ reforestation efforts within the National Forest System without generating carbon credits. The U.S. Forest Service does not make claims of permanence or any guarantees of carbon sequestration on lands reforested or afforested through partner assistance. The U.S.

Forest Service will provide for long-term management of reforested and afforested lands, according to applicable Federal statute regulations and forest plans.

X. U.S. FOREST SERVICE ACKNOWLEDGED IN PUBLICATIONS. AUDIOVISUALS AND ELECTRONIC MEDIA. NFF shall acknowledge U.S. Forest Service support in any publications, audiovisuals, and electronic media developed as a result of this agreement.

Y. TRAINING, EVALUATION, AND CERTIFICATION OF SAWYERS. Any of the cooperator's employees, and any participants and volunteers engaged on behalf of the cooperator and Forest Service, who will use chain saws or crosscut saws on National Forest System lands to conduct the program of work contained in this agreement must be trained, evaluated, and certified in accordance with Forest Service Manual 2358 and Forest Service Handbook 6709.11, section 22.48b. The cooperator is responsible for providing this training, evaluation, and certification, unless the Forest Service and the cooperator determine it is not in the best interest of the partnership. In these circumstances, the Forest Service, upon request and based on availability of Agency funding and personnel, may assist with developing and conducting training, evaluation, and certification of the cooperator's employees, and any volunteers and participants engaged on behalf of the cooperator and the Forest Service, who will use chain saws or cross cut saws on National Forest System lands.

Z. NONDISCRIMINATION STATEMENT – PRINTED, ELECTRONIC, OR AUDIOVISUAL MATERIAL. NFF shall include the following statement, in full, in any printed, audiovisual material, or electronic media for public distribution developed or printed with any Federal funding.

"In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited bases apply to all programs.)

To file a complaint alleging discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington DC 20250-9410 or call toll free voice (866) 632-9992, TDD (800)877-8339, or voice relay (866) 377-8642. USDA is an equal opportunity provider and employer."

If the material is too small to permit the full statement to be included, the material must, at minimum, include the following statement, in print size no smaller than the text:

"This institution is an equal opportunity provider."

AA. REMEDIES FOR COMPLIANCE RELATED ISSUES. If NFF materially fail(s) to comply with any term of the agreement, whether stated in a Federal statute or regulation, an assurance, or the agreement, the U.S. Forest Service may take one or more of the following actions:

1. Temporarily withhold cash payments pending correction of the deficiency by NFF or more severe enforcement action by the U.S. Forest Service;

2. Disallow (that is, deny both use of funds and matching credit for) all or part of the cost of the activity or action not in compliance;

3. Wholly or partly suspend or terminate the current agreement for NFF's program;

4. Withhold further awards for the program, or

5. Take other remedies that may be legally available, including debarment procedures under 2 CFR Part 417.

BB. TERMINATION BY MUTUAL AGREEMENT. This agreement may be terminated, in whole or part, as follows:

1. When the U.S. Forest Service and NFF agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated.

2. By 30 days written notification by NFF to the U.S. Forest Service setting forth the reasons for termination, effective date, and in the case of partial termination, the portion to be terminated. If the U.S. Forest Service decides that the remaining portion of the agreement does not accomplish the purpose for which the award/agreement was made, the Forest Service may terminate the award upon 30 days written notice in its entirety.

Upon termination of an agreement, NFF shall not incur any new obligations for the terminated portion of the agreement after the effective date, and shall cancel as many outstanding obligations as possible. The U.S. Forest Service shall allow full credit to NFF for the United States Federal share of the non-cancelable obligations properly incurred by NFF up to the effective date of the termination. Excess funds must be refunded within 60 days after the effective date of termination.

CC. ALTERNATE DISPUTE RESOLUTION – PARTNERSHIP AGREEMENT. In the event of any issue of controversy under this agreement, the parties may pursue Alternate Dispute Resolution procedures to voluntarily resolve those issues. These procedures may include, but are not limited to conciliation, facilitation, mediation, and fact finding.

DD. DEBARMENT AND SUSPENSION. NFF shall immediately inform the U.S. Forest Service if they or any of their principals are presently excluded, debarred, or suspended from entering into covered transactions with the Federal Government according to the terms of 2 CFR Part 180. Additionally, should NFF or any of their principals receive a transmittal letter or other official Federal notice of debarment or

suspension, then they shall notify the U.S. Forest Service without undue delay. This applies whether the exclusion, debarment, or suspension is voluntary or involuntary.

EE. COPYRIGHTING. NFF is/are granted sole and exclusive right to copyright any publications developed as a result of this agreement. This includes the right to publish and vend throughout the world in any language and in all media and forms, in whole or in part, for the full term of copyright and all renewals thereof in accordance with this agreement.

No original text or graphics produced and submitted by the U.S. Forest Service must be copyrighted. The U.S. Forest Service reserves a royalty-free, nonexclusive, and irrevocable right to reproduce, publish, or otherwise use, and to authorize others to use the work for Federal Government purposes. This right must be transferred to any sub-agreements or subcontracts.

This provision includes:

- The copyright in any work developed by NFF under this agreement.
- Any right of copyright to which NFF purchase(s) ownership with any Federal contributions.

FF. PROHIBITION AGAINST INTERNAL CONFIDENTIAL AGREEMENTS: All non federal government entities working on this agreement will adhere to the below provisions found in the Consolidated Appropriations Act, 2016, Pub. L. 114-113, relating to reporting fraud, waste and abuse to authorities:

(a) The recipient may not require its employees, contractors, or subrecipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting them from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(b) The recipient must notify its employees, contractors, or subrecipients that the prohibitions and restrictions of any internal confidentiality agreements inconsistent with paragraph (a) of this award provision are no longer in effect.

(c) The prohibition in paragraph (a) of this award provision does not contravene requirements applicable to any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(d) If the Government determines that the recipient is not in compliance with this award provision, it:

(1) Will prohibit the recipient's use of funds under this award, in accordance with sections 743, 744 of Division E of the Consolidated Appropriations Act, 2016, (Pub. L. 114-113) or any successor provision of law; and

(2) May pursue other remedies available for the recipient's material failure to comply with award terms and conditions.

GG. PUBLICATION SALE. NFF may sell any publication developed as a result of this agreement. The publication may be sold at fair market value, which is initially defined in this agreement to cover the costs of development, production, marketing, and distribution. After the costs of development and production have been recovered, fair market value is defined in this agreement to cover the costs of marketing, printing, and distribution only. Fair market value must exclude any in-kind or Federal Government contributions from the total costs of the project.

HH. MODIFICATIONS. Modifications within the scope of this agreement must be made by mutual consent of the parties, by the issuance of a written modification signed and dated by all properly authorized, signatory officials, prior to any changes being performed. Requests for modification should be made, in writing, at least 30 days prior to implementation of the requested change. The U.S. Forest Service is not obligated to fund any changes not properly approved in advance.

II. COMMENCEMENT/EXPIRATION DATE. This agreement is executed as of the date of the last signature and is effective through September 30, 2022 at which time it will expire. The expiration date is the final date for completion of all work activities under this agreement.

JJ. AUTHORIZED REPRESENTATIVES. By signature below, each party certifies that the individuals listed in this document as representatives of the individual parties are authorized to act in their respective areas for matters related to this agreement. In witness whereof, the parties hereto have executed this agreement as of the last date written below.

MARY MITSOS, President — Date
National Forest Foundation

HEATHER C. PROVENCIO, Forest Supervisor — Date
U.S. Forest Service, Kaibab National Forest

The authority and format of this agreement have been reviewed and approved for signature.

SUSAN L. BROWN Date
U.S. Forest Service Grants Management Specialist

Burden Statement

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0217. The time required to complete this information collection is estimated to average 4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call toll free (866) 632-9992 (voice). TDD users can contact USDA through local relay or the Federal relay at (800) 877-8339 (TDD) or (866) 377-8642 (relay voice). USDA is an equal opportunity provider and employer.

Attachment A

National Forest Foundation
Northern Arizona Forest Fund Project Proposal (FY18)

Name and Title of Project Proponent:
Twin Springs Fuels Reduction Restoration Project

National Forest and District:
Kaibab NF, Williams RD

Date:
April 18, 2017

1. Project Summary (1-2 paragraphs):

This proposal is to improve forest health and reduce the risk of uncharacteristic fire on approximately 360 acres of fuels using hand-felling or, where practical, machinery equipped with cutting or grinding heads within the Upper Hell Canyon (UHC) Watershed, Hydrological Unit Code (HUC) 12. Slash will be piled and burned when it cures. Costs are estimated at a total of $800/ac, and if bids come in lower additional acres will be treated.

2. Physical description of project location (site name, watershed and/or tributary) as well as ecosystem type:

The UHC Watershed is within the Bill Williams Mountain Restoration Project area, which is 15,200 acres located adjacent to the City of Williams, AZ and extends 4 miles south-southwest of the city. The forest type on the south side of the mountain is primarily ponderosa pine mixed with juniper and cliff rose on dry ridges and Douglas-fir and white fir in drainages. The majority of the project will fall near or within goshawk nesting and/or goshawk and Mexican Spotted Owl (MSO) foraging habitat.

3. Why is this project a priority? (1-2 paragraphs):

Upper Hell Canyon, a 6th level (HUC12) hydrologic unit that ultimately drains into the Verde Watershed, begins near the summit of Bill Williams Mountain. The watershed has been rated as "impaired" due to degraded soils and poor road maintenance according to a hydrology specialists report developed for the NEPA process discussed more below. Uplands and hill-slopes are overstocked with trees and have excessive fuel loads. The majority of the Upper Hell Canyon watershed is in Fire Regime Condition Class 3 (approximately 100+ years departed from historical condition) and is at risk of uncharacteristically large, high-severity wildfire that could adversely affect the City of Williams and Verde River. Forest conditions also contribute to increased risk of and interaction between insects and diseases, particularly dwarf mistletoe, a parasite that weakens trees and increases the risk of bark beetle attack.

Other values at risk on the mountain include dozens of cultural sites, a crucial communications site on the peak of the mountain, aesthetic values on a highly prominent peak, hiking trails, and wildlife habitat integrity for MSO and northern goshawk. Further, The recent post-fire flood risk report for Coconino county (https://jefuller.sharefile.com/share?#/view/s1efc452b7964e0ba) notes that the impacts of a high severity wildfire fire and subsequent floods modeled on Bill Williams Mountain could be reduced by 50% with treatments on the north side of the mountain

(Section 4.4). Similar treatments on the south side of the mountain in our project area will reduce the risk of a fire start on the south side moving to the north side of the mountain.

An Environmental Impact Statement (EIS) NEPA planning initiative to restore the mountain and address these issues was signed in December 2015. (Find a complete copy of the EIS here: https://www.fs.usda.gov/project/?project=34690). Implementation has begun on the mountain. Treatments currently laid out on the south side of the mountain address lower slopes with mechanized equipment, and prepare stands on steeper slopes for prescribed burning primarily with thinning and hand piling. Typically, slash and cut material will be piled on steep slopes, which contributes to the high cost of implementation. In order to fully eliminate fuels from these targeted stands, slash material created during fuels reduction treatments would be burned after piles cure.

In summary, the reduction of tree densities on steep slopes near the top of the Upper Hell Canyon watershed will improve forest and watershed health and surrounding springs by reducing competition for nutrients, and would protect the loss of specialized wildlife habitat from fire and forest disease and pests. Treating fuel accumulations for this project would also abate fire risks to MSO recovery habitat, conserving existing nesting and roosting habitat.

4. Project tasks and objectives (List all project activities on-site and downstream benefits for Salt or Verde watershed):

Tasks	Objectives	Area treated
Dwarf mistletoe infected PP targeted removal	*Improve forest health and reduce risk of BB outbreak*	*250 ac*
PP and juniper thinning	*Reduce risk of uncharacteristic fire*	*250 ac*

5. The Big Picture – Please help us understand how this project helps the district achieve restoration at the watershed scale? And/Or What other projects will you be able to complete because this project is complete? (1-2 paragraphs):

Reducing hazardous fuels and moving vegetative conditions toward desired conditions identified in the Bill Williams EIS is needed to reduce the risk of a high intensity wildfire and improve the health and sustainability of the forest on and surrounding Bill Williams Mountain, including the UHC Watershed. This proposal will directly improve the condition of the watershed, protect MSO and goshawk habitat, and improve the spring conditions at Twin Springs. Further, restoration will reduce hazardous fuels and the risk of high intensity stand-replacing wildfires and allow for the reintroduction of fire as a natural part of the ecosystem; and reduce fuel buildup and help prevent the spread of wildfire onto private property and into drainages leading to the Verde River.

This specific project is adjacent to units planned for treatment under FY17 non-commercial thinning contracts, as well as 368 acres proposed for funding by the NFF in FY17. There is also >500ac of commercial treatment planned for the lower slopes east and south of this proposed treatment area. Finally, as previously mentioned, the FY18

proposed project is within or adjacent to a goshawk nest stand that contains a high density of heavily dwarf mistletoe infected ponderosa pine and scattered juniper. There are slopes in the area that will make pile burning a challenge and thus we propose to use heavy plastic to cover piles and allow more windows for burning.

6. Proposed timeline for work (on-the-ground start date and anticipated duration of the project):

We would like to have contractors working by the spring of 2018 and finish treatments before August of 2018. Based on previous contracts issued for similar work in the surrounding area we feel this is a viable timeline.

7. Proposed project management arrangement (select the type of project management strategy or strategies appropriate for the project; you may select all that are appropriate):

☐ *Non-profit Organization* -- All work can be completed by non-profit organization and/or volunteers. Please identify potential non-profit partners below.

☒ *Private Contractor* -- All work can be completed by private contractor

☐ *Forest Service* -- All work must be completed by U.S. Forest Service employees. Non-profit organizations or contractors cannot complete this project (e.g., prescribed fire).

☐ *Combined Management* – Any combination of these three options. Please explain below how project objectives could be divided between non-profit organizations (Please identify potential non-profit partners), private contractors, and/or U.S. Forest Service employees

8. Description of volunteer opportunities (if they exist, type of volunteer work, estimate of volunteer hours):

n/a

9. Opportunity for matching funds from Forest Service or external partner (If external please provide name and contact):

Time/hours of professional foresters to lay-out and prepare the project area for treatment.

10. Estimated Project Costs (Itemized list of project activities/tasks or other anticipated expenses, and the sum total requested):

Itemized Expenses	Anticipated Cost
Thinning – 250 ac	*$300/ac*
Hand Piling – 250 ac	*$500/ac*
Visqueen (plastic for piles) – 250 ac	*$200/ac*
PROJECT TOTAL:	**$200,000**

11. Proposed monitoring metrics (What can we measure to demonstrate that this was a success)?

Pre- vs. post-treatment basal area
Pre- vs. post-treatment DM infection levels
Pre- vs. post-treatment coarse woody debris in tons/ac

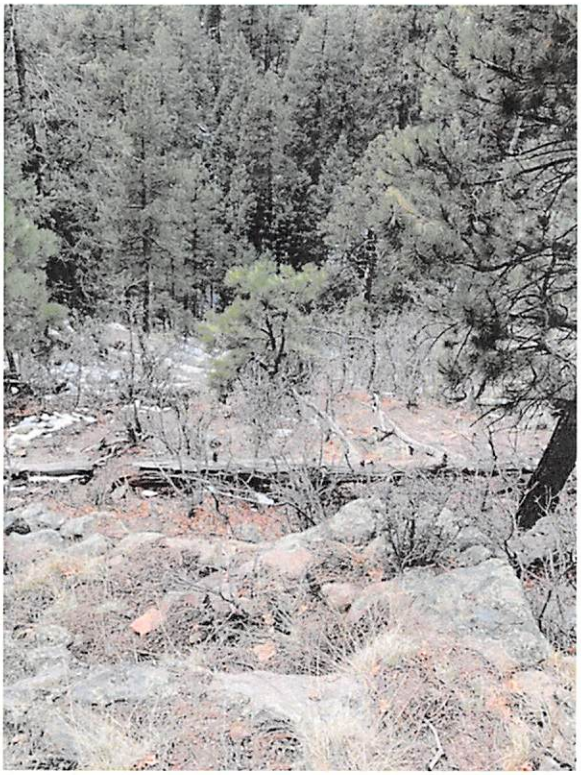


Figure 1. Looking south (downhill) near the project area.

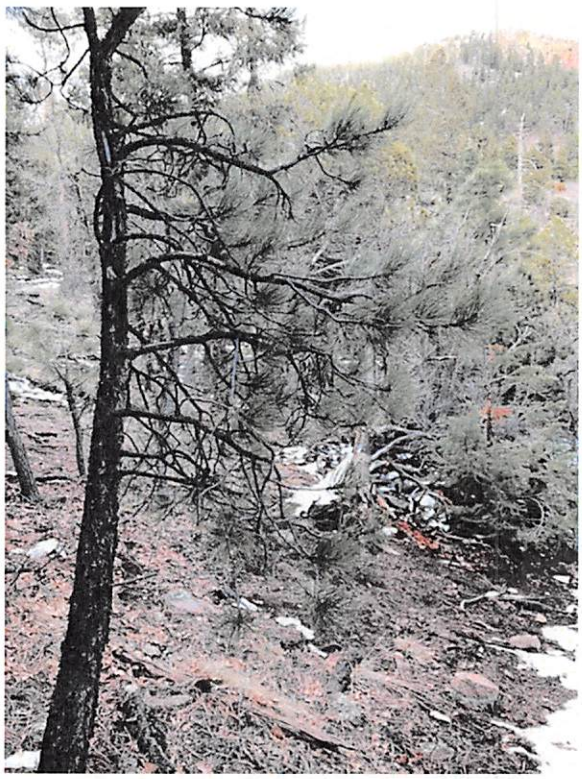


Figure 2. Small diameter ponderosa pine tree.

Figure 3. Looking south from rocky outcrop across project area.

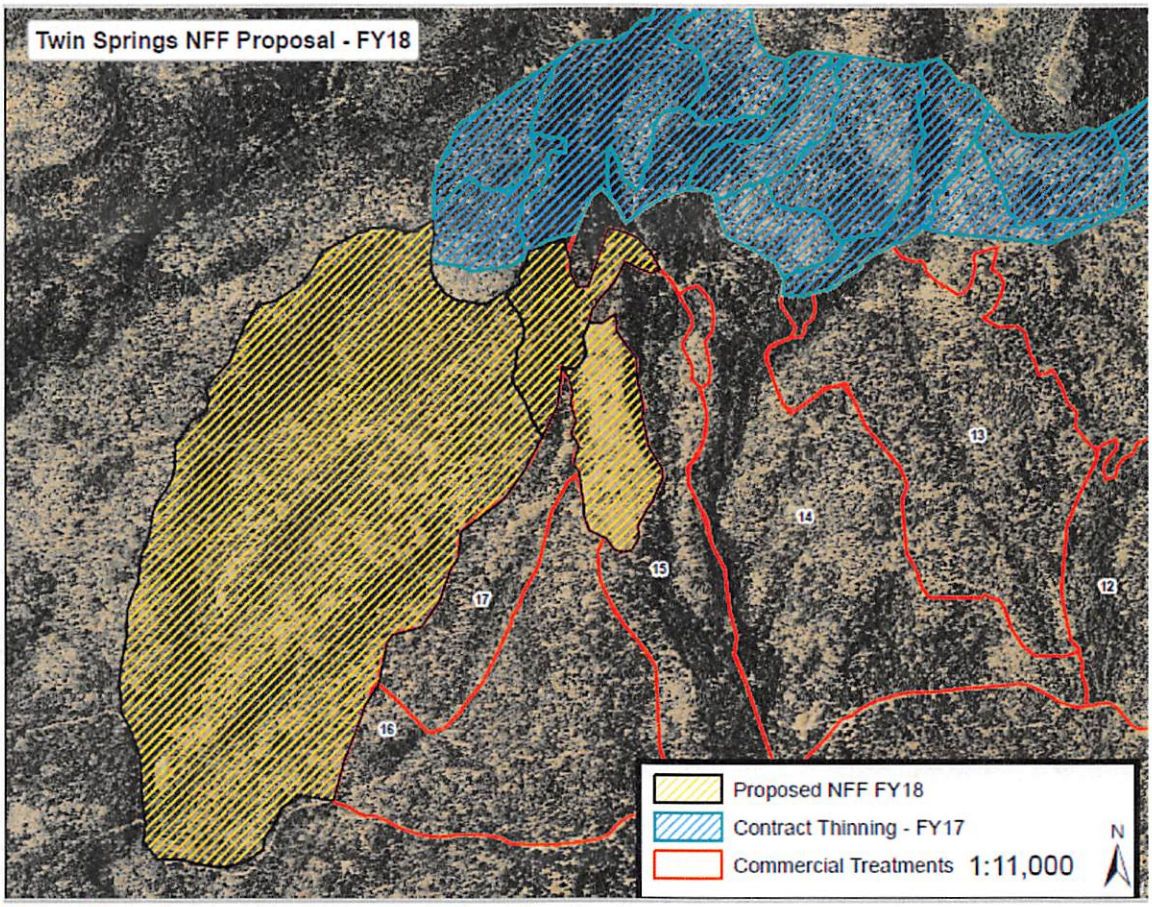
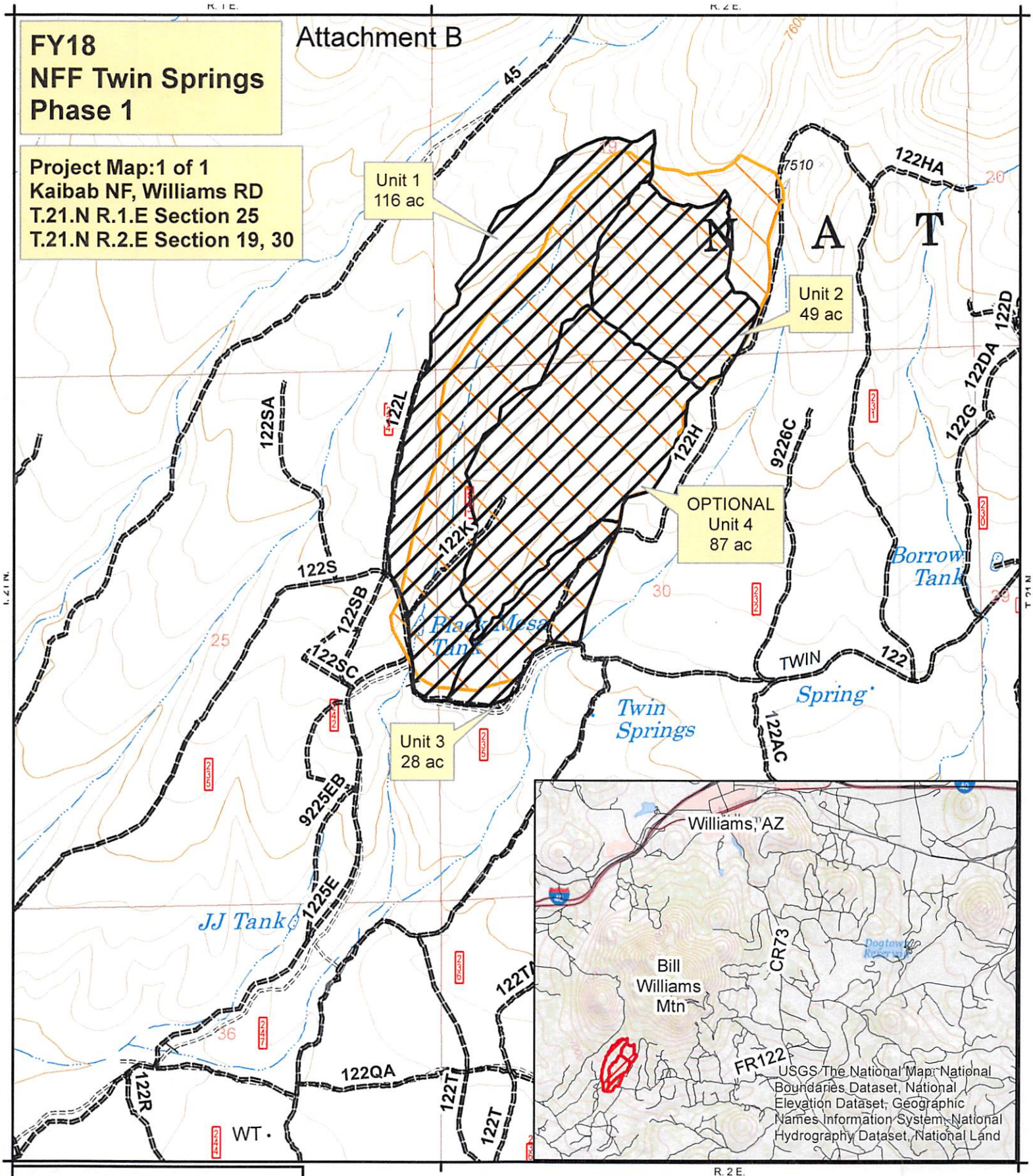


Figure 4. Map of proposed project area and adjacent treatments.


FY18
NFF Twin Springs
Phase 1
Attachment B
Project Map:1 of 1
Kaibab NF, Williams RD
T.21.N R.1.E Section 25
T.21.N R.2.E Section 19, 30
Unit 1
116 ac
Unit 2
49 ac
OPTIONAL
Unit 4
87 ac
Unit 3
28 ac
N A T
122HA
122D
122DA
122G
9226C
122H
122L
122SA
122K
122S
122SB
122SC
9225EB
1225E
122AC
122T
122QA
122R
45
7510
Borrow Tank
Black Mesa Tank
Twin Springs
TWIN
Spring
JJ Tank
WT
Williams, AZ
Bill Williams Mtn
CR73
FR122
USGS The National Map: National Boundaries Dataset, National Elevation Dataset, Geographic Names Information System, National Hydrography Dataset, National Land
R.1E.
R.2E.
T.21N.
Cut Units
KNF_SZ_GOS_NEST
MSO PAC
KNF Silvi Shop
Date: 4/15/2018
N
1:15,000
0
0.125
0.25
0.5 Miles

Location and Description of Project Area and Units

NFF Grant	2. Unit	3. Acres	4. % Slope	5. Other	6. Seasonal Restriction	7. Cutting Prescription	8. Slash Treatment
	1	116	15%		Waiver issued	Thin conifers <9" DBH on a 20' x 20' spacing. Fall all juniper <6" DBH.	Hand pile activity and dead/down <9".
	2	49	10%		Waiver issued	Fall all ponderosa pine w. DM infection <9" DBH. Thin healthy conifers <9" DBH on a 20' x 20' spacing. Fall all juniper <6" DBH.	Hand pile activity and dead/down <9".
	3	28	15%		Waiver issued	Fall all ponderosa pine w. DM infection <9" DBH. Thin healthy conifers <9" DBH on a 20' x 20' spacing. Fall all juniper <6" DBH.	Hand pile activity and dead/down <9".
	4 (OPTIONAL)	87	10%		Waiver issued	Fall all ponderosa pine w. DM infection <9" DBH. Thin healthy conifers <9" DBH on a 20' x 20' spacing. Fall all juniper <6" DBH.	Hand pile activity and dead/down <9".
	Total	280					

Notes:

General	**All Units:** Boundaries will be painted pink facing into the unit.
	All Units: Archaeological site boundaries are designated with pink flagging or white paint. Fall trees to unit prescription and pull out slash from marked archaeological sites.
Thinning Specs	**All Units:** Retain all yellow pines (see definition) and deciduous trees. This supercedes all other specifications.
	All Units: Stump heights will be <6" (unless otherwise specified) and cut surface of stumps will be horizontal (to ensure the safety of workers in the area). All juniper stumps will be flush cut with no residual green foliage.
	All Units: Cutting Preference - Only ponderosa pine, douglas fir, white fir and juniper will be cut. Retain all other species. Select the most vigorous trees for retention. When possible retain trees with no mistletoe infection or the least amount of mistletoe infection.
	All Units: Fall all ponderosa pine and juniper <12" for 50 feet around large ponderosa pine (>22"), alligator juniper (>18"), and Gambel oak (>12").
Piling Specs	**All Hand Piling Units:** Piles will be 7' by 7' in size at the minimum; larger material shall be mixed throughout the pile and material should be compact enough to facilitate full consumption. Piles will be built outside the dripline of retained trees at an adequate distance from retained trees (including snags) that mortality and damage from pile burning will be minimal. Piles shall be constructed to prevent fire spread/creep when they are burned. Piles shall not be constructed within 10' of a stream channel (designated by blue lines on the map), 20' of a road edge, 10' of a fence, 10' of a land survey monument.

U.S. Forest Service

OMB 0596-0217
FS-1500-17B

Attachment: D

USFS Agreement No.: 18-CS-11030701-010

Cooperator Agreement No.:

Mod. No.:

Note: This Financial Plan may be used when:
(1) No program income is expected and
(2) The Cooperator is not giving cash to the FS and
(3) There is no other Federal funding

Agreements Financial Plan (Short Form)

Financial Plan Matrix: Note: All columns may not be used. Use depends on source and type of contribution(s).

	FOREST SERVICE CONTRIBUTIONS		COOPERATOR CONTRIBUTIONS		
	(a)	(b)	(c)	(d)	
COST ELEMENTS	Noncash	Cash to Cooperator	Noncash	In-Kind	(e) Total
Direct Costs					
Salaries/Labor	$10,181.50	$0.00	$8,800.00	$0.00	$18,981.50
Travel	$0.00	$0.00	$4,800.00	$0.00	$4,800.00
Equipment	$9,296.00	$0.00	$0.00	$0.00	$9,296.00
Supplies/Materials	$0.00	$0.00	$200,000.00	$0.00	$200,000.00
Printing	$0.00	$0.00	$0.00	$0.00	$0.00
Other	$0.00	$0.00	$0.00	$0.00	$0.00
Other					$0.00
Subtotal	$19,477.50	$0.00	$213,600.00	$0.00	$233,077.50
Coop Indirect Costs		$0.00	$32,040.00		$32,040.00
FS Overhead Costs	$1,947.75				$1,947.75
Total	$21,425.25	$0.00	$245,640.00	$0.00	
Total Project Value:					$267,065.25

Matching Costs Determination	
Total Forest Service Share = (a+b) ÷ (e) = (f)	(f) 8.02%
Total Cooperator Share (c+d) ÷ (e) = (g)	(g) 91.98%
Total (f+g) = (h)	(h) 100.00%

WORKSHEET FOR

FS Non-Cash Contribution Cost Analysis, Column (a)

Use this worksheet to perform the cost analysis that supports the lump sum figures provided in the matrix. NOTE: This worksheet auto populates the relevant and applicable matrix cells.

Cost element sections may be deleted or lines may be hidden, if not applicable. Line items may be added or deleted as needed. The Standard Calculation sections provide a standardized formula for determing a line item's cost, e.g. cost/day x # of days=total, where the total is calculated automatically. The Non-Standard Calculation sections provide a write-in area for line items that require a calculation formula that is other than the standardized formules, e.g. instead of salaries being calculated by cost/day x # of days, costs may be calculated simply by a contracted value that is not dependent on days worked, such as 1 employee x $1,200/contract= $1,200. Be sure to review your calculations when entering in a Non-Standard Calculation, and provide a brief explanation of units used to make calculation, e.g. '1 month contract,' on a line below the figures.

Salaries/Labor

Standard Calculation

Job Description		Cost/Day	# of Days		Total
Giles, Joshua		$375.78	20.00		$7,515.60
Sedgeman, Michael		$266.59	10.00		$2,665.90
					$0.00
					$0.00

Non-Standard Calculation

Total Salaries/Labor					**$10,181.50**

Travel

Standard Calculation

Travel Expense	Employees	Cost/Trip	# of Trips		Total
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Travel					**$0.00**

Equipment

Standard Calculation

Piece of Equipment	# of Units	Cost/Day	# of Days		Total
Vehicle FOR	1.00	$214.00	40.00		$8,560.00
Mileage	40.00	$0.46	40.00		$736.00
					$0.00
					$0.00

Non-Standard Calculation

Total Equipment					**$9,296.00**

Supplies/Materials				
Standard Calculation				
Supplies/Materials		# of Items	Cost/Item	Total
				$0.00
				$0.00
				$0.00
				$0.00
Non-Standard Calculation				
Total Supplies/Materials				**$0.00**

Printing					
Standard Calculation					
Paper Material		# of Units	Cost/Unit		Total
					$0.00
Non-Standard Calculation					
Total Printing					**$0.00**

Other Expenses					
Standard Calculation					
Item		# of Units	Cost/Unit		Total
					$0.00
					$0.00
					$0.00
					$0.00
Non-Standard Calculation					
Total Other					**$0.00**

Subtotal Direct Costs	$19,477.50

Forest Service Overhead Costs				
Current Overhead Rate	Subtotal Direct Costs			Total
10.00%	$19,477.50			$1,947.75
Total FS Overhead Costs				**$1,947.75**

TOTAL COST	**$21,425.25**

U.S. Forest Service

OMB 0596-0217
FS-1500-17B

Attachment: D

USFS Agreement No.: 18-CS-11030701-010

Mod. No.:

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Travel	$0.00	$0.00	$4,800.00	$0.00	$4,800.00
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Supplies/Materials	$0.00	$0.00	$200,000.00	$0.00	$200,000.00
Printing	$0.00	$0.00	$0.00	$0.00	$0.00
Other	$0.00	$0.00	$0.00	$0.00	$0.00
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Total Project Value:					$267,065.25

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Total Cooperator Share (c+d) ÷ (e) = (g)	(g) 91.98%
Total (f+g) = (h)	(h) 100.00%

WORKSHEET FOR

FS Non-Cash Contribution Cost Analysis, Column (a)

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					$0.00
					$0.00

Non-Standard Calculation

Total Salaries/Labor					**$10,181.50**

Travel

Standard Calculation

Travel Expense	Employees	Cost/Trip	# of Trips		Total
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Travel					**$0.00**

Equipment

Standard Calculation

Piece of Equipment	# of Units	Cost/Day	# of Days		Total
Vehicle FOR	1.00	$214.00	40.00		$8,560.00
Mileage	40.00	$0.46	40.00		$736.00
					$0.00
					$0.00

Non-Standard Calculation

Total Equipment					**$9,296.00**

Supplies/Materials				
Standard Calculation				
Supplies/Materials		# of Items	Cost/Item	Total
				$0.00
				$0.00
				$0.00
				$0.00
Non-Standard Calculation				
Total Supplies/Materials				**$0.00**

Printing					
Standard Calculation					
Paper Material		# of Units	Cost/Unit		Total
					$0.00
Non-Standard Calculation					
Total Printing					**$0.00**

Other Expenses					
Standard Calculation					
Item		# of Units	Cost/Unit		Total
					$0.00
					$0.00
					$0.00
					$0.00
Non-Standard Calculation					
Total Other					**$0.00**

Subtotal Direct Costs	$19,477.50

Forest Service Overhead Costs

Current Overhead Rate	Subtotal Direct Costs			Total
10.00%	$19,477.50			$1,947.75
Total FS Overhead Costs				**$1,947.75**

TOTAL COST	**$21,425.25**

WORKSHEET FOR

Cooperator Non-Cash Contribution Cost Analysis, Column (c)

Use this worksheet to perform the cost analysis that supports the lump sum figures provided in the matrix. NOTE: This worksheet auto populates the relevant and applicable matrix cells.

Cost element sections may be deleted or lines may be hidden, if not applicable. Line items may be added or deleted as needed. The Standard Calculation sections provide a standardized formula for determing a line item's cost, e.g. cost/day x # of days=total, where the total is calculated automatically. The Non-Standard Calculation sections provide a write-in area for line items that require a calculation formula that is other than the standardized formules, e.g. instead of salaries being calculated by cost/day x # of days, costs may be calculated simply by a contracted value that is not dependent on days worked, such as 1 employee x $1,200/contract= $1,200. Be sure to review your calculations when entering in a Non-Standard Calculation, and provide a brief explanation of units used to make calculation, e.g. '1 month contract,' on a line below the figures.

Salaries/Labor

Standard Calculation

Job Description		Cost/Day	# of Days		Total
Project Management	Arizona Prog	$440.00	20.00		$8,800.00
					$0.00
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Salaries/Labor					**$8,800.00**

Travel

Standard Calculation

Travel Expense	Employees	Cost/Trip	# of Trips		Total
Contractor Show Me Trip (R	2	$350.00	2.00		$1,400.00
Project Management	1	$150.00	10.00		$1,500.00
Final Inspection	2	$350.00	1.00		$700.00
Project Monitoring	2	$150.00	4.00		$1,200.00
					$0.00

Non-Standard Calculation

Total Travel					**$4,800.00**

Equipment

Standard Calculation

Piece of Equipment	# of Units	Cost/Day	# of Days		Total
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Equipment					**$0.00**

Supplies/Materials

Standard Calculation

Supplies/Materials		# of Items	Cost/Item		Total
Contract costs		1.00	$200,000.00		$200,000.00
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Supplies/Materials					**$200,000.00**

Printing

Standard Calculation

Paper Material		# of Units	Cost/Unit		Total
					$0.00

Non-Standard Calculation

					$0.00
Total Printing					**$0.00**

Other Expenses

Standard Calculation

Item		# of Units	Cost/Unit		Total
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Other					**$0.00**

Subtotal Direct Costs	$213,600.00

Cooperator Indirect Costs

Current Overhead Rate	Subtotal Direct Costs			Total
15.00%	$213,600.00			$32,040.00
Total Coop. Indirect Costs				**$32,040.00**

TOTAL COST	**$245,640.00**

WORKSHEET FOR

Cooperator Non-Cash Contribution Cost Analysis, Column (c)

Use this worksheet to perform the cost analysis that supports the lump sum figures provided in the matrix. NOTE: This worksheet auto populates the relevant and applicable matrix cells.

Cost element sections may be deleted or lines may be hidden, if not applicable. Line items may be added or deleted as needed. The Standard Calculation sections provide a standardized formula for determing a line item's cost, e.g. cost/day x # of days=total, where the total is calculated automatically. The Non-Standard Calculation sections provide a write-in area for line items that require a calculation formula that is other than the standardized formules, e.g. instead of salaries being calculated by cost/day x # of days, costs may be calculated simply by a contracted value that is not dependent on days worked, such as 1 employee x $1,200/contract= $1,200. Be sure to review your calculations when entering in a Non-Standard Calculation, and provide a brief explanation of units used to make calculation, e.g. '1 month contract,' on a line below the figures.

Salaries/Labor

Standard Calculation

Job Description		Cost/Day	# of Days		Total
Project Management	Arizona Prog	$440.00	20.00		$8,800.00
					$0.00
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Salaries/Labor					**$8,800.00**

Travel

Standard Calculation

Travel Expense	Employees	Cost/Trip	# of Trips		Total
Contractor Show Me Trip (R	2	$350.00	2.00		$1,400.00
Project Management	1	$150.00	10.00		$1,500.00
Final Inspection	2	$350.00	1.00		$700.00
Project Monitoring	2	$150.00	4.00		$1,200.00
					$0.00

Non-Standard Calculation

Total Travel					**$4,800.00**

Equipment

Standard Calculation

Piece of Equipment	# of Units	Cost/Day	# of Days		Total
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00

Non-Standard Calculation

Total Equipment					**$0.00**

Supplies/Materials					
Standard Calculation					
Supplies/Materials		# of Items	Cost/Item		Total
Contract costs		1.00	$200,000.00		$200,000.00
					$0.00
					$0.00
					$0.00
Non-Standard Calculation					
Total Supplies/Materials					**$200,000.00**

Printing					
Standard Calculation					
Paper Material		# of Units	Cost/Unit		Total
					$0.00
Non-Standard Calculation					
					$0.00
Total Printing					**$0.00**

Other Expenses					
Standard Calculation					
Item		# of Units	Cost/Unit		Total
					$0.00
					$0.00
					$0.00
Non-Standard Calculation					
Total Other					**$0.00**

Subtotal Direct Costs	$213,600.00

Cooperator Indirect Costs					
Current Overhead Rate	Subtotal Direct Costs				Total
15.00%	$213,600.00				$32,040.00
Total Coop. Indirect Costs					**$32,040.00**

TOTAL COST	**$245,640.00**

Bill Williams Mountain Forest and Watershed Restoration Project
National Forest Foundation
Legal Authority Conduct Work on Forest Service Land
Access and Control of Project Implementation

The National Forest Foundation was established by Congressional Act, known as the National Forest Foundation Act, Public Law No. 101-593. The purposes of the Act include:

(1) to encourage, accept, and administer private gifts of money, and of real and personal property for the benefit of, or in connection with, the activities and services of the Forest Service of the Department of Agriculture;

(2) to undertake and conduct activities that further the purposes for which units of the National Forest System are established and are administered and that are consistent with approved forest plans, and;

(3) to undertake, conduct and encourage educational, technical and other assistance, and other activities that support the multiple use, research, cooperative forestry and other programs administered by the Forest Service.

Per FS Agreement No. 18-CS-11030701-010, Challenge Cost Share Agreement between the National Forest Foundation (NFF) and the USDA, Forest Service Kaibab National Forest, The NFF shall have the legal authority to enter into an arrangement with the Kaibab National Forest for work on Bill Williams Mountain providing the institutional, managerial, and financial capability to ensure proper planning, management and completion of the project. In this agreement the NFF will provide and fund a contractor to complete the work in accordance to the silviculture and fuels prescription provided by the Forest Service, and to provide contract administration for the project work and quality control.

As part of the Scope of Work (Task #1), the NFF will modify the contract with the Forest Service, as deemed necessary, to add the specified acres as part of this proposal; 200 acres on steep slopes using mechanical treatment methods. This inclusion would be *in addition to* the current work plans agreed to by and between the NFF and the Kaibab National Forest in Agreement No. 18-CS-11030701-010.

7324 E. Sixth Avenue
Scottsdale, AZ 85251
◆ TEL 720-749-9008 ◆
WWW.NATIONALFORESTS.ORG

September 6, 2018

Mr. Reuban Teran
Executive Director
Arizona Water Protection Fund
Arizona Department of Water Resources
1110 W. Washington Street, Suite #310 | Phoenix, AZ 85007

Dear Mr. Teran,

Per the Arizona Water Protection Fund 2019 Grant Cycle, this letter documents and confirms match funds dedicated to the work associated with the National Forest Foundation's (NFF) proposal for the Bill Williams Mountain Forest and Watershed Restoration Project.

The NFF works each year to partner with many organizations to collect funds that we use for on-the-ground restoration work across the Salt and Verde Watersheds. With each organization, the NFF has a unique funding agreement, but always for the purpose of watershed health within the watersheds. This effort is known as the Northern Arizona Forest Fund (NAFF).

Through the NAFF we have the ability to dedicate funds to any one or multiple projects that we select, with input from the Forest Service an Advisory Council. The Bill Williams Mountain Forest and Watershed Restoration Project has been selected and approved for 2019 efforts as part of the NAFF, and we are now in the process of raising all the funds necessary to implement the project.

As part of this grant application, the NFF confirms here, and is pledging NAFF dollars as delineated in the Detailed Budget Breakdown and Matching Funds Breakdown, to match the funds awarded via the AWPF's 2019 Grant Cycle.

Sincerely,

Rebecca Davidson

Rebecca Davidson
Director, Southern Rockies Region
National Forest Foundation