MAY 2026

COCONINO COUNTY ARIZONA

GREATER FLAGSTAFF FORESTS PARTNERSHIP

A COMMUNITY WILDFIRE PROTECTION PLAN

for Rural Fire Districts and Tribal Communities in Coconino County

SWCA®
ENVIRONMENTAL CONSULTANTS

ACKNOWLEDGEMENTS

We would like to formally thank the Core Team, community members, the public, and all stakeholders who contributed their time and expertise throughout the planning process. We are especially grateful to the communities across Coconino County who attended meetings, completed surveys, and provided thoughtful and invaluable feedback. Your engagement and participation help shape strategies that support resilient landscapes, effective public education, reduced structural ignitability, and safe and coordinated wildfire response.

Special thanks are extended to the Greater Flagstaff Forests Partnership (GFFP), whose efforts, led by board member Anne Mottek, demonstrated a high level of initiative and coordination in advancing this CWPP from concept through implementation. Prior to the grant award, on behalf of GFFP, Anne laid critical groundwork by scoping the project, engaging potential partners and contractors, and developing a competitive proposal supported by early outreach to fire districts, Tribal representatives, and federal agencies. This early investment established a strong foundation for a collaborative and well-informed planning process.

Following the grant award, Anne kept GFFP in an active leadership role in both project management and stakeholder engagement. This included administering grant requirements, coordinating with the Core Team and community members, supporting outreach and public involvement efforts, and providing ongoing review and input throughout plan development. Their consistent involvement helped ensure the CWPP reflects local priorities, incorporates diverse perspectives, and remains positioned for implementation.

For additional information, questions, or concerns regarding this project, please contact the Greater Flagstaff Forests Partnership Director/`Project Manager Anne Mottek at mottekconsulting@gmail.com, admin@gffp.org or SWCA Project Manager Annie Lutes at alutes@swca.com.

Funding for this project was provided by the US Forest Service (USFS) Community Wildfire Defense Grant (CWDG).

DISCLAIMER

The purpose of the risk assessment contained in this plan is solely to provide a broad county-level overview of general wildfire risks within the assessment area as of the date hereof, and to provide a potential resource for community and county pre-fire planning. This risk assessment is premised on various assumptions and models, which include and are based upon data, software tools, and other information provided by third parties (collectively, "Third-Party Information and Tools"). SWCA, Incorporated, doing business as SWCA Environmental Consultants ("SWCA"), relied upon various Third-Party Information and Tools in the preparation of this risk assessment and SWCA shall have no liability to any party in connection with this risk assessment including, without limitation, as a result of incomplete or inaccurate Third-Party Information and Tools used in the preparation hereof. SWCA hereby expressly disclaims any responsibility for the accuracy or reliability of the Third-Party Information and Tools relied upon by SWCA in preparing this risk assessment. SWCA shall have no liability for any damage, loss (including loss of life), injury, property damage, or other damages whatsoever arising from or in connection with this risk assessment, including any person's use or reliance on the information contained in this risk assessment. Any reproduction or dissemination of this risk assessment or any portion hereof shall include the entirety of this plan disclaimer.

FOREWORD

The Greater Flagstaff Forest Partnership (GFFP) is pleased to present this novel "Community Wildfire Protection Plan for Rural Fire Districts and Tribal Communities in Coconino County." Given Coconino County is geographically the second largest county in the country and has a broad and diverse extent of rural communities, this CWPP provides increased wildfire preparedness, resources, and mitigation capacity that otherwise had been unavailable to these underserved and underrepresented rural and tribal communities.

As communities across Coconino County are facing increased frequency, size, and intensity of wildfires and the aftermath of flooding events, this wildfire planning document appropriately encapsulates the three tenants of the National Cohesive Wildland Fire Management Strategy that include 1) **restoring and maintaining landscapes, 2) creating fire adapted communities, and 3) improving wildfire response**. Maintaining and improving upon these tenants are essential in assuring the County upholds vibrant and sustainable rural and tribal communities.

Now that the CWPP is complete, the next critical step is to work together and share the responsibility in assuring that each community's priority projects, identified in the CWPP, are executed. For example, activities may include conducting fuel reduction projects, improving street and house signage, or upgrading fire station equipment and communication systems. To reach this goal, all members of the communities, whether it is residents, fire districts, municipalities, or the State, need to collectively and urgently work together to support the CWPP's identified actionable solutions specifically designed to reduce wildfire risk across the County.

The CWPP is the result of a collaborative effort by GFFP, Coconino County, SWCA, a Core Team, and community members from across the County. The Core Team was comprised of rural fire districts and tribal communities working side-by-side wildland fire, forestry, and land management professionals. The service the Core Team afforded was invaluable. Additionally, Coconino County provided both financial and in-service support, and this is testament to their dedication in addressing the greatest threat residents in the County face. Lastly, thanks and recognition go out to others who took the time to contribute to this effort, especially the community members who completed the survey, showed up at the community meetings, and continued to provide invaluable input throughout the process.

As County residents are well aware, Coconino County is home to cherished natural resources and national treasures; like the Coconino, Kaibab, and Apache-Sitgreaves National Forests and the Grand Canyon and San Francisco Peaks, a sacred mountain to 13 Native American Tribes. Resistance and resilience to wildfires are key in sustaining what we treasure. This countywide CWPP is the first of its kind that is designed to tackle this challenge. It's up to all of us to see it through – to preserve our quality of life – and for the communities, Tribes, wildlife, forests, deserts, rangelands, watersheds, and our treasured landmarks and landscapes.

Anne Mottek
Director, CWPP Project Manager
Greater Flagstaff Forests Partnership

The entities listed below participated in the development of, and/or reviewed and are in support of the 2026 Coconino County CWPP and agree that the CWPP is viable, complete, and realistic in terms of risk reduction and implementation.

Signature	**Signature**
Name (printed)	**Name (printed)**
Date	**Date**
Agency /Position (printed)	**Agency /Position (printed)**
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EXECUTIVE SUMMARY

Prior to the development of the 2026 Coconino County Community Wildfire Protection Plan (CWPP), Coconino County did not have a single, countywide CWPP. Instead, wildfire planning occurred through a series of community- and district-specific CWPPs developed over a decade ago for areas such as Williams, Tusayan, Blue Ridge, and the Greater Flagstaff area. Many of these plans are now outdated, and the communities of Williams, Tusayan, and Blue Ridge opted to participate in this new countywide plan. The CWPP for the Greater Flagstaff area is currently undergoing its own plan update, and therefore, the planning area encompassing Flagstaff, portions of Sedona, and other unincorporated communities in Coconino County are not included in this plan. As such, this CWPP integrates and updates those earlier efforts to create a unified, countywide planning framework with a particular focus on rural and Tribal communities. All Tribes within Coconino County were sent letters via email inviting them to participate early in the planning process, and one Tribe (the Hualapai Tribe) actively engaged in the development of this CWPP.

Coconino County faces persistent and evolving wildfire risk driven by extensive forests and rangelands, expanding wildland-urban interface development, prolonged drought, and longer fire seasons. These conditions increase the likelihood of large, high-severity wildfires and elevate risks to communities, infrastructure, water supplies, cultural resources, and public safety. This CWPP responds to these challenges by updating countywide wildfire hazard and risk information, identifying locally relevant and actionable mitigation strategies, and establishing a coordinated framework to strengthen wildfire resilience across Coconino County.

This CWPP was developed by a Core Team of county, municipal, Tribal, state, and federal agencies and community organizations with wildfire and land management expertise. The planning process combined wildfire risk modeling, fire history and fuels analysis, and mapping of values at risk with public and stakeholder input through surveys, meetings, and online tools. Recommendations were refined through community and partner feedback. The CWPP also aligns with key planning efforts that influence wildfire mitigation and emergency management in the region, including county, state, federal, and Tribal plans and strategies.

This CWPP was prepared in response to the Healthy Forests Restoration Act of 2003 (HFRA). In doing so, it:

- Was collaboratively developed by local, Tribal, state, and federal partners
- Identifies and prioritizes hazardous fuels reduction and vegetation management projects
- Recommends actions to reduce the ignitability of structures
- Incorporated public input during plan development

In addition, this plan meets Arizona's CWPP requirements because it:

1. Describes the local area (Chapter 1)
    a. Describes fuel types and fire history (Chapter 2), and completed fuel treatments (Chapter 4)
2. Identifies communities at risk for damage or destruction from wildfire (Appendix C) and evacuation planning for such communities (Appendix J)
3. Lists existing wildfire response resources (Chapter 2)
4. Identifies community projects for the next 5 years (Appendix C)

This CWPP provides a countywide assessment of wildfire hazards and risks, identifies vulnerabilities and planning gaps, and proposes actionable strategies to reduce wildfire impacts and improve preparedness. It establishes a shared framework that brings together fire agencies, land managers, planners, emergency responders, Tribal governments, and residents around common wildfire resilience goals.

The planning area encompasses all of Coconino County, more than 18,600 square miles, and includes incorporated communities, unincorporated rural areas, and Tribal lands. Landscapes range from desert and grasslands to piñon–juniper woodlands and ponderosa pine and mixed-conifer forests, with elevations ranging from approximately 2,000 feet in the Grand Canyon to over 12,600 feet at Humphreys Peak. Land ownership is dominated by federal and Tribal jurisdictions, with State Trust and private lands interspersed throughout, making cross-boundary coordination essential for effective wildfire mitigation and response.

Coconino County and its partners have a strong record of wildfire risk reduction through forest restoration, fuels treatments, prescribed fire, watershed protection, public education, and Firewise and defensible space programs. Regional initiatives such as the Four Forest Restoration Initiative, the Flagstaff Watershed Protection Project, and Arizona's Shared Stewardship Agreement with the U.S. Forest Service have treated large areas of fire-prone landscapes, providing a foundation for continued risk reduction.

At the same time, the county has experienced numerous significant wildfire events in recent years, including the 2025 Dragon Bravo and White Sage Fires, which threatened communities, disrupted transportation, and degraded air and water quality. These incidents highlight the increasing potential for late-season ignitions, extreme fire behavior, and long-duration fires under drought and high-wind conditions.

Fire seasons in northern Arizona are becoming longer and more variable due to rising temperatures, reduced snowpack, shifting precipitation patterns, and more frequent heat and drought extremes. When combined with complex terrain, strong winds, and diverse vegetation types, these trends can contribute to elevated and uneven wildfire risk across portions of the county.

Field-based wildfire hazard assessments found that most communities in Coconino County exhibit high wildfire hazard conditions, while quantitative wildfire risk modeling indicates that all communities are within or immediately adjacent to areas of high or very high wildfire risk. Together, these findings highlight the importance of proactive, coordinated wildfire mitigation and preparedness actions to reduce risk to communities, structures, infrastructure, and critical resources across Coconino County.

This CWPP identifies wildfire risks and outlines mitigation strategies aligned with the three goals of the National Cohesive Wildland Fire Management Strategy: resilient landscapes, fire-adapted communities, and safe and effective wildfire response. For resilient landscapes, the plan emphasizes fuels management near communities, along transportation corridors, and around critical infrastructure. For fire-adapted communities, it prioritizes defensible space, home hardening, Firewise programs, and wildfire preparedness. For wildfire response, it supports improved coordination, evacuation planning, staffing, equipment and facility upgrades, water supply improvements, and responder safety.

Although CWPPs do not have regulatory authority, their value lies in collaboration. In a county as large and jurisdictionally complex as Coconino County, effective wildfire risk reduction depends on coordinated action among property owners, Tribal governments, local fire agencies, state partners, federal land managers, and non-profit organizations.

To support transparency and community engagement, Coconino County developed a public-facing ArcGIS Hub site to accompany this CWPP. The site includes a StoryMap that serves as a digital companion to the plan, as well as a project tracker with interactive web maps to support implementation and progress monitoring. In addition, the hub contains a comprehensive web map featuring the data layers used to develop the maps included in this document, allowing users to explore communities and geographic areas at finer scales. The hub site can be accessed at: https://cwpp-coconinocounty.hub.arcgis.com.

The hub site

CHAPTER 1 – INTRODUCTION

Wildfire activity across the United States has remained elevated in recent years, with ignition counts consistently ranging between approximately 50,000 and 70,000 fires annually since 2018 (National Interagency Fire Center [NIFC] 2024). Although acres burned vary from year to year due to climate and fuel conditions, the national average has increased to nearly seven million acres burned annually, more than double the average observed in the 1990s (Congressional Research Service [CRS] 2023; NIFC 2024). These trends reflect a broader shift toward larger, more complex wildfire events across the western United States.

Arizona mirrors these national patterns. In 2024, the state recorded 2,162 wildfires that burned approximately 282,000 acres, representing notable increases in both incident count and acres burned compared to the previous year (Arizona Department of Fire Forestry and Fire Management [DFFM] 2024a). Persistent drought conditions, a weak monsoon season, and widespread fine-fuel accumulation contributed to elevated wildfire activity statewide. Northern Arizona, including Coconino County, remained at elevated risk later into the fire season due to prolonged dry fuels and delayed seasonal moisture (DFFM 2024a).

Within Coconino County, wildfire is consistently identified as one of the most significant natural hazards due to steep terrain, extensive forested landscapes, expanding wildland-urban interface (WUI) development, and the legacy of long-term fire exclusion that has increased fuel loads (Coconino County Emergency Management [CCEM] 2022). Past wildfire events, including the 2010 Schultz Fire, illustrate the potential for rapid fire growth and severe impacts under high-risk conditions (Greater Flagstaff Forests Partnership [GFFP] 2018). In response, substantial mitigation efforts have been implemented across the region through coordinated local, state, and federal initiatives, including large-scale forest restoration watershed protection projects and community-level risk reduction programs.

As wildfire risk continues to affect communities across Coconino County, coordinated planning is necessary to address current hazards, changing development patterns, and long-term resilience needs. This 2026 Coconino County Community Wildfire Protection Plan (CWPP) represents a new countywide effort that builds upon previous community-based planning while expanding the focus to include the county's diverse rural and Tribal communities. The following section describes the goals and statutory requirements that guide CWPP development and implementation.

GOAL OF A COMMUNITY WILDFIRE PROTECTION PLAN

The goal of a CWPP is to enable local communities to improve their wildfire-mitigation capacity, while working with government agencies to identify high fire risk areas and prioritize areas for mitigation, fire suppression, and disaster preparedness. Another goal of the CWPP is to enhance public awareness by helping residents better understand the natural and human-caused risk of wildland fires that threaten lives, safety, and the local economy. The minimum requirements for a CWPP, as stated in the Healthy Forests Restoration Act of 2003 (HFRA), are the following:

Collaboration: Town, county, and state government representatives, in consultation with federal agencies or other interested groups, must collaboratively develop a CWPP (Society of American Foresters [SAF] 2004).

Prioritized Fuel Reduction: A CWPP must identify and prioritize areas for hazardous fuels reduction and treatments and recommend the types and methods of treatment that will protect one or more communities at risk (CARs) and their essential infrastructures (SAF 2004).

Treatments of Structural Ignitability: A CWPP must recommend measures that local governments, homeowners, and communities can take to reduce the ignitability of structures throughout the area addressed by the plan (SAF 2004).

It is the intent of this 2026 CWPP to provide a countywide assessment of wildfire risk and protection needs. The plan also brings together wildfire management entities and jurisdictions across Coconino County to address identified needs and support planning and implementation of mitigation measures. Additional information on the planning and policy process is available in Appendix B.

ALIGNMENT WITH COHESIVE WILDLAND FIRE MANAGEMENT STRATEGY

The 2026 CWPP is aligned with the Cohesive Strategy and its Phase III Western Regional Action Plan by adhering to the nationwide goal “to safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and collectively, live with wildland fire.”

The primary, national goals identified as necessary to achieving the vision are:

- **Resilient Landscapes –** Landscapes, regardless of jurisdictional boundaries are resilient to fire, insect, disease, invasive species, and climate change disturbances, in accordance with management objectives.
- **Fire Adapted Communities –** Human populations and infrastructure are as prepared as possible to receive, respond to, and recover from wildland fire.
- **Safe, Effective, Risk-based Wildfire Response –** All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

For more information on the Cohesive Strategy, please visit: https://www.forestsandrangelands.gov/strategy/.

Alignment with these Cohesive Strategy goals is described in more detail in Chapter 4, Mitigation Strategies. In addition to aligning with the Cohesive Strategy, the CWPP also incorporates information on post-fire recovery, the significant hazards of a post-fire environment, and the risk that post-fire effects pose to communities (Figure 1.1).

Additional information regarding post-fire recovery, restoration strategies, and funding sources is provided in Appendix F.

Figure 1.1. The CWPP incorporates the three primary goals of the Cohesive Strategy with post-fire recovery to serve as a holistic plan for fire prevention and resilience.

ALIGNMENT WITH LOCAL, STATE, AND FEDERAL PLANS AND AGREEMENTS

The CWPP is designed to align with existing federal, state, local, and Tribal planning documents that influence wildfire mitigation, emergency response, and land management across the region. Many of these plans were developed independently to meet agency- or jurisdiction-specific needs, but they often share common goals related to risk reduction, landscape resilience, and public safety. This CWPP builds

on those efforts by identifying where strategies can be aligned, updated, or expanded to reflect current wildfire science and countywide priorities.

In alignment with Arizona CWPP development guidance, this plan identifies other federal, state, local, and Tribal documents that provide valuable information and support wildfire mitigation in the CWPP area. Table 1.1 summarizes local plans and agreements, while Table 1.2 outlines relevant state and federal plans that provide additional guidance and opportunities for coordination. Together, these tables highlight future opportunities for alignment with the 2026 Coconino County CWPP, supporting consistent fuel treatment priorities, community preparedness efforts, and emergency response coordination across jurisdictions.

Note: The Blue Ridge, Tusayan, and Williams Fire District CWPPs are integrated into this plan as of 2026, and these districts will not be updating separate individual CWPPs. The Flagstaff CWPP is being updated independently and is not included in this plan.

Table 1.1. Local Plans for Alignment with the Coconino County CWPP

Plan/Agreement Title	Future Opportunities for Alignment with the 2026 Coconino County CWPP
Greater Flagstaff Area CWPP (2018) (currently under revision)	• Cross-reference new areas of concern or ember cast modeling from the current CWPP. • Expand prioritization to incorporate updated population density or structural exposure data. • Better coordinate project tracking across both CWPPs (Flagstaff and Coconino County). • Clarify roles for public outreach and homeowner mitigation beyond the city boundary. • Update implementation priorities based on recent wildfire activity or vegetation shifts.
Tusayan CWPP an At-Risk Community of the Kaibab National Forest in Coconino County (2005)	• Update WUI boundaries and risk priorities using current modeling and vegetation conditions. • Integrate Tusayan's past fuels treatments into a countywide project tracking framework (e.g., Coconino County's project tracker on the Hub site). • Align defensible space and homeowner outreach with modern Firewise guidance. • Coordinate updated evacuation and readiness messaging with county protocols. • Strengthen alignment with Kaibab National Forest priorities reflecting post-2005 fuel changes.
Greater Williams Area CWPP (2005)	• Modernize priority treatment areas and WUI mapping using current fire behavior data. • Integrate Williams-area treatments into countywide monitoring and project tracking. • Update structure hardening and defensible space guidance to current standards. • Coordinate cross-jurisdictional fuels priorities with Kaibab National Forest and nearby fire districts. • Revisit watershed protection priorities (e.g., Bill Williams Mountain) using updated risk information.

Plan/Agreement Title	Future Opportunities for Alignment with the 2026 Coconino County CWPP
Blue Ridge and Mogollon Rim Ranger District of the Coconino National Forest CWPP (2010)	• Refresh WUI and priority treatment areas based on current development and risk data. • Update older fire behavior assessments with modern ember and exposure modeling. • Standardize defensible space messaging across the dispersed subdivision network. • Coordinate project priorities with countywide and Coconino National Forest landscape treatments. • Align updated evacuation planning with current road conditions and population patterns.
Coconino County Comprehensive Plan (2025)	• Include clearer mapping and identification of CWPP priority areas in land use maps. • Incorporate fire-adapted community principles into rural development guidelines, especially near forested areas. • Strengthen language supporting interagency fuels reduction projects in open space and public lands. • Aligning fire mitigation projects with forest restoration and watershed protection projects • Leverage community risk reduction to support homeowner insurability
Coconino County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) (2021 [updated 2022])	• Align fire mitigation actions with CWPP risk modeling zones. • Include CWPP areas of concern in the list of critical infrastructure at risk from wildfire. • Emphasize coordinated grant pursuit for joint mitigation work. • Add CWPP-based recommendations into future mitigation actions in MJHMP annexes. • Incorporate CWPP public outreach strategies into mitigation education efforts.
Coconino County Emergency Operations Plan (EOP) (2023)	• Incorporate CWPP-modeled flame lengths and crown fire potential into evacuation planning. • Use CWPP maps and community-level risk analysis to refine trigger points for evacuation. • Strengthen EOP appendices with wildfire-specific resource staging and suppression access zones. • Coordinate incident command structure with CWPP's identified WUI response zones. • Reference mitigation actions (like shaded fuel breaks) in suppression strategy templates.
Flagstaff Regional Plan (2014–2030)	• Integrate updated CWPP wildfire risk layers into open space and greenbelt planning. • Reinforce use of ignition-resistant materials and defensible space in residential design standards. • Cross-reference CWPP priority fuel breaks in transportation or utility corridor planning. • Coordinate forest health restoration goals with wildfire hazard reduction targets. • Emphasize long-term land use policies that reduce exposure to wildfire in WUI expansions.

Plan/Agreement Title	Future Opportunities for Alignment with the 2026 Coconino County CWPP
Hopi Tribe Hazard Mitigation Plan (2015)	• Expand wildfire mitigation strategies to include finer-scale WUI delineation and treatments. • Add Tribal-specific fuel break priorities or coordinated burn windows with federal/state partners. • Reference updated fire behavior modeling or incorporate outputs from recent CWPPs. • Incorporate community outreach strategies and Firewise participation incentives. • Align Tribal evacuation routes with cross-jurisdictional emergency response corridors.
Navajo Nation Wildfire Protection Plan	• Reduce structural ignitability by educating homeowners and permittees in the WUI. • Increase knowledge of fire prevention measures using an education program for the general public, local schools, community events and fairs. • Reduce human-caused fires. • Develop an interagency partnership/collaboration to increase prevention awareness and efforts with agencies located within and adjacent to the Nation. • Increase fire danger signage throughout the Navajo Nation. • Develop a communications plan to increase fire danger awareness.
Climate Adaptation Plan for the Navajo Nation (2018)	• Integrate fuel treatment as a proactive adaptation strategy under climate and vegetation shifts. • Include wildfire modeling as a climate risk to traditional grazing and cultural resources. • Link culturally sensitive fire management (e.g., traditional ecological knowledge) with CWPP strategies. • Reference shared land boundaries with areas of concern identified in the CWPP. • Promote restoration of fire-resilient native vegetation as both a climate and wildfire strategy.
Hualapai Tribe Wildfire Prevention Plan (2024)	• Coordinate wildfire risk mapping and areas of concern across shared Coconino County boundaries. • Integrate Tribal fuel treatment and prevention priorities into countywide project tracking where appropriate (e.g., Coconino County's project tracker on the Hub site). • Align prevention outreach and seasonal wildfire messaging across jurisdictions for residents and visitors. • Reference CWPP risk and exposure analysis in future prevention planning updates where beneficial.

Plan/Agreement Title	Future Opportunities for Alignment with the 2026 Coconino County CWPP
Navajo Nation Integrated Weed Management Plan (2022)	• Align invasive species control efforts with fire-prone fuel corridors identified in the CWPP. • Emphasize joint treatments for tamarisk, cheatgrass, and other flashy fuels in WUI areas. • Coordinate mechanical treatments or prescribed fire with CWPP priorities where feasible. • Include recommendations to monitor fuel loading post-treatment in CWPP areas of concern. • Explore co-benefits of weed control and fire mitigation for funding alignment.
Final Integrated Resource Management Plan for the Former Bennet Freeze Area (2022)	• Include fuels reduction around newly planned infrastructure or housing clusters. • Address access constraints for suppression in remote or restricted zones. • Add wildfire risk as a key consideration in rangeland and forest restoration projects. • Build in coordination with BIA and Navajo Nation fire managers for shared mitigation goals. • Identify potential for community defensible zones or fire breaks based on CWPP risk layers.

Table 1.2. State and Federal Plans for Alignment with the Coconino County CWPP

Plan/Agreement Title	Future Opportunities for Alignment with the 2026 Coconino County CWPP
Arizona Forest Action Plan (2020)	• Integrate statewide priority landscapes and the statewide strategy map into CWPP prioritization for cross-boundary fuels work, especially in high-risk ponderosa pine and WUI zones. • Align county treatment priorities with statewide goals such as restoring fire-adapted ecosystems, reducing large-fire potential, and improving community resilience. • Use Forest Action Plan metrics to strengthen competitive positioning for State Fire Assistance, WUI grants, and cross-boundary projects. • Incorporate Forest Action Plan emphasis on collaboration with Tribes, federal partners, and local jurisdictions to strengthen implementation pathways. • Reference statewide landscape-scale priorities to improve consistency between county projects and regional restoration strategies. • Increase the pace, scale, and capacity to implement Good Neighbor Authority agreements to support fuels treatments on federal lands near communities.

Plan/Agreement Title	Future Opportunities for Alignment with the 2026 Coconino County CWPP
Arizona State Hazard Mitigation Plan (HMP) (2023)	• Align CWPP wildfire risk findings with the HMP's updated risk assessment, including climate-driven fuel changes and WUI expansion. • Integrate HMP mitigation actions (fuels reduction, evacuation enhancements, defensible space outreach) into county-level recommendations. • Coordinate CWPP project lists with HMP priorities to improve eligibility for FEMA BRIC and Hazard Mitigation Grant Program (HMGP) funding. • Incorporate HMP emphasis on interagency coordination, especially with public safety, land management, and emergency management partners. • Use the HMP's critical infrastructure vulnerability framework to strengthen county recommendations for utility corridors and transportation routes.
Arizona Urban Community Forestry (UCF) 5-Year Strategic Plan (2025 – 2029)	• Incorporate UCF goals related to urban fuels management, emphasizing defensible space, canopy maintenance, and post-fire tree-risk mitigation in Tusayan, Williams, and gateway communities. • Integrate UCF guidance for storm- and drought-stressed trees, which increase surface and ladder fuel hazards. • Align community outreach actions with UCF strategies to grow urban forest stewardship, support Firewise efforts, and expand mitigation education. • Coordinate CWPP recommendations with UCF's emphasis on equitable access to tree-risk reduction resources in underserved neighborhoods. • Use UCF resilience goals to support fire-adapted landscaping guidance and community preparedness programs.
USFS Wildfire Crisis Strategy (2022)	• Align CWPP priority treatment areas with high-risk firesheds identified in the Wildfire Crisis Strategy, particularly around Flagstaff, Williams, and the Mogollon Rim. • Use the Strategy's framework to justify county-level priorities for large-scale fuels treatments, POD-aligned work, and cross-boundary coordination. • Integrate USFS emphasis on shared stewardship, Tribal engagement, and cross-jurisdictional planning into CWPP implementation. • Reference federal workforce and capacity investments to support increased treatment pace and scale on lands adjacent to communities. • Align CWPP monitoring and adaptive management with the Strategy's call for risk-based, outcome-driven projects and long-term maintenance planning.

PLANNING AREA DESCRIPTION

Coconino County serves as the planning area for this CWPP (Figure 1.2). Certain areas are excluded from the scope of analysis due to existing planning efforts, including the Greater Flagstaff area and specific Tribal lands. The plan focuses on rural communities, participating Tribal communities, and unincorporated areas with distinct wildfire exposure and mitigation needs.

Coconino County encompasses approximately 18,616.36 square miles, making it the second-largest county by land area in the contiguous United States (U.S. Census Bureau 2024). As of 2024, the estimated population is 145,161, resulting in a population density of approximately 7.8 persons per square mile (U.S. Census Bureau 2024). The county includes incorporated municipalities such as Flagstaff, Page, and Williams, as well as numerous unincorporated communities and Tribal lands, including portions of the Navajo Nation, Hopi Tribe, and Hualapai Tribe (CCEM 2022).

The planning area spans diverse landscapes of the Colorado Plateau, San Francisco Peaks, Oak Creek Canyon, Mogollon Rim, and the Grand Canyon. Elevations range from below 2,000 feet to over 12,600 feet at Humphreys Peak, the highest point in Arizona (CCEM 2022). Vegetation communities transition from desert scrublands at lower elevations to grasslands, piñon–juniper woodlands, and ponderosa pine and mixed conifer forests at higher elevations (CCEM 2022).

Land Ownership

Land ownership in Coconino County consists of a complex mix of federal, Tribal, state, and private lands, which strongly influences land use patterns, access, and wildfire management across the county. A detailed summary of land ownership is provided in Table 1.3, and a countywide ownership map is shown in Figure 1.3. Most land in the county is publicly managed, with federal and Tribal governments each overseeing large, contiguous areas of land.

The U.S. Forest Service (USFS) is the largest land manager, overseeing the Kaibab, Coconino, and Apache-Sitgreaves national forests across much of the central and southern county. The National Park Service (NPS) manages Grand Canyon National Park in the north, while the Bureau of Land Management (BLM) manages scattered parcels throughout the region. Tribal lands administered by the Bureau of Indian Affairs (BIA), including portions of the Hualapai Tribe, Navajo Nation, and Hopi Tribe, comprise substantial areas of the eastern and northern county.

State Trust lands, administered by the Arizona State Land Department, are interspersed throughout Coconino County, often adjacent to private holdings, and play an important role in land leasing and natural resource management. Privately owned lands are primarily concentrated near incorporated communities such as Flagstaff, Page, and Williams, as well as along major transportation corridors in unincorporated areas.

Additional details on land use, jurisdictional boundaries, and land management frameworks are provided in Appendix B.

Table 1.3. Breakdown of Land Ownership in the Planning Area

Land Ownership	Acres	Percentage of County
Federal (Non-Tribal)	4,745,308.14	39.15
Navajo Nation	3,342,957.62	27.58
Private + BNSF	1,413,945.74	11.67
State of Arizona	1,129,200.89	9.32
Hopi Tribal Land	679,042.92	5.6
Hualapai Tribal Land	579,475.11	4.78
Havasupai Tribal Land	174,094.71	1.44

Land Ownership	Acres	Percentage of County
Local Governments	27,763.51	0.23
Kaibab Paiute Tribal Land	13,367.88	0.11
Tribal Land Allotment	9,656.34	0.08
Paiute Navajo Treaty Area	5,029.40	0.04
Total	**12,119,842.26**	**100.00**

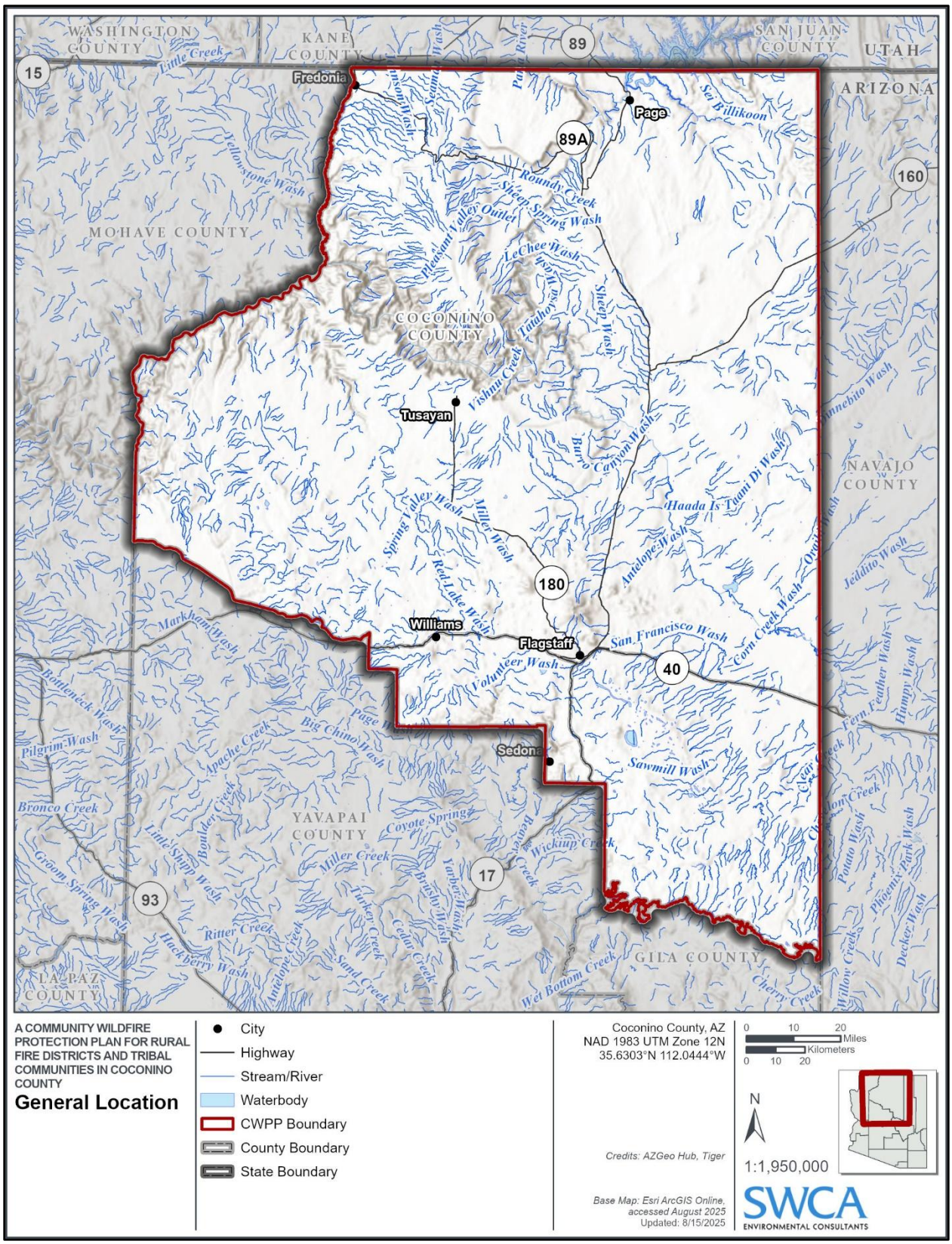

Figure 1.2. Coconino County general location.

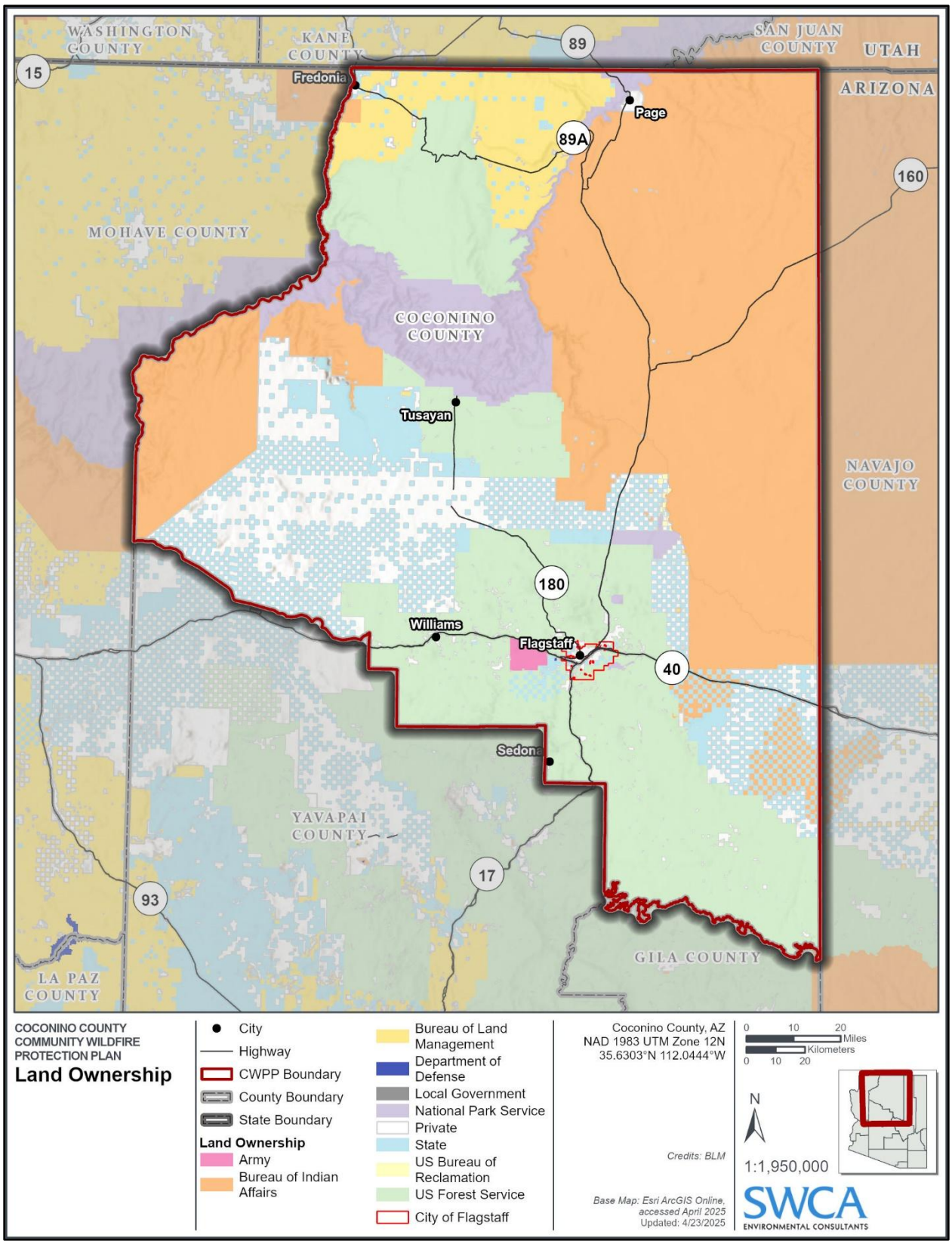

Figure 1.3. Coconino County land ownership.

Population

As of 2020, Coconino County had an estimated population of approximately 145,000 people, reflecting continued growth since 2010 (U.S. Census Bureau 2023a, 2023b). Despite this growth, population density remains low at approximately 7.8 people per square mile due to the county's large geographic size (Coconino County 2021).

Population distribution is uneven, with higher concentrations in incorporated communities such as Flagstaff, Sedona, Williams, and Page, and numerous unincorporated communities clustered primarily in the south-central portion of the county (Coconino County 2021). Many of these communities are within or adjacent to forested and mountainous areas, increasing exposure to wildfire hazards.

Social Vulnerability Considerations

Social vulnerability influences how communities experience and recover from wildfire impacts. Populations that may be more vulnerable include older adults, children, underrepresented racial or ethnic groups, individuals with limited English proficiency, low-income households, people with disabilities, and those with medical conditions (Fothergill and Peek 2004). These factors (see Figure 1.5) can increase challenges related to evacuation, access to mitigation resources, and post-fire recovery.

This CWPP incorporates Social Vulnerability Index (SVI) data developed by the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry, based on U.S. Census Bureau American Community Survey data (CDC 2023). The SVI provides a relative, percentile-based measure of social vulnerability by census tract and is used to support countywide risk assessment and mitigation prioritization. Figure 1.4 illustrates the overall SVI percentile rankings across the Coconino County CWPP planning area, highlighting areas where social vulnerability may compound wildfire risk.

SVI data are used as a screening-level planning tool and are interpreted alongside other wildfire risk indicators, including hazard severity, exposure, and response capacity. While useful for identifying relative patterns, SVI results are subject to limitations related to data resolution, indicator selection, and reliance on theoretical rather than empirical weighting (Beccari 2016; Reilley 2022). These limitations are considered when applying SVI findings to community-level planning and mitigation decisions.

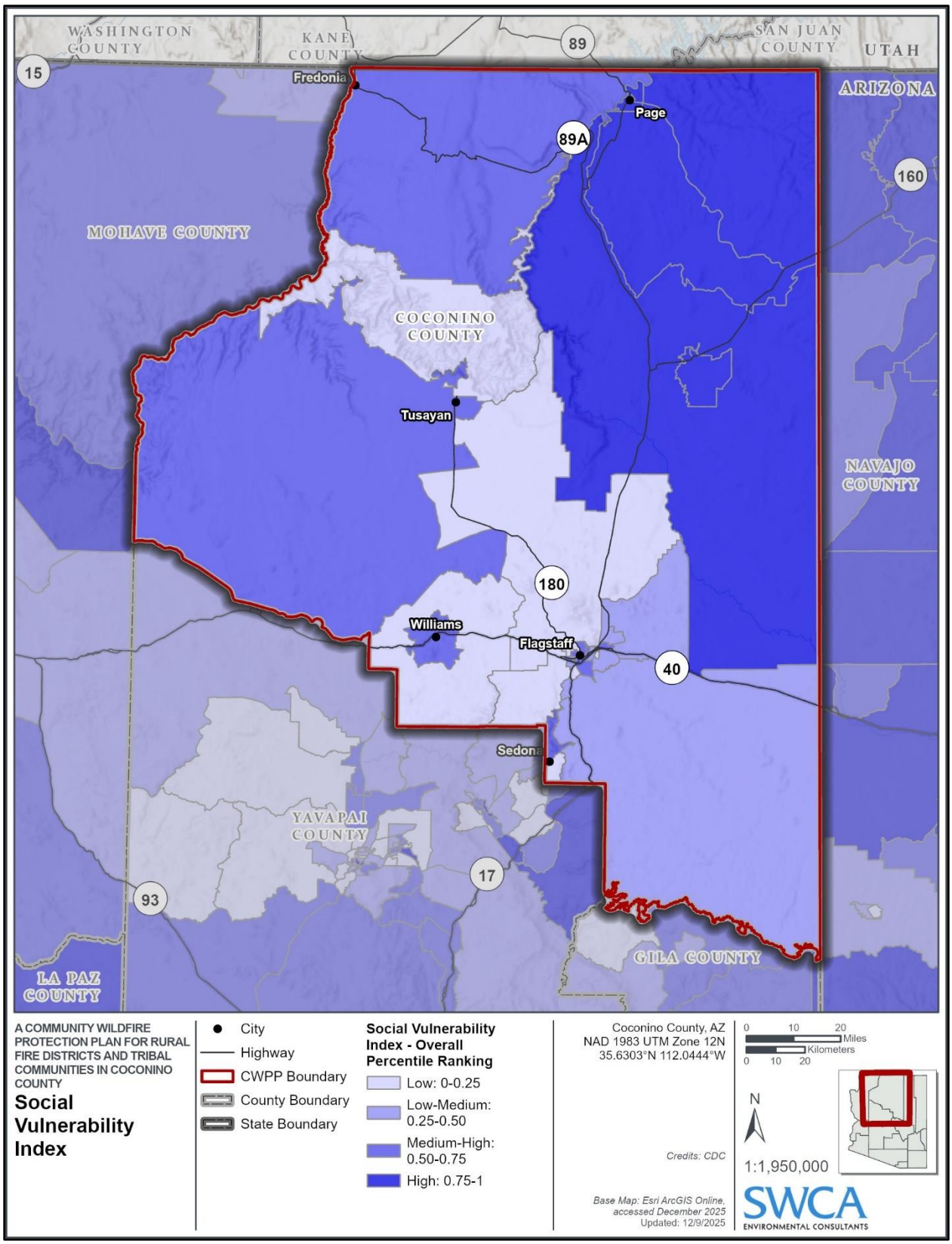

Figure 1.4. Overall SVI percentile ranking for the planning area.

Source: CDC (2023).

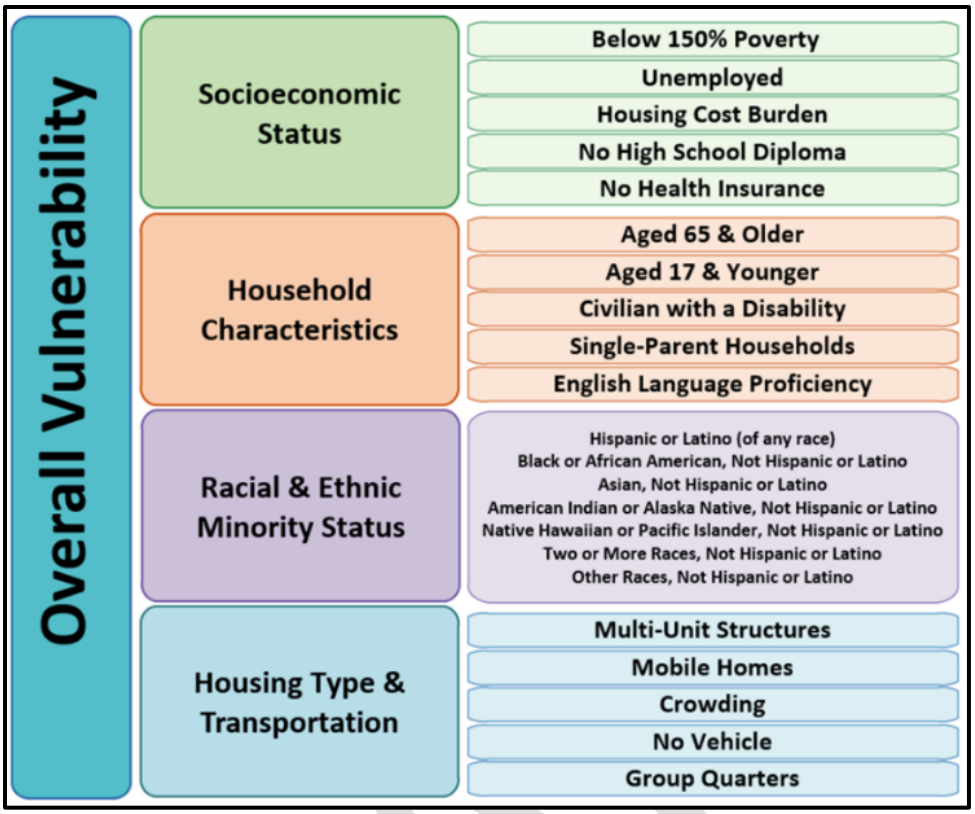

Figure 1.5. Flowchart describing CDC/ATSDR indicators of social vulnerability.
Source: CDC (2023).

Poverty percentages are derived from the 2020 federal 150% poverty level determinations for the contiguous United States. Table 1.4 shows the 150% federal poverty levels per household size.

Table 1.4. 2020 Poverty Guidelines for CDC/ATSDR Social Vulnerability Indicators

Household Size	2020 150% Federal Poverty Line (dollars)
1	19,140
2	25,860
3	32,580
4	39,300
5	46,020
6	52,740
7	59,460
8	66,180
9	72,900
10	79,620

Recreation

Coconino County is a major destination for outdoor recreation and tourism, with the highest visitation rates to parks and recreational lands in Arizona (Coconino County 2015). Extensive public lands, natural areas, and cultural resources support a wide range of activities, including hiking, camping, hunting, fishing, and off-highway vehicle use. Nationally significant destinations such as Oak Creek Canyon, Lake Powell, and Grand Canyon National Park attract millions of visitors annually, with Grand Canyon National Park alone recording approximately 4.9 million recreation visits in 2024 (NPS 2025).

EXISTING WILDFIRE MITIGATION STRATEGIES

Coconino County participates in broader state and federal efforts to reduce wildfire risk at the landscape scale. In 2020, Arizona signed a Shared Stewardship Agreement with the USFS, committing to joint planning, treatment prioritization, and restoration across land ownership boundaries (USFS 2024a). In 2024, the agreement was renewed to reinforce collaboration and funding support for programs like the Four Forest Restoration Initiative (4FRI) (USFS 2015a). Shared Stewardship is especially relevant to Coconino County, where fire-adapted ecosystems and checkerboard land ownership require strong interagency coordination.

Coconino County also shares borders and jurisdictional responsibilities with several Tribal nations. Tribal collaboration is a key component of successful wildfire mitigation and response. Federal authorities, such as the Tribal Forest Protection Act and the Indian Self-Determination Act (Public Law 93-638), now allow Tribal governments to lead cross-boundary restoration projects through 638 agreements with the USFS (Southwest Fire Science Consortium 2024; USFS 2024b). These agreements provide a mechanism for Tribes to implement fuels reduction and forest health work on adjacent federal lands. The CWPP encourages the use of these tools to improve coordination and ensure Tribal priorities are reflected in countywide planning.

Wildfire Programs

Coconino County also has various wildfire programs available to the public. Table 1.5 lists local programs currently being implemented within the planning area. This list includes programs hosted by the City of Flagstaff and other fire departments outside of the countywide CWPP. **Please see Appendix D for more details on existing local, state, and federal wildfire outreach programs and homeowner resources.**

Table 1.5. Coconino County Programs Regarding Wildfire

Agency/ Organization	Program/ Outreach Tool	Description
Coconino County Flood Control District	Coconino County Forest Restoration Initiative	The Coconino County Forest Restoration initiative was established under the Flood Control District by the County Board of Supervisors to focus on forest restoration with the intention of minimizing threats associated with wildfire and post-wildfire flooding. Under this initiative, the Flood Control District has worked in partnership with several other organizations to plan and implement thousands of acres of forest restoration. https://www.coconino.az.gov/2083/Forest-Restoration

Agency/ Organization	Program/ Outreach Tool	Description
Coconino County Office of Emergency Management	Website	The County Emergency Management Office offers a webpage with notices and evacuation information, as well as tracking information, for wildfires in the county. The website additionally contains information on fire restrictions and a link to sign up for the county's emergency notification system. https://emergency-management-operations-coconinocounty.hub.arcgis.com/
City of Flagstaff	Flagstaff Watershed Protection Project	This project began in 2012 and intends to reduce severe wildfire risk and post-wildfire flooding in the Rio de Flag and Lake Mary watersheds. Funding for the project was approved by Flagstaff voters, and the project is a partnership between the city, Coconino National Forest, and the Arizona Department of Forestry and Fire Management. https://flagstaffwatershedprotection.org/
	Pine Needle Drop Off	The City of Flagstaff placed dumpsters throughout the city to provide residents with an avenue to dispose of excess pine needles and reduce wildfire fuel sources within neighborhoods. The 2025 program ran from the end of March to the beginning of July. https://www.flagstaff.az.gov/5119/Pine-Needle-Drop-Off
	Flagstaff Fire Department Community Risk Assessment and Plan	The Flagstaff Fire Department produced a Community Risk Assessment and Community Risk Reduction Plan in 2023. The Risk Reduction Plan has a goal of aligning with the National Wildland Fire Cohesive Strategy of living with wildland fire through management of fire when possible, extinguishing fires when needed, and managing natural resources. The Risk Reduction Plan breaks down the department's objectives, strategies, and activities to meet this goal. https://www.flagstaff.az.gov/5035/Community-Risk-Assessment-and-Plan
Greater Flagstaff Forests Partnership	Wildfire Smoke Outreach Strategy	This is a planned outreach project to provide information to communities south of Flagstaff (some of which fall outside Coconino County) of potential risks associated with uncharacteristicaly severe wildfire smoke and the resource benefits of prescribed fire that emits considerably less smoke. https://gffp.org/what-is-happening/
	Ft. Tuthill County Park Fire Ecology Demo Site	This project is a 325-acre demonstration site that is intended to be used as a public education tool to show the difference between areas that have and have not undergone thinning treatments. https://gffp.org/what-is-happening/
	Website	The organization has a website that details their past work, upcoming and continuing projects, and provides some wildfire resources for the area. https://gffp.org/
Ponderosa Fire Advisory Council (PFAC)	Website	The PFAC is composed of representatives from emergency service organizations in Flagstaff and the surrounding area. Their website provides information on wildfire preparedness, restrictions, resources, and prescribed burns. https://www.pfacaz.org/home

Agency/ Organization	Program/ Outreach Tool	Description
Forest Lakes Fire District (FLFD)	Healthy Forest Initiative Grant	FLFD was awarded a Healthy Forest Initiative Grant from the Arizona Department of Forestry and Fire Management, which they will use to reimburse property owners for a portion of the cost to remove hazardous fuels to bring their properties up to Firewise standards. https://flfdaz.com/firewise
	Green Waste Transfer Station	FLFD operates a green waste transfer station permitted by the USFS that gives residents a place to bring green waste. Green waste brought to the site is chipped and then taken for use as compost or power plant fuel. https://flfdaz.com/gwts
Highlands Fire District, Pinewood Fire Department, Ponderosa Fire District, City of Flagstaff Fire Department	Firewise Assessments	Highlands Fire District, Pinewood Fire Department, and Ponderosa Fire District all provide Firewise assessments for property owners to better understand wildfire risks to their homes, including vegetation management needs https://www.highlandsfire.org/firewise-assessment https://pinewoodfire.org/about/firewise/ https://ponderosafire.org/services/#fuels-reduction https://www.flagstaff.az.gov/132/Wildland-Fire-Management
Bear Jaw Interagency Fire and Fuels Crew	Community Clean-Up	The Highlands Fire District and the Pinewood Fire District both support the Bear Jaw Interagency Fire and Fuels Crew. The Bear Jaw Interagency Fire and Fuels Crew hosts clean-up days where residents can bring their vegetative waste for free chipping and removal. https://www.highlandsfire.org/community-clean-up
Sedona Fire District	Wildfire Preparedness Days Yard Waste Drop Off	The Sedona Fire District hosts yard waste drop-off days each spring where residents can dispose of most hazardous fuels from their yards. https://www.sedonafire.org/public-education-outreach/#wildfire
Coconino Community College	Fire Science Degrees and Certifications	Coconino Community College offers degrees and certificates intended to provide students with the necessary background to enter firefighting positions. This includes a certification in wildfire suppression. https://www.coconino.edu/info/fire-science

STAKEHOLDER COLLABORATION

Core Team

Broad stakeholder participation was essential to ensure the CWPP reflects diverse community perspectives and local priorities. To maximize community participation and collaboration, the GFFP and Coconino County directed the 2026 CWPP process by convening a Core Team. This team included representatives from local, state, and federal agencies, as well as Tribal entities and other organizations, to guide plan development (Table 1.5). Shared decision making, data exchange, professional expertise, and communication with community members were key contributions of the Core Team.

The planning process began on March 14, 2025. The Core Team met on April 25, 2025, August 26, 2025, and March 17, 2026, with each meeting supporting key milestones in plan development.

Table 1.5. Coconino County CWPP Core Team.

Name	Organization
Anne Mottek	Greater Flagstaff Forests Partnership
Jay Smith	Coconino County
Joe Hinz	Coconino County
Lucinda Andreani	Coconino County
Chance Wnuck	Coconino County
Tim Carter	Coconino County
Chief Phil Paine	Blue Ridge Fire District
Neil Chapman	City of Flagstaff, Flagstaff Fire Department
John Nelson	Forest Lakes Fire District
Chief Robert Trotter	High Country Fire & Rescue
Chief Laurie Granger	Kaibab Estates West Fire District
Chief Matthew McDowell	Sherwood Forest Estates Fire District
Kate Johnson	Tusayan Fire District
Chief Chase Pearson	Williams Fire Department
Rick Miller	Arizona Department of Forestry and Fire Management
Colette Pansini	Salt River Project
Elvy Barton	Salt River Project
Melvin Hunter Sr.	Hualapai Tribe
Melvin Hunter Jr.	Bureau of Indian Affairs
Jonathan Chee	U.S. Department of Agriculture - Natural Resources Conservation Service
Charles (CW) Portell	Coconino National Forest
Jesse Causer	Coconino National Forest
True Brown	Coconino National Forest
Brad Johnson	Kaibab National Forest
Drew Leiendecker	Kaibab National Forest
Andrew Sanchez Meador	Northern Arizona University – Ecological Research Institute
Jay Nielsen	Arizona Public Service
Annie Lutes	SWCA, Environmental Consultants
Vicky Amato	SWCA, Environmental Consultants
Molly Chamberlain	SWCA, Environmental Consultants
Montiel Ayala	SWCA, Environmental Consultants
Kelci Metzger	SWCA, Environmental Consultants

CWPP Public and Tribal Involvement

Public and Tribal involvement is a foundational component of the CWPP process and is essential for identifying community priorities, capturing local knowledge, and shaping realistic, community-supported wildfire mitigation strategies (SAF 2004). The development of the Coconino County CWPP included extensive public engagement efforts led by the Greater Flagstaff Forests Partnership (GFFP) and Coconino County, with support from rural fire districts across the county. These outreach activities were designed to give residents, fire personnel, and community leaders opportunities to share concerns, identify priority areas, and recommend mitigation actions across diverse landscapes and jurisdictions.

The goal of public involvement during the Coconino County CWPP process was to collect community feedback on wildfire risk, preparedness, and mitigation priorities, and to integrate that information directly into the development of community-specific recommendations. Public outreach occurred through in-person meetings hosted in rural fire districts, a countywide survey available both online and at community events, and direct discussions between residents and Core Team members. Across all engagement methods, residents expressed detailed concerns regarding hazardous fuels, egress challenges, communications limitations, insurance issues, and gaps in public education and home hardening resources.

For Tribal involvement, GFFP and Coconino County initiated outreach to the Tribes early in the planning stages, providing information on the upcoming CWPP update process and inviting them to engage in CWPP development. The Hualapai Tribe and Navajo Nation each have a wildfire prevention plan (WFPP), which is the BIA equivalent of a CWPP that identifies fire risks on Tribal lands, includes a list of prioritized mitigation projects, and describes ways to enhance preparedness for Tribal lands, people, and resources. Despite having a current WFPP, the Hualapai Tribe accepted the opportunity to participate in the Coconino County CWPP during the CWPP planning process. As part of the Tribal involvement efforts, GFFP and Coconino County held an in-person Tribal interview with Hualapai Tribe's Fire & EMS Department and Forestry & Wildland Fire Management personnel to discuss wildfire preparedness, risk management, project needs, staffing capacity, and areas of concern within their community. A summary of the Hualapai interview as well as their concerns and priority projects are in Appendix C.

Areas of concern identified during meetings were digitized and incorporated into the CWPP's risk evaluation and action planning processes. Public comments also informed the plan, supported the identification of priority mitigation projects, and guided the development of recommendations related to public education, evacuation preparedness, and response capacity.

The draft CWPP was available for public review from March 30 to April 17, 2026. Public comments regarding the draft CWPP were gathered and used to further refine the document.

Appendix G contains a summary of the public outreach process and public input, including feedback gathered during in-person public meetings and information from the community survey.

Recommendations for future community engagement and outreach are provided in Chapter 4, Table 4.3.

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CHAPTER 2 – FIRE ENVIRONMENT

WILDLAND-URBAN INTERFACE

The Coconino County Comprehensive Plan defines the WUI as *the area in and around a community where the immediate or secondary effects of a wildfire would threaten a community's environmental, social, and economic values, causing serious detriment to the area's overall health and viability* (Coconino County 2015). In intermix areas, wildland vegetation is interspersed among structures, allowing fire to spread between vegetative and structural fuels (National Institute of Standards and Technology 2023). As development has expanded into fire-adapted ecosystems across Coconino County, the extent of the WUI has increased, elevating exposure for residents and critical infrastructure.

Under the Healthy Forests Restoration Act (HFRA), CWPPs support collaborative delineation of WUI boundaries to inform wildfire hazard characterization and mitigation prioritization. Because this CWPP covers a large geography with diverse communities, the WUI boundary was developed to support county-level assessment, identifying broad areas where wildfire poses risk to people, structures, and assets, while allowing flexibility for finer-scale local planning.

For this CWPP, the WUI was mapped using a buffer- and structure-density approach. A 2.5-mile buffer was applied around mapped structures, and areas within the buffer were classified as:

- **Interface WUI:** Areas within 1 mile from structures and with high-density development adjacent to undeveloped wildland vegetation, defined as five or more structures per mile.
- **Intermix WUI:** Areas within 1 mile from structures and where lower-density residential development is interspersed with undeveloped wildland vegetation, defined as greater than 0.01 structures per mile and fewer than five structures per mile.
- **Influence Zone:** The remaining 1.5-mile WUI area beyond the density-based interface and intermix categories.

Local fire protection districts, municipalities, and Tribal governments may define WUI boundaries differently for project-level or community-specific planning based on local topography, fuel conditions, values at risk, and response considerations. Although WUI definitions vary by scale, they consistently serve to guide mitigation, preparedness, and investment toward areas where wildfire risk reduction will provide the greatest benefit.

Figure 2.1 illustrates the countywide WUI delineation developed for this CWPP. This approach prioritizes populated areas and WUI zones most susceptible to wildfire while deferring to existing CWPPs for more

detailed local designations, including the Greater Flagstaff Area CWPP, as well as the Hualapai Tribe and Navajo Nation WFPPs. As wildfire risk modeling and development patterns evolve, the WUI delineation may be updated in future plan revisions.

WILDLAND-URBAN INTERFACE LAND USE

Land use patterns within Coconino County's WUI reflect dispersed rural and forested development rather than dense suburban expansion. Much of this development occurs in unincorporated areas where zoning allows rural residential uses, seasonal residences, and short-term rentals adjacent to fire-adapted landscapes (Coconino County 2015, 2024c).

Coconino County also has a high and increasing proportion of vacation homes and short-term rental properties, many of which are located in intermix areas near national forests (Coconino County 2015). Recent housing market analyses identify the county as one of the top vacation-home markets in the United States, with second homes comprising a substantial share of the housing stock (*Arizona Republic* 2025).

The prevalence of seasonally occupied and absentee-owned homes presents wildfire mitigation challenges. These properties may receive less consistent defensible space maintenance and vegetation management, and owners or short-term occupants may be less connected to local mitigation programs, fire restrictions, and evacuation procedures. As a result, wildfire preparedness and compliance can be more difficult to achieve in WUI and intermix areas dominated by vacation and rental housing.

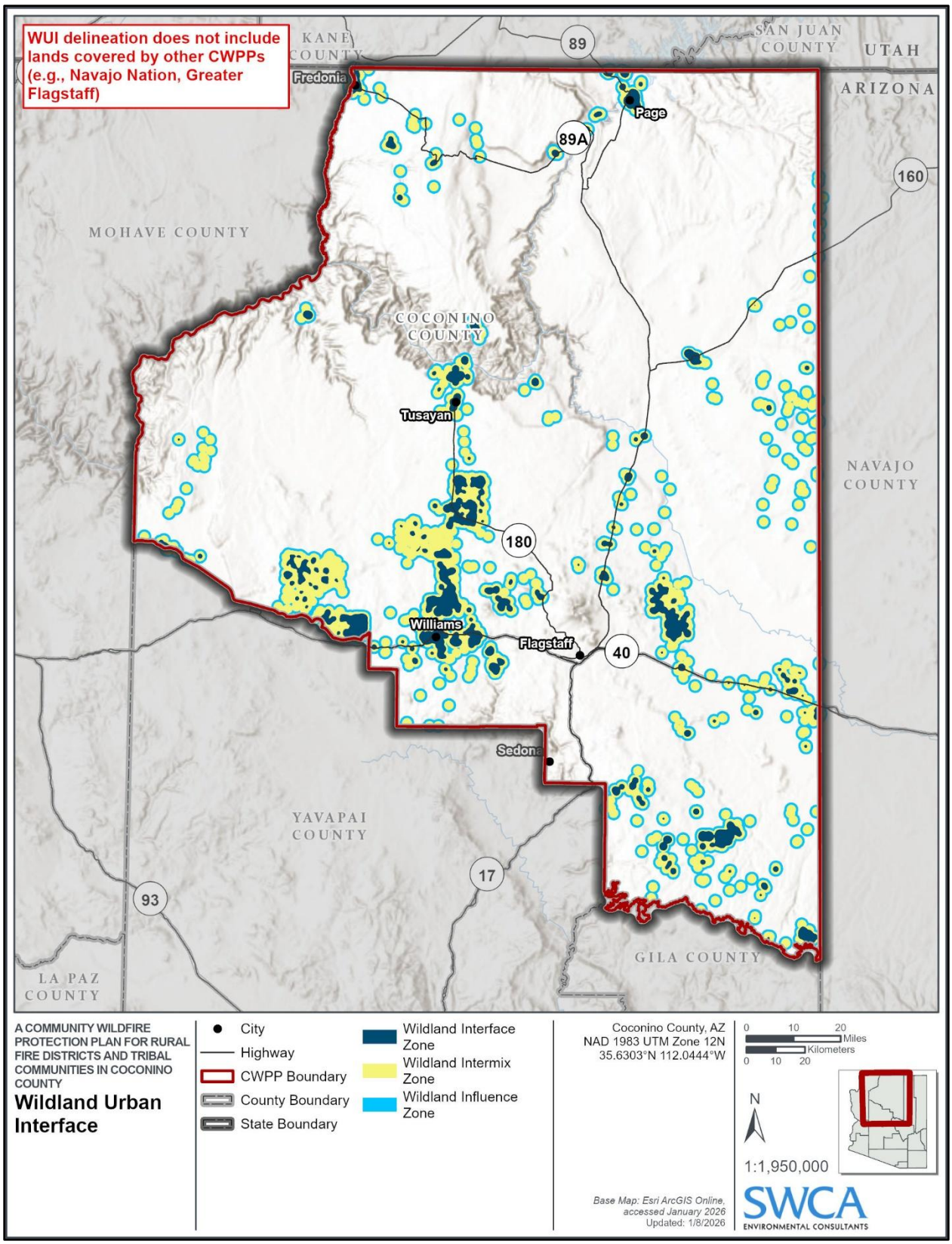

Figure 2.1. Coconino County CWPP planning area WUI map.

URBAN CONFLAGRATION

Although most of Coconino County is defined by dispersed rural development and forested open space, certain areas face an elevated risk of urban conflagration during wildfire events. An urban conflagration occurs when fire spreads rapidly through closely spaced structures, overwhelming suppression resources and leading to major losses (Insurance Institute for Business & Home Safety 2023).

In Coconino County, urban conflagration risk is most relevant in Tusayan, Williams, and in specific neighborhoods of Flagstaff, including Southside, Downtown, Lower Greenlaw, and Sunnyside, where older buildings, combustible materials, and limited defensible space increase vulnerability (GFFP 2018). Mobile home parks and manufactured housing communities throughout both incorporated and unincorporated areas also present concerns due to flammable construction, lack of Firewise practices, and minimal spacing between units (CCEM 2022).

Causes of Urban Conflagration

Several conditions increase the likelihood of urban conflagration. Wildland fuels near developed areas can produce ember showers that ignite structures. Closely built homes, variable construction quality, and vegetation on properties create pathways for fire to spread. Weather conditions such as drought, high winds, and low humidity further increase flammability. Firefighting operations may also be challenged by limited water supply, difficult access, communication system issues, and the need for coordination across multiple agencies (Bowman et al. 2017).

Impacts of Urban Conflagration

The effects of urban conflagration extend beyond direct property loss. Fires of this scale can cause fatalities and injuries, destroy homes and infrastructure, degrade ecosystems, and release harmful pollutants. Social consequences often include mass evacuations, displacement, and long-term community disruption. Mitigation in Coconino County relies on WUI treatments, community preparedness, and coordinated planning to reduce structural ignition risk and strengthen emergency response capacity (United Nations Office for Disaster Risk Reduction 2019).

Addressing Urban Conflagration Risk in the CWPP

While urban conflagration represents a significant and growing concern, it is important to acknowledge limitations in current wildfire risk assessment and modeling approaches. The fire behavior modeling conducted for this CWPP evaluates potential fire behavior in wildland fuels only and does not simulate fire spread within developed areas or account for urban fuels, structure-to-structure ignition, or building materials. As a result, modeled outputs may underestimate risk in areas where structural density and ignitability are primary drivers of fire spread.

To address this limitation, the CWPP incorporates multiple complementary strategies beyond fire behavior modeling. A field-based structural ignitability assessment (refer to Appendix C) was completed in several fire districts to evaluate building materials, defensible space conditions, access, and other factors influencing structure loss. This assessment identifies specific hazards and provides recommendations for home hardening, retrofits, defensible space implementation, and long-term maintenance actions to reduce ignition potential.

In addition, the CWPP addresses urban conflagration risk through recommendations outlined in Chapter 4, including:

- Community protection measures such as fuel reduction and fuel breaks around community perimeters and adjacent forested lands with high fuel loads;
- Strategic treatment of critical locations, particularly along southwestern community edges where predominant wind patterns increase exposure;
- Structure hardening protocols, defensible space guidance, and outreach to homeowners, landlords, and short-term rental operators;
- Community preparedness and evacuation planning, including coordination with fire districts and emergency management agencies;
- Enhanced wildfire response capacity, including access and water supply improvements.

FIRE ECOLOGY

Wildland fire is characterized by attributes such as severity, frequency, seasonality, spatial extent, and fire type, which together define a fire regime describing how fire functions within an ecosystem over time (USFS 2018).

In Coconino County, historic fire suppression, grazing, land use changes, and overharvesting of large, old-growth trees have altered vegetation structure and fuel conditions across many ecosystems (GFFP 2018; USFS 2018). These practices have increased fire return intervals and contributed to denser, more homogeneous forests with elevated surface and ladder fuels, particularly in ponderosa pine and dry mixed-conifer systems (USFS 2015, 2018). As a result, many fire-adapted landscapes are now more susceptible to large, high-severity wildfires that depart from historic fire behavior patterns (USFS 2018).

Vegetation and Land Cover

Fire behavior and ecosystem resilience in Coconino County are strongly influenced by vegetation type, elevation, and topography. The County encompasses diverse vegetation systems, ranging from ponderosa pine and mixed-conifer forests to higher-elevation spruce-fir communities, each with distinct historical fire regimes and ecological responses to wildfire.

Topography further shapes fire patterns and vegetation structure. South-facing slopes typically experience drier conditions and more frequent fire activity, while north-facing slopes retain more moisture and generally have longer fire return intervals (GFFP 2018). These relationships have influenced forest composition and fuel conditions over time and remain central to understanding current wildfire behavior.

Vegetation zones across the County reflect variation in elevation, slope, aspect, climate, substrate, and land use history, resulting in substantial spatial variability in fire behavior and ecosystem resilience (Figure 2.2). Understanding historic fire–vegetation relationships provides a foundation for management strategies aimed at restoring ecosystem function, reducing hazardous fuels, and improving landscape-scale resilience (USFS 2018).

According to the 2022 LANDFIRE Existing Vegetation Type dataset, forested vegetation dominates higher elevations in the central and southern County, including the San Francisco Peaks, Mogollon Rim, and Kaibab Plateau, where ponderosa pine, mixed-conifer, and spruce-fir forests are prevalent.

In contrast, northern and northeastern areas, including lands near Page and portions of the Grand Canyon, are largely characterized by shrublands, herbaceous vegetation, sparsely vegetated rock, and desert grasslands.

Riparian areas and perennial water bodies, though limited in extent, support denser vegetation near communities such as Flagstaff, Sedona, and in lower-elevation drainages. Developed land cover is concentrated around cities and towns, including Flagstaff, Sedona, Williams, Page, and Tusayan, which also represent key WUI areas.

While this section provides a countywide overview of dominant vegetation patterns, site-specific assessments remain critical for developing effective, project-level wildfire mitigation and ecosystem management strategies.

Coconino County Fire Regimes

Historically, frequent low-intensity surface fires maintained open ponderosa pine woodlands, while mixed-conifer forests experienced variable-severity fire, and high-elevation spruce-fir forests burned infrequently but at high severity. Lower elevation shrublands and grasslands burned less often but were capable of fast-moving surface fires during favorable fuel and climate conditions (USFS 2018).

Across many ecosystems, historic fire suppression, grazing, invasive species, land use changes, and overharvesting of large, old-growth trees have altered fuel structure and fire behavior, increasing the likelihood of large, high-severity wildfires that depart from historic patterns (USFS 2018).

Mixed-Conifer/Spruce Fir Forests

Mixed-conifer forests in Coconino County typically support mixed-severity fire regimes characterized by a mosaic of surface fire, patchy crown fire, and stand-replacing fire (Agee 1998, 2005; Fulé et al. 2003; Touchan et al. 1996). Fire exclusion has increased understory density and ladder fuels, elevating crown fire potential, particularly where shade-tolerant species dominate (Johnson 1994).

At higher elevations, spruce-fir forests dominated by Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) are associated with infrequent, stand-replacing fire regimes, with long return intervals and high-severity events that reset forest structure and succession (Fulé et al. 2003).

Ponderosa Pine Forests

Ponderosa pine (*Pinus ponderosa*) forests historically experienced frequent, low-intensity surface fires that maintained open, heterogeneous stand structures and limited surface fuel accumulation (Cooper 1960; Covington and Moore 1994; Weaver 1947). Across northern Arizona, mean fire return intervals generally ranged from approximately 4 to 25 years (Allen 2002; Fulé et al. 2003; Grissino-Mayer et al. 2004; Swetnam and Dieterich 1985; Veblen et al. 2000).

Fire exclusion has substantially altered these systems, leading to denser stands, increased surface and ladder fuels, and heightened crown fire and long-range spotting potential under extreme fire weather conditions (Westerling et al. 2006).

In many ponderosa pine forests, high-grading and overharvesting of large, old-growth trees removed fire-resistant individuals that historically survived frequent low-intensity fires, while livestock grazing reduced the grass and fine fuels that once carried surface fire across the landscape. Aggressive suppression

policies further eliminated the frequent, low-intensity burns that historically maintained open ponderosa pine and mixed-conifer forests and supported natural regeneration of fire-adapted species. Together, these actions disrupted the natural fire–vegetation relationship, producing dense stands and hazardous fuel accumulations that increase the risk of large, high-severity wildfire (Fulé et al. 2002; DFFM 2020).

Piñon-Juniper Woodlands

Piñon–juniper woodlands dominated by piñon pine (*Pinus edulis, Pinus monophylla*) and juniper (*Juniperus osteosperma*) are widespread across Coconino County and exhibit variable fire regimes depending on site conditions, vegetation structure, and fuel continuity (USFS 2016; USFS 2018). Savanna-like woodlands historically supported more frequent, low-severity fire, while persistent woodlands experienced long fire-free intervals punctuated by infrequent, high-severity events (Baker and Shinneman 2004; Romme et al. 2007).

Unlike ponderosa pine forests, many piñon–juniper systems have not been uniformly altered by fire exclusion. Current fire dynamics are shaped by climate stress, woodland expansion, and interactions among drought, insects, and other disturbance processes (DFFM 2020).

Desert Grasslands

Desert grasslands in Coconino County are classified within Fire Regime Group II and are characterized by frequent replacement-severity fire, with fire return intervals strongly influenced by interannual wet–dry climate cycles that control fine-fuel production (USFS 2005a). Periods of above-average precipitation promote grass growth and fuel continuity, while subsequent dry conditions facilitate fire spread.

Fire occurrence in desert grasslands is closely tied to fuel availability rather than ignition limitation. During years with sufficient fine fuels, fires can spread rapidly across large areas, particularly under windy conditions. Conversely, prolonged drought or grazing pressure can reduce fuel continuity and limit fire spread. Historic grazing and land use have influenced grassland structure and fuel dynamics, contributing to variability in fire frequency across the landscape (USFS 2005a).

Salt Desert Scrublands

Salt Desert Scrublands in Coconino County occur on poorly drained flats, playa margins, and fan bases where fine-textured, saline soils limit continuous vegetation cover (USFS 2005b). Vegetation is typically patchy, with shrubs often exceeding 15% cover and grasses and forbs comprising approximately 20% to 30% cover in more productive sites; overall cover is lower in less favorable settings (USFS 2005b).

This vegetation group is classified as Fire Regime Group III and supports infrequent mixed-severity fire (USFS 2005b). Mean fire return intervals average approximately 30 years but vary widely due to soil conditions and moisture-driven fuel continuity (USFS 2005b). Replacement-severity fire is rare, occurring on intervals averaging approximately 200 years and accounting for just over 10% of fire events, while mixed-severity fire dominates, representing nearly 90% of ignitions (USFS 2005b).

Fire occurrence is constrained by poor drainage and variable fine-fuel production. Fires are most likely during intermediate moisture conditions that allow sufficient fuel accumulation, while prolonged drought or very wet periods limit fire spread. Historical grazing further contributed to patchy fuel distributions and influenced fire patterns across the landscape (USFS 2005b).

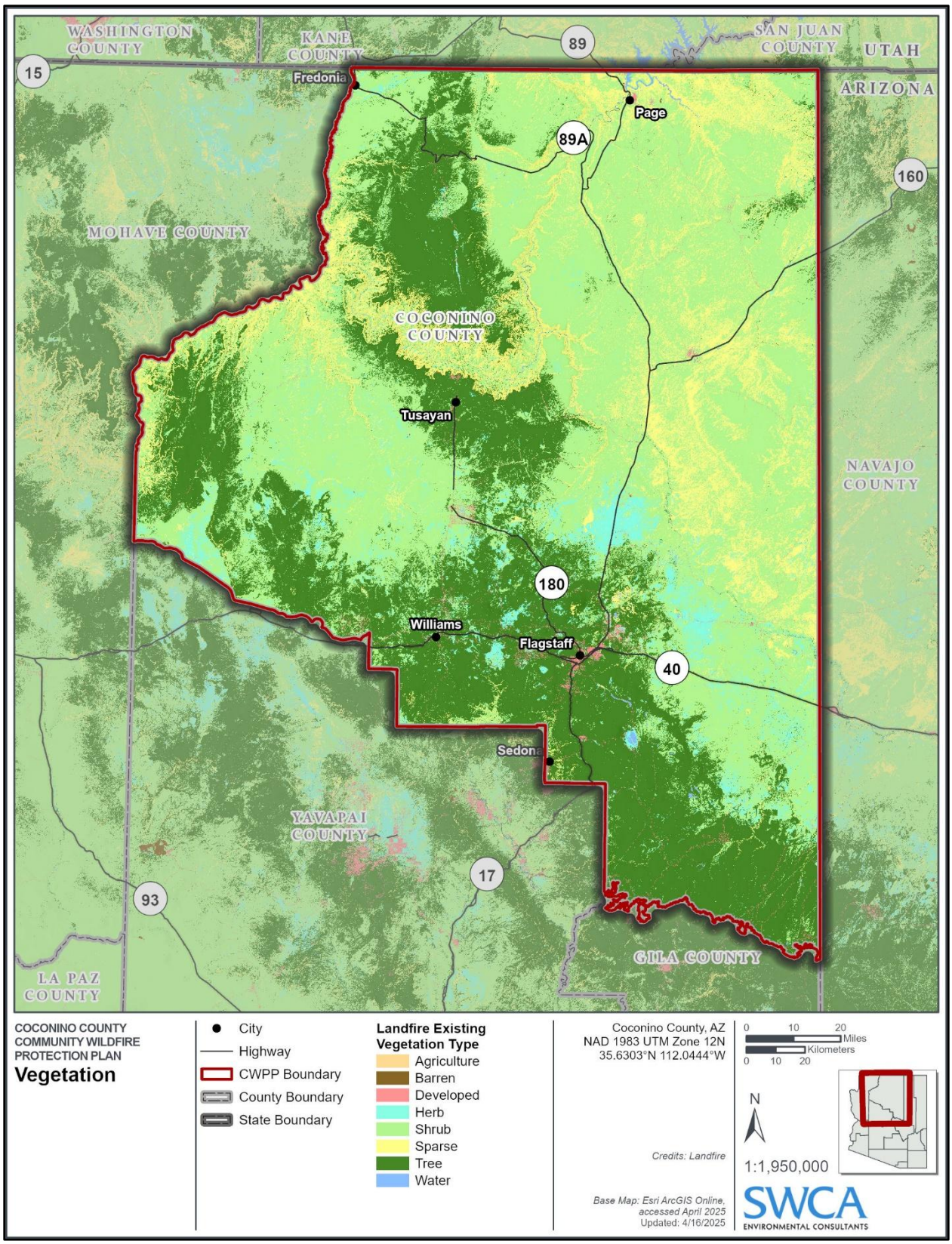

Figure 2.2. Vegetation types in the Coconino County CWPP planning area.

Fuels and Topography

This section builds on the previous discussion of vegetation by examining how these landscape components function as wildfire fuels. Fuel models refer to groups of vegetation with similar physical burning characteristics that affect the spread, intensity, and severity of wildland fires. These characteristics include the loading, size, and bulk density of the vegetation. In contrast, vegetation type is a broader term that describes the different categories of plant communities, such as grasslands, shrubs, or forests, without specifically accounting for their fire behavior characteristics.

Fuels in the planning area are classified using the Scott and Burgan (2005) Standard Fire Behavior Fuel Model system, which includes 40 models based on Rothermel's surface fire spread equations. These models are grouped by primary fire-carrying fuel types (Table 2.1). Most of the planning area is predominantly composed of grass (GR) and grass-shrub (GS) fuel models, covering approximately two-thirds of the landscape (Figure 2.3).

The dominance of grass and grass-shrub fuels across much of Coconino County underscores the potential for rapid wildfire spread, especially under the influence of high winds common to the region. Understanding the distribution and characteristics of these fuels is critical for identifying areas at greatest risk and effectively targeting wildfire mitigation efforts.

Important! The Scott & Burgan (2005) fuel models describe ***wildland vegetation only***. Urban and developed areas (e.g., NB1 – urban/suburban development) may appear as "non-burnable," but this does not indicate that they are non-combustible. Structures and other urban fuels can support fire spread; they are simply not represented within the wildland fuel model system.

Table 2.1. Most Common Fuel Types in the Planning Area

Coconino County Common Fuel Types	Acres of Planning Area	Percent of Planning Area
GR1 – Grass: Short, sparse dry climate grass; spread rate very high (60–110 chains/hr); flame length low (1–4 ft); fine fuel load 0.4 tons/acre.	3,418,497.08	28.64
GS2 – Grass–Shrub: Shrubs 1–3 ft high with moderate grass load; fine fuel load 2.1 tons/acre; spread rate high (20–50 chains/hr); flame length moderate (4–8 ft); fuel bed depth 2 ft.	2,305,763.51	19.32
NB9 – Bare Ground: Non-burnable. Bare soil, sand, gravel, or rock with minimal to no burnable vegetation.	1,654,062.46	13.86
GR2 – Grass: Moderately coarse, continuous grass about 1 ft deep; fine fuel load 1.10 tons/acre; spread rate high (20–50 chains/hr); flame length moderate (4–8 ft); fuel bed depth 1 ft.	1,379,491.62	11.56
GS1 – Grass–Shrub: Shrubs ~1 ft high with light grass load; fine fuel load 1.35 tons/acre; spread rate moderate (5–20 chains/hr); flame length low (1–4 ft); fuel bed depth 1 ft.	866,312.14	7.26
SH1 – Shrub: Low shrub load ~1 ft deep, some grass present; fine fuel load 1.0 tons/acre; spread rate very low (0–2 chains/hr); flame length very low (0–1 ft); fuel bed depth 1 ft.	666,102.32	5.58

Coconino County Common Fuel Types	Acres of Planning Area	Percent of Planning Area
TL8 – Timber Litter: Very high load, long-needle pine or hardwood litter; fine fuel load 7.7 tons/acre; spread rate very low (0–2 chains/hr); flame length low (1–4 ft); fuel bed depth 0.2 ft.	661,919.97	5.55
TL3 – Timber Litter: Moderate load conifer litter; light understory; fine fuel load 2.0 tons/acre; spread rate low (2–5 chains/hr); flame length low (1–4 ft); fuel bed depth 0.25 ft.	227,218.76	1.90
SH2 – Shrub: Moderate fuel load ~1 ft deep, no grass; fine fuel load 5.2 tons/acre; spread rate low (2–5 chains/hr); flame length low (1–4 ft); fuel bed depth 1 ft.	202,962.94	1.70
SH7 – Shrub: Very high shrub load, tall shrubs (3–6 ft), dense fuel bed; fine fuel load 6.2 tons/acre; spread rate high (20–50 chains/hr); flame length very high (12–25 ft); fuel bed depth 4 ft.	136,258.81	1.14
NB1 – Urban/suburban development: Non-burnable. Urban or suburban areas dominated by structures, pavement, or other non-flammable surfaces; little to no burnable vegetation.	92,729.95	0.78
TU5 – Timber Understory: High load, dry climate timber-shrub understory; fine fuel load 4.6 tons/acre; spread rate moderate (5–20 chains/hr); flame length moderate (4–8 ft); fuel bed depth 1 ft.	67,604.78	0.57

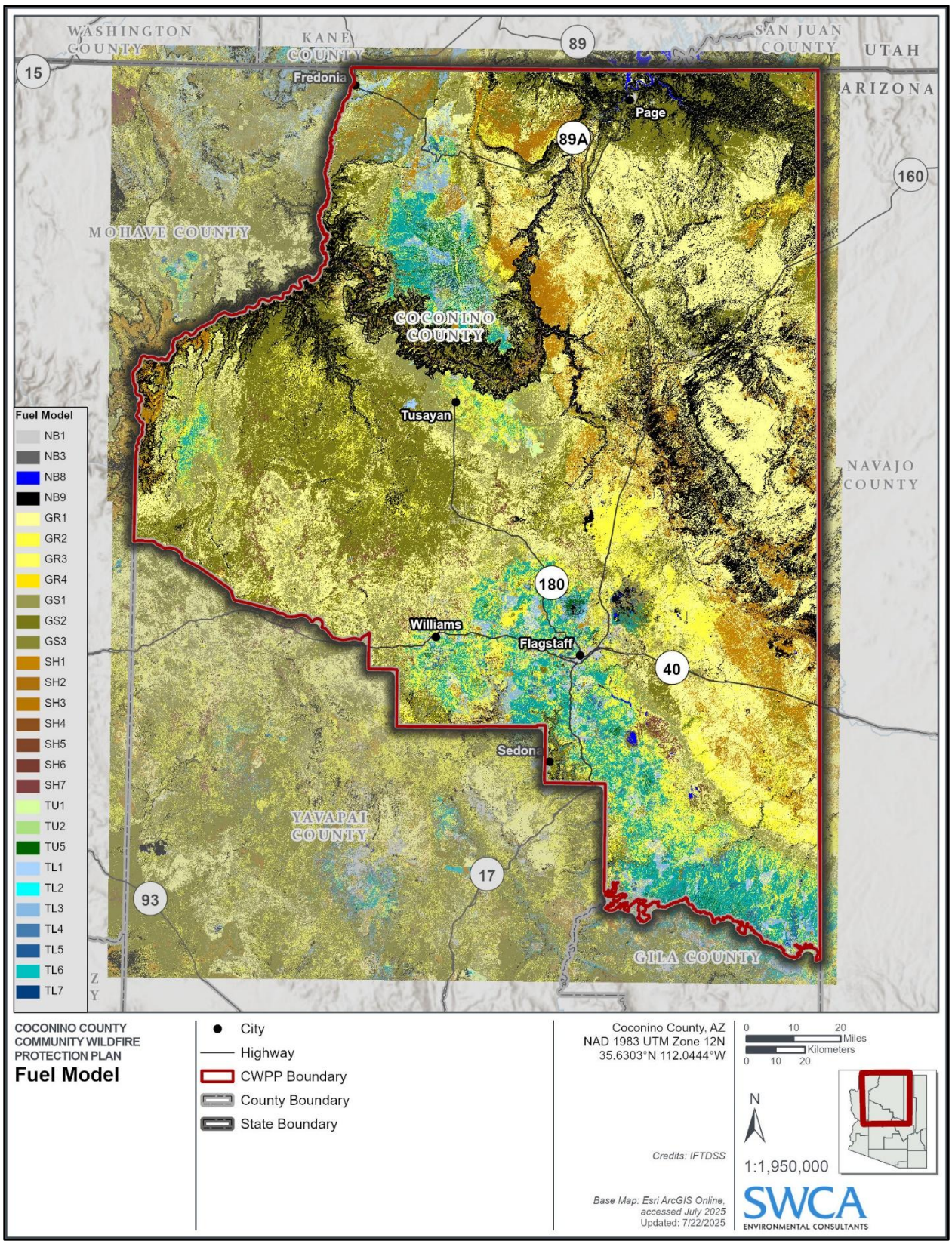

Figure 2.3. Scott and Burgan 40 fire behavior fuel models within the planning area.

CLIMATE AND WEATHER PATTERNS

Coconino County's large size and elevation range, from desert basins near Page to alpine areas around Humphreys Peak, create distinct climate gradients (National Oceanic and Atmospheric Administration [NOAA] 2020). Higher elevations like Flagstaff and the Mogollon Rim are cooler and wetter, while lower regions such as the Grand Canyon are warmer and drier (Coconino County 2015; NOAA 2020).

NOAA data from Flagstaff Airport and Grand Canyon National Park Airport illustrate these differences: Flagstaff receives about 20.52 inches of precipitation annually, compared to 13.36 inches at the Grand Canyon, though both have similar average annual temperatures due to their latitude (Table 2.2) (NOAA 2020).

Table 2.2. Mean Annual Temperature and Precipitation by Station in the Planning Area

			Mean Annual Temperature (°F)		
Station	**Period of Record**	**Mean Annual Precipitation (inches)**	**Max**	**Min**	**Mean Annual**
Flagstaff AP	1991 – 2020	20.52	61.8	31.9	46.8
Grand Canyon National Park AP	1991 – 2020	13.36	64.0	29.5	46.7

Source: NOAA (2020).

Monthly climate normals (Figure 2.4) for Flagstaff show that July is typically the hottest month, with average maximum temperatures around 83°F, while December is the coldest, with average lows near 17°F (NOAA 2020). Precipitation is strongly bimodal, with peaks in late summer (July–August) from the monsoon and again in winter (January–March) from Pacific frontal systems (Coconino County 2021; NOAA 2020). June is consistently the driest month, a critical factor in early fire season buildup, especially during dry years or weak monsoon patterns (Coconino County 2021; NOAA 2020).

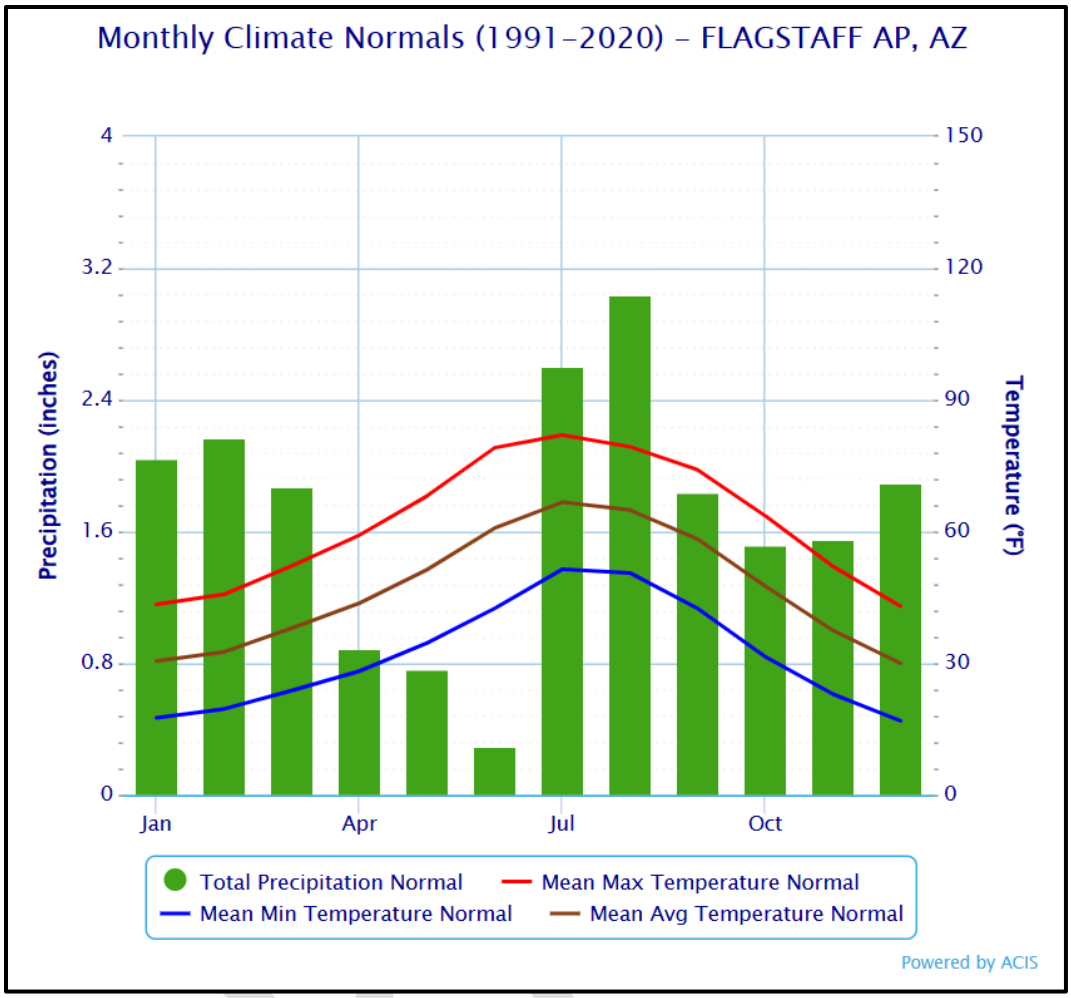

Figure 2.4. Monthly climate averages for the Flagstaff area, 1991–2020.
Source: NOAA (2020).

The Southwest monsoon, from early July to mid-September, brings intense thunderstorms that can both reduce fire danger and increase wildfire risk from lightning and winds (Coconino County 2021). Delayed or weak monsoons extend fire season, raising the chance of large fires, especially after a dry June. Coconino County's topography (slopes, ridgelines, and canyons) also shapes wildfire spread, with fires moving faster uphill due to preheating of fuels (see Figure 2.5).

Long-term climate trends are expected to worsen Coconino County's fire risk. Arizona has warmed by about 2.5°F since the 1970s, with further increases projected (Center for Climate Integrity 2023). While annual precipitation may not change much, shifts in timing and intensity (especially for snowfall and monsoons) could prolong dry periods and disrupt moisture cycles. Warmer temperatures will cause earlier snowmelt and higher evaporation, drying fuels and lengthening wildfire seasons. These changes highlight the need for adaptive wildfire strategies across the county's varied elevations.

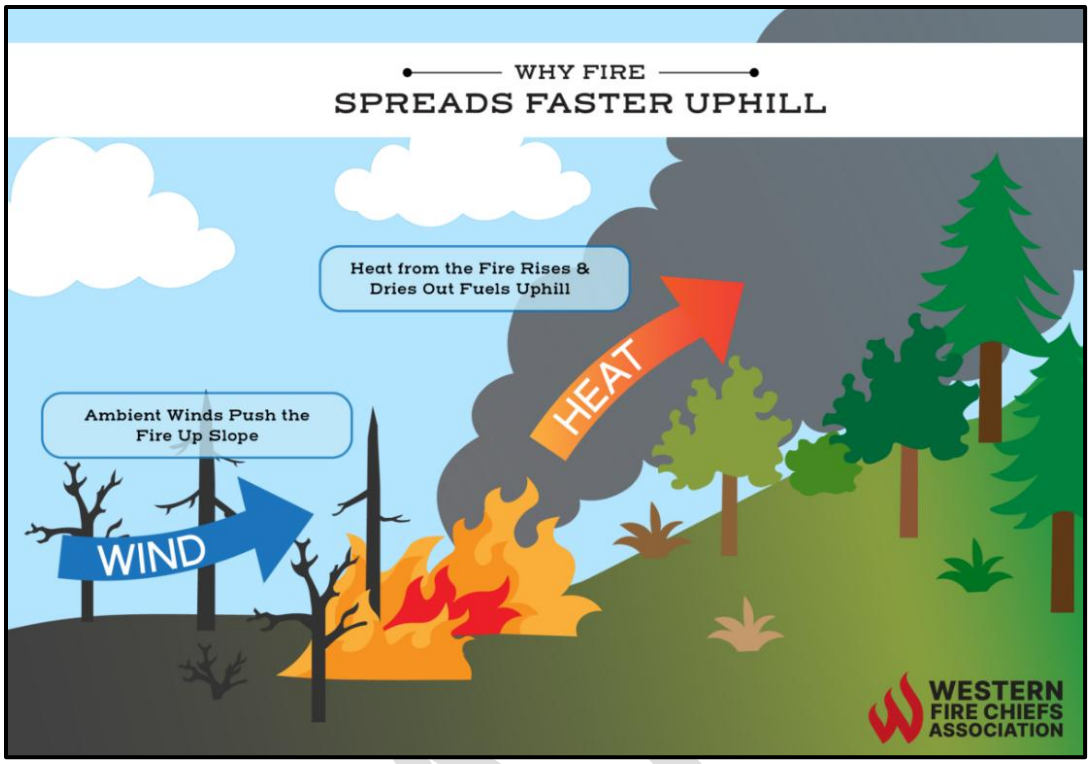

Figure 2.5. Standard fire behavior on topographic features, such as slopes and hillsides.

Source: Western Fire Chief Association (WFCA) 2024.

Wind

Wind is a critical and highly variable driver of wildfire behavior. Influenced by regional pressure systems, topography, diurnal patterns, and monsoonal dynamics, wind can produce rapid rates of spread, long flame lengths, and high fireline intensity that limit suppression effectiveness. In Coconino County, winds are commonly shaped by pressure gradients and topographic funneling through canyons, accelerating fire spread, increasing spotting potential, and constraining aerial suppression operations.

Strong southwesterly winds frequently occur during the pre-monsoon period in late spring and early summer, often coinciding with low relative humidity and elevated temperatures (Coconino County 2015; Coconino County 2021). Analysis of wind data from the Arizona RAWS station near Flagstaff during peak fire season (May–October) from 2020 to 2024 confirms the predominance of southerly and southwesterly winds (Figure 2.6) (Western Regional Climate Center [WRCC] 2024). Wind speeds most commonly ranged from 4 to 11 miles per hour, with regular occurrences exceeding 19 miles per hour and occasional events above 26 miles per hour. Although calm conditions were recorded approximately 41.5% of the time, periods of elevated wind remain a significant concern for wildfire response and public safety (WRCC 2024).

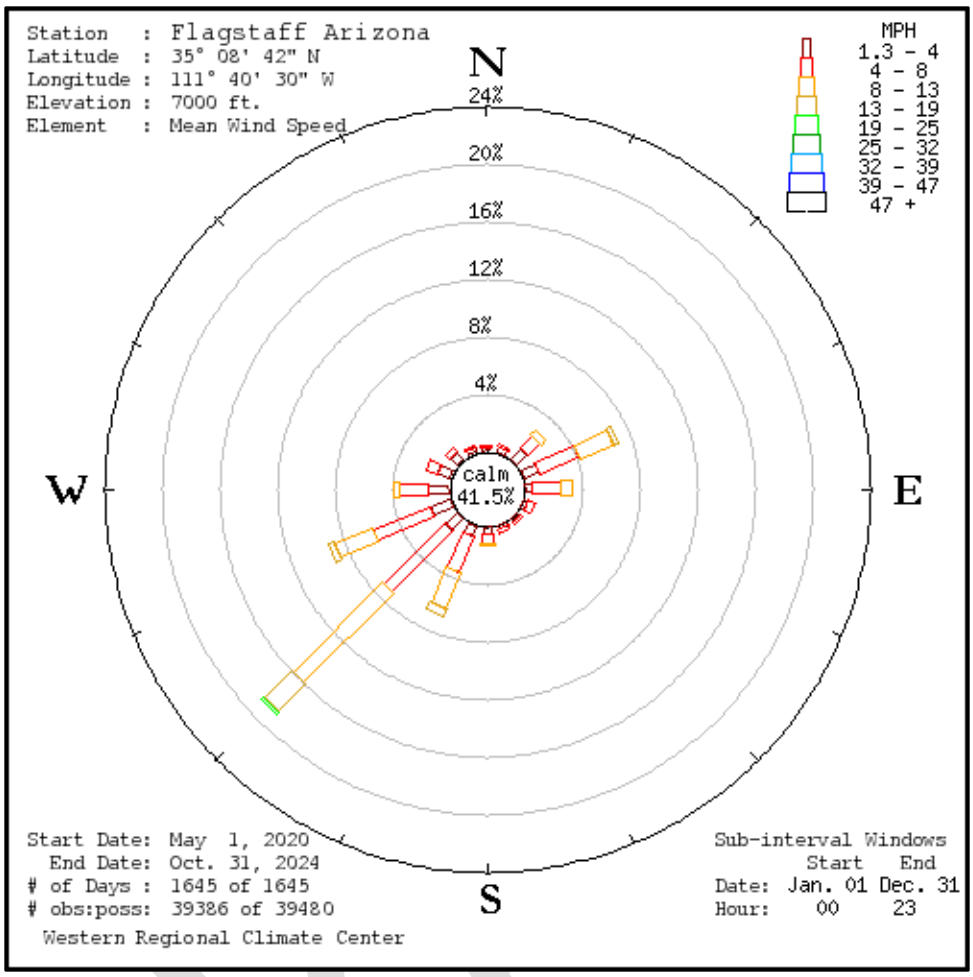

Figure 2.6. Wind rose showing mean wind speed and direction for the Flagstaff RAWS station at 7,000 feet elevation.

The data represent the fire season period from May 1, 2020, to October 31, 2024, based on hourly observations. Source: WRCC (2024).

High wind events have played a significant role in the spread of major wildfires in the region. For example, the 2022 Tunnel Fire was driven northeast under the influence of strong winds, jumping containment lines and prompting widespread evacuations as well as destroying 30 homes (CCEM 2023). Similarly, the 2019 Museum Fire exhibited rapid upslope spread under gusty southwest winds funneled through canyons north of Flagstaff (Coconino County 2021).

FIRE HISTORY

Wildfire is a defining force in Arizona's landscapes, shaping ecosystems from ponderosa pine forests and piñon–juniper woodlands in Coconino County to grasslands and desert shrublands in lower elevations. These systems are fire-adapted and historically experienced frequent, low- to mixed-severity burns that maintained open stands, recycled nutrients, and sustained watershed health (DFFM 2024a). Indigenous communities in northern Arizona, including the Hopi, Navajo, and Hualapai, used fire for generations to manage vegetation, improve forage, and sustain ecological resilience (DFFM 2024a).

The introduction of high-grading and overharvesting of large, old-growth trees in ponderosa pine forests, in conjunction with livestock grazing and a century of strict fire suppression, disrupted these natural fire

cycles, resulting in unnaturally dense forests and an increased risk of high-intensity fire events (GFFP 2018). Coconino County's fire history reflects this shift.

Between 2000 and 2025, the planning area recorded more than 400 wildfires, with ignitions rising from 124 in the 2000s to 149 in just the first half of the 2020s. While most fires remain small due to successful initial attack, medium- and large-sized events account for a growing share of burned acreage.

Twentieth-Century Fire Management Policies and Land Management Actions

For much of the twentieth century, land management across Arizona emphasized fire exclusion and intensive resource extraction. In many ponderosa pine forests, high-grading and overharvesting of large, old-growth trees removed fire-resistant individuals that historically survived frequent low-intensity fires, while livestock grazing reduced the grass and fine fuels that once carried surface fire across the landscape. Aggressive suppression policies further eliminated the frequent, low-intensity burns that historically maintained open ponderosa pine and mixed-conifer forests and supported natural regeneration of fire-adapted species. Together, these actions disrupted the natural fire–vegetation relationship, producing dense stands and hazardous fuel accumulations that increase the risk of large, high-severity wildfire (Fulé et al. 2002; DFFM 2020).

By the 1970s, research and Indigenous knowledge reaffirmed the ecological role of fire, prompting agencies to shift toward prescribed burning, thinning, and restoration treatments. In northern Arizona, the 4FRI has become the centerpiece of these efforts, targeting millions of acres across the Coconino and adjacent national forests for thinning and fuels reduction (DFFM 2020; Forests and Rangelands 2021). As of 2020, more than half a million acres had been treated (prescribed fire and thinning), with additional projects planned (DFFM 2020).

The DFFM has reinforced these efforts through community fuel breaks, defensible space programs, and interagency suppression agreements. Projects like the Mayer fuel break demonstrated the effectiveness of such measures, stopping the 2017 Goodwin Fire from entering neighborhoods (DFFM 2020). Despite these advances, challenges remain. Dense stands, invasive grasses, and prolonged drought continue to elevate fire risk, particularly in Coconino County's WUI (DFFM 2020). Addressing these hazards requires accelerating restoration and maintaining strong federal, Tribal, state, and local partnerships.

Recent Fire Occurrence

Wildfire activity in Coconino County has trended upward over the past two and a half decades, with both the number of ignitions and the total acres burned increasing. As shown in Figure 2.7, the county recorded 124 fires in the 2000s, 141 in the 2010s, and already 149 in just the first half of the 2020s, more than 400 ignitions since 2000. While many of these fires are successfully contained at small sizes, medium- and large-sized events are increasingly driving overall impacts. This is reflected in Figure 2.8, which shows burned acreage per decade climbing from 270,063 acres in the 2000s to more than 328,000 acres in the 2020s to date.

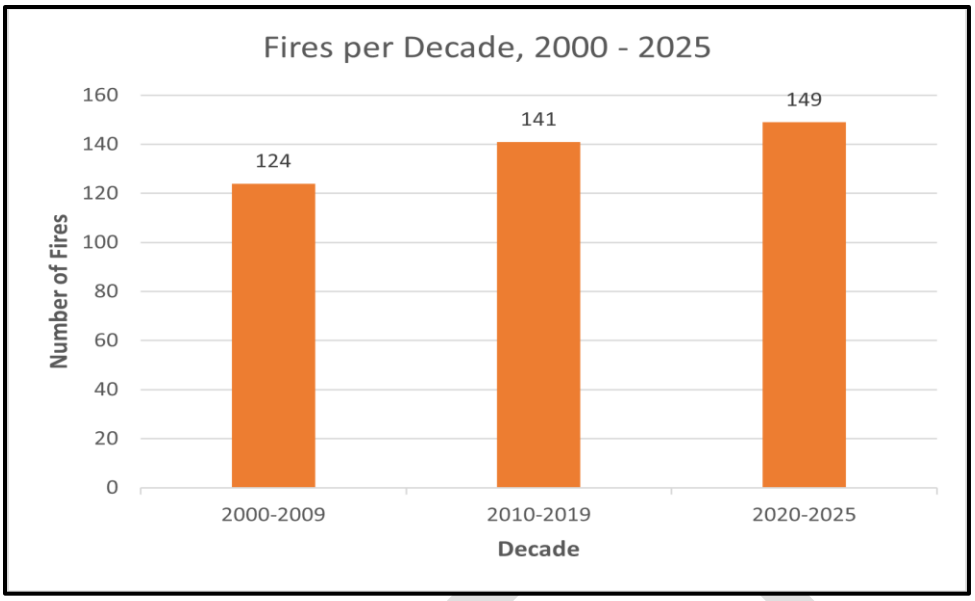

Figure 2.7. Decadal wildfire frequency in Coconino County 2000 through 2025, based on available data.

Source: NIFC

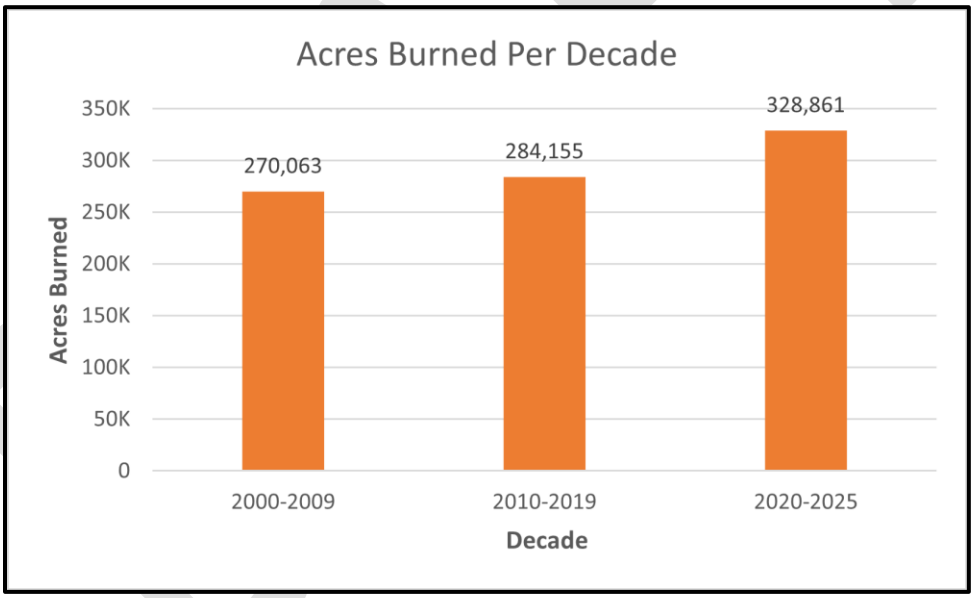

Figure 2.8. Acres burned per decade in Coconino County based on fire history data from 2000 through 2025

Source: NIFC

Fire size distributions also reveal this shift. Figure 2.9 illustrates that in the 2000s, most incidents were smaller (Classes B–E), but by the 2020s, the proportion of Class C, D, and E fires expanded sharply. Although fewer in number than small fires, these medium- and large-sized fires have accounted for most of the increase in acres burned. This pattern parallels national data showing that, while ignition numbers have not risen dramatically, average fire size and severity have increased across the United States (NIFC 2025).

Seasonality adds another layer of risk. Figure 2.10 highlights a strong concentration of ignitions in June (69 fires) and July (109 fires), when pre-monsoon heat and high winds align with critically dry fuels. Fire

occurrence then tapers in late summer but remains elevated through September (34 fires) and October (22 fires). A secondary rise in December (12 fires) demonstrates that Coconino County now faces an extended season, with damaging fires possible well beyond the historic summer window. The Horton Fire of December 2024, which burned more than 8,000 acres along the Mogollon Rim, exemplifies this shift toward year-round risk (DFFM 2024a).

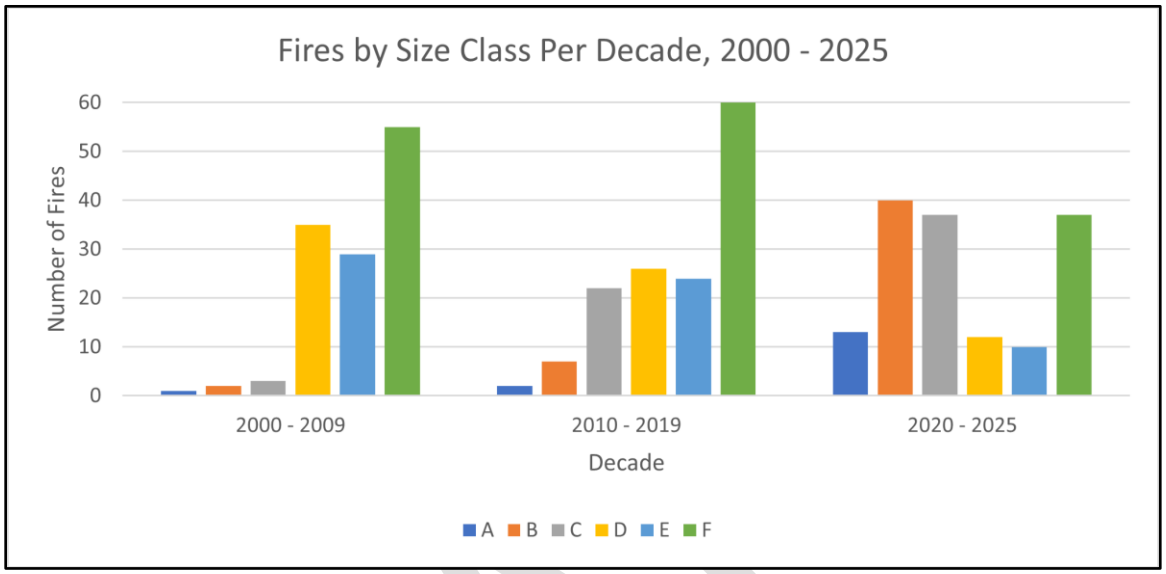

Figure 2.9. Fire size statistics per decade for Coconino County based on fire history data from 2000 through 2025.

Size Class: A = 0.25 acre or less; B = greater than 0.25 to 10 acres; C = 10 to 100 acres; D = 100 to 300 acres; E = 300 to 1,000 acres; F = 1,000+ acres.

Source: NIFC

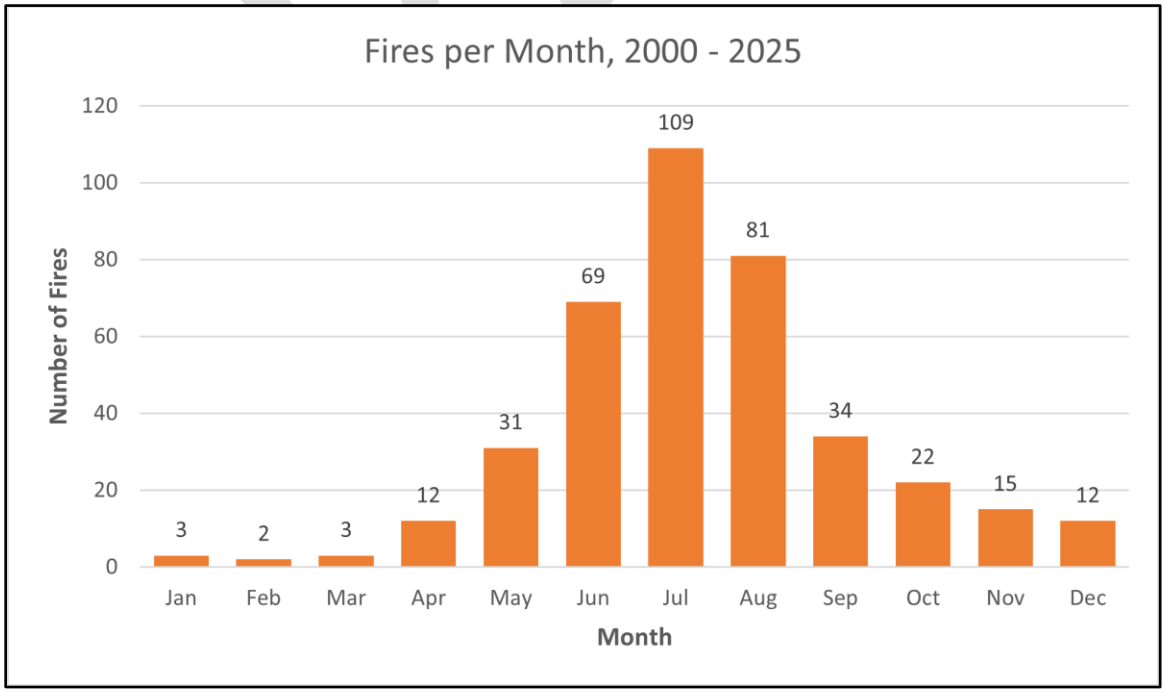

Figure 2.10. Monthly fire frequency in Coconino County based on data from 2000 through 2025.

Source: NIFC

Ignition patterns in Coconino County underscore the dominant role of human activity. As shown in Figure 2.11, most fires since 1992 have been human-caused, with concentrations near highways, recreation areas, and expanding development corridors. Lightning remains an important ignition source in higher-elevation forests but is surpassed by human-caused starts in most years. A notable proportion of ignitions remain undetermined (Arshad et al. 2022).

Spatial analyses provide important context for community risk. Fire perimeter mapping (Figure 2.12) shows that large, burned areas are concentrated along the Mogollon Rim, the San Francisco Peaks, and in forests surrounding Flagstaff and Williams. Ignition density mapping (Figure 2.13) highlights hotspots around Flagstaff and Sedona, where road networks and residential growth intersect with dense ponderosa pine and chaparral fuels. These areas represent some of the highest fire occurrence densities in Arizona, with 1.4 to 1.8 fires per square mile recorded since 2000.

Local patterns mirror broader state and national trends. In 2024, Arizona experienced more than 2,100 wildfires that burned nearly 282,000 acres, an increase of 33% in acreage compared to the previous year (DFFM 2024a). Nationally, the United States has averaged approximately 7.9 million acres burned annually over the past decade, more than double the 1990s average.

Recent wildfire events further illustrate the severity of risk in Coconino County. The 2022 Tunnel and Pipeline Fires burned nearly 48,000 acres near Flagstaff, prompted evacuations, destroyed many homes (The Tunnel fire alone burned 30 homes), and threatened thousands more. The 2019 Museum Fire, though smaller at 1,961 acres, demonstrated the vulnerability of communities to fires occurring near the urban edge. The 2018 Tinder Fire burned 33 homes and 54 outbuildings. More recently, the Horton Fire of December 2024 highlighted the growing concern of late-season ignitions, consistent with statewide patterns documented in the 2024 Arizona Wildland Fire Report, which noted record-breaking fall and winter temperatures and an absence of monsoonal moisture that left fuels critically dry into winter (DFFM 2024a).

Wildfire activity intensified further in 2025, with several large incidents including the Dragon Bravo Fire (143,492 acres), White Sage Fire (39,019 acres), Blind Fire (5,346 acres), Cabin Fire (1,018 acres), and Basin Fire (9,145 acres). Collectively, these events reflect the compounding effects of climate change, accumulated fuels, and continued human expansion into fire-prone landscapes across Coconino County.

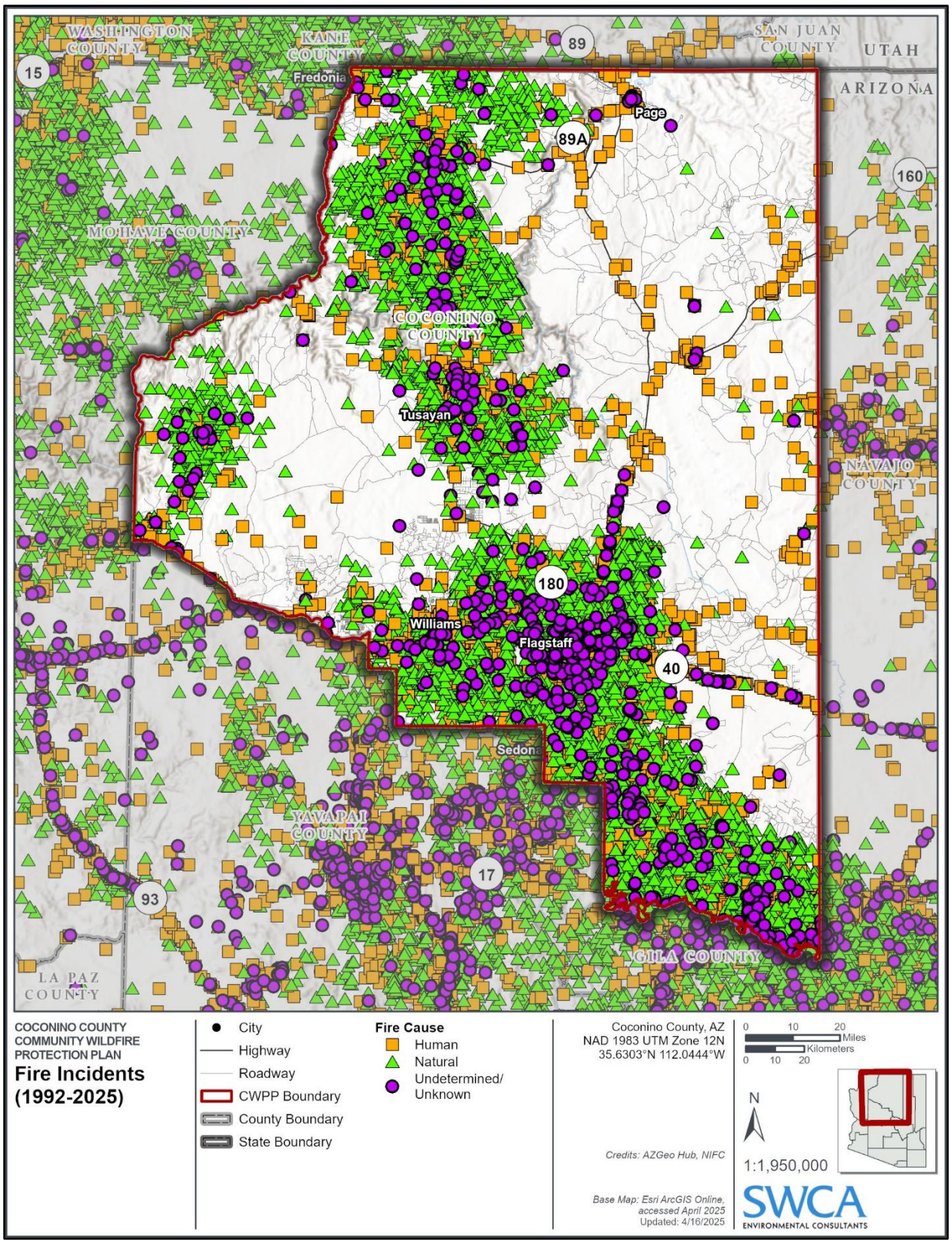

Figure 2.11. Recent wildfire history (ignition points) in the Coconino County CWPP planning area.

Note: Not all small fires are depicted on this map.

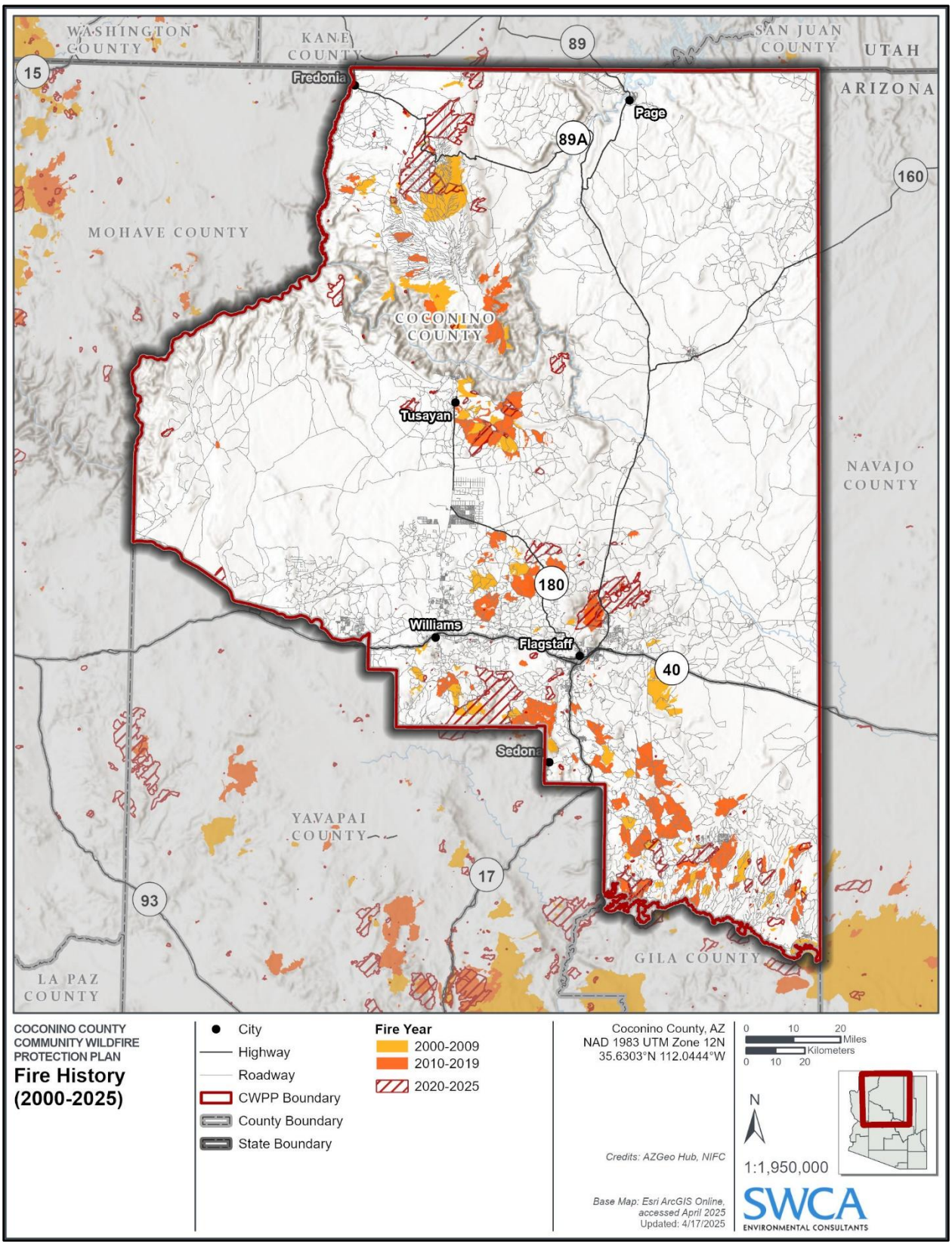

Figure 2.12. Recent wildfire history (perimeters) in the Coconino County CWPP planning area.

Note: Not all small fires are depicted on this map.

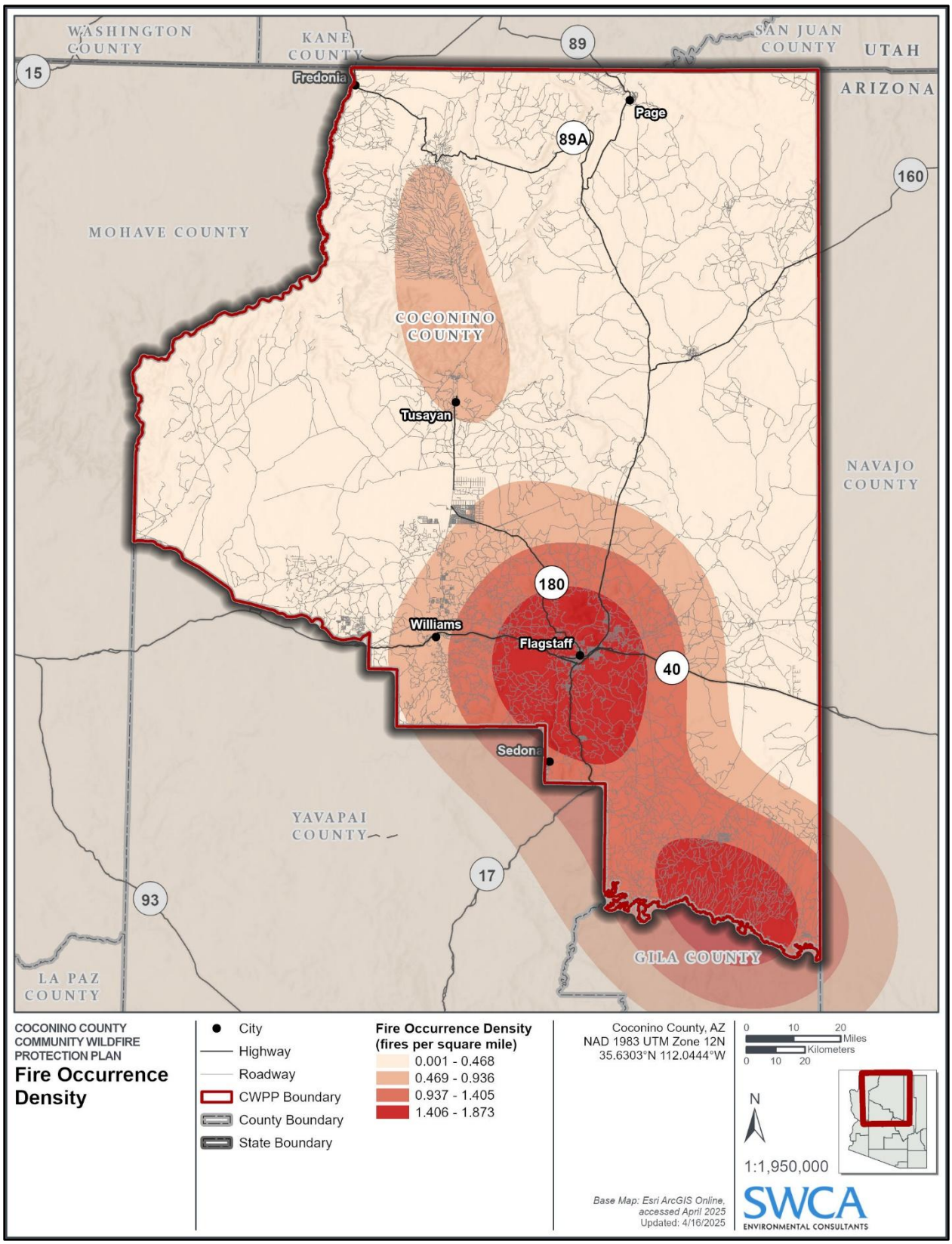

Figure 2.13. Recent wildfire history in the Coconino County CWPP planning area.

Note: Not all small fires are depicted on this map.

FIRE RESPONSE CAPABILITIES

Planning Decision and Support

Coconino County utilizes the National Incident Management System (NIMS) as the standardized framework for coordinating wildfire response and interagency communication (Federal Emergency Management Agency [FEMA] 2008). Within this framework, the Incident Command System (ICS) supports on-scene command and coordination during wildfire incidents, while strategic support, resource coordination, and policy-level decision-making are provided through the Coconino County Emergency Operations Center (EOC), managed by Coconino County Emergency Management (CCEM) (Ready 2023).

Wildfires have continued to grow in size and severity over the last decade, requiring fire managers to institute more robust pre-fire planning as well as adaptive and improved decision-making tools in order to reduce risk to fire responders and the public.

For wildfire incidents that exceed initial response capacity, Coconino County maintains a local Type 3 Incident Management Team (IMT). The IMT is a multiagency resource composed of qualified personnel from local fire districts, the Coconino County Sheriff's Office (CCSO), and cooperating partners, and provides enhanced incident command, planning, and logistical support during extended operations (CCEM 2023). The IMT works in coordination with the EOC to support unified incident management.

The IMT may be activated at the request of a local Incident Commander or the CCSO and can operate across unincorporated areas, Tribal lands in coordination with Tribal partners, and national forest lands in partnership with state and federal agencies. Team members meet National Wildfire Coordinating Group (NWCG) qualification standards, and the County conducts regular wildfire training and exercises to maintain operational readiness (CCEM 2023).

Fire Resources

Fire management in Arizona is accomplished through a cooperative, interagency partnership among federal, state, Tribal, and local entities. In Coconino County, wildfire response involves collaboration between the USFS, DFFM, Tribal fire programs, and local fire districts (CCEM 2023). Wildland fire suppression is mobilized through the Arizona Interagency Dispatch Center (AIDC), located in Deer Valley, which is a part of the Southwest Area Coordination Center and operates 24/7 to dispatch statewide resources (aircraft, crews, equipment, and personnel) for both initial and extended attack incidents on federal, state, and private lands (DFFM 2025a).

The DFFM Wildland Fire Division is organized into five district offices: Northern, Northeastern, Central, Northwestern, and Southern Arizona, each responsible for suppression, prevention, and fuels management across its jurisdictional area (DFFM 2024a). The boundaries of these districts, and the locations of local fire protection district stations that augment state and federal efforts, are shown in Figure 2.14 below.

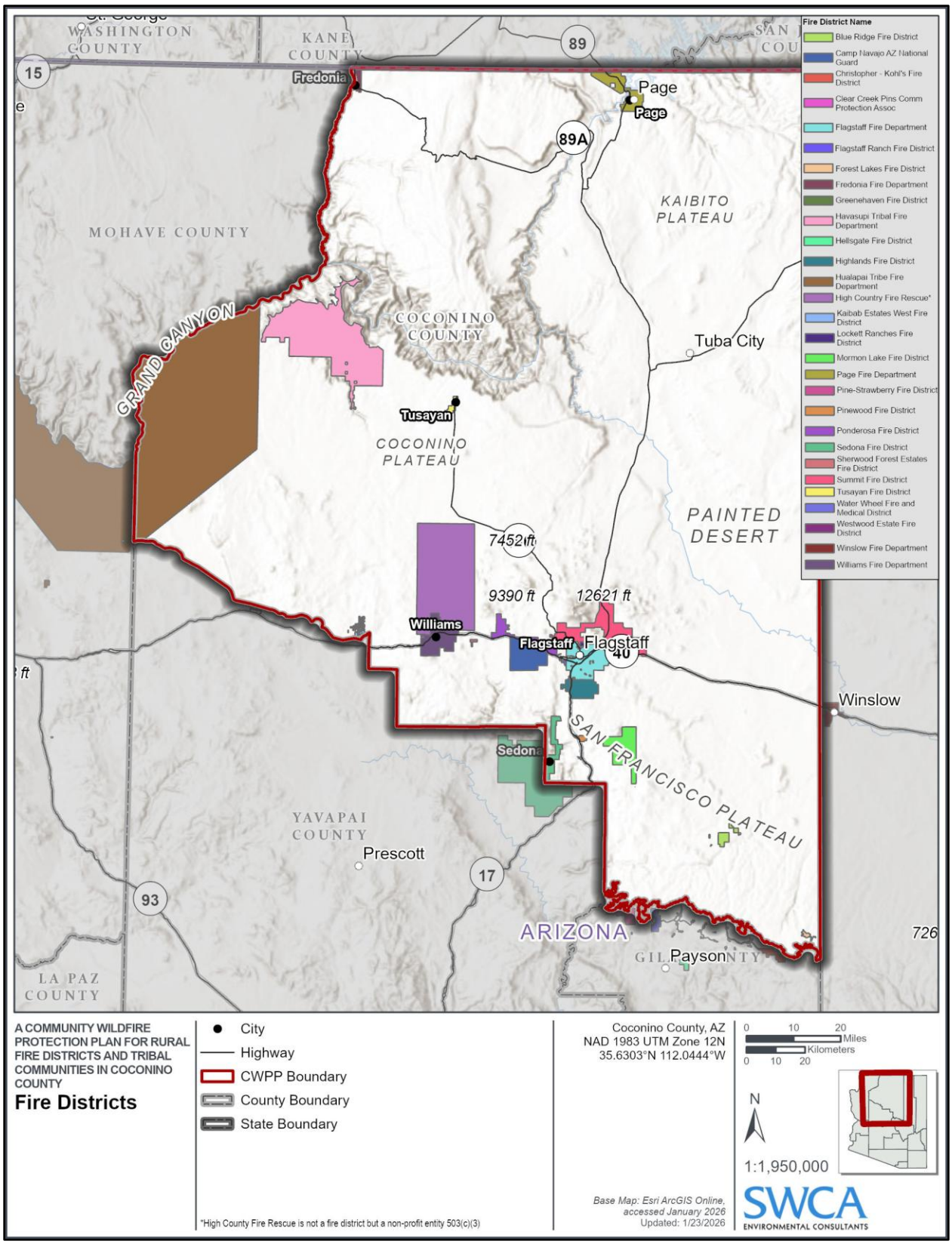

Figure 2.14. Fire districts (including nonprofit fire response entities) within Coconino County.

Local Response

Fire protection within Coconino County and the immediate region is provided through a coordinated network of 19 fire districts and two municipal fire departments. All agencies are listed below; those that participated directly in the development of this CWPP are marked with an asterisk (*)

1. Blue Ridge Fire District*
2. Flagstaff Ranch Fire District
3. Forest Lakes Fire District*
4. Greenehaven Fire District
5. Highlands Fire District
6. Kaibab Estates West Fire District*
7. Lockett Ranches Fire District
8. Mormon Lake Fire District
9. Pinewood Fire District
10. Ponderosa Fire District
11. Sedona Fire District
12. Sherwood Forest Estates Fire District*
13. Summit Fire District
14. Tusayan Fire District*
15. Westwood Fire District
16. Woods Fire District
17. High Country Fire Rescue*
18. Williams Fire Department*

Table 2.3 below shows fire station equipment and staffing resources for participating agencies.

Fire Station Statistics

Table 2.3. Fire Station Equipment and Staffing Statistics*

Fire Department Name	Sherwood Forest Estates Fire District	Kaibab Estates West Special Fire District	Forest Lakes Fire District	Blue Ridge Fire District	Tusayan Fire District	High Country Fire Rescue	Williams Fire Department	Hualapai Fire and EMS
Station Number	4	1	1	1	1	10 and 20	2	141, 142, and 143
Fulltime firefighters	0	0	39	7	10	0	1	24
On-call firefighters	0	0	4	9	0	0	0	19
Volunteer firefighters	12	6	0	7	11	18	27	0
Water Tenders								
Type 1	0	2	1	0	0	0	1	1
Type 2	0	0	0	1	0	1	0	0
Type 3	3	0	0	1	0	1	0	1
Wildland Engines								
Type 1	0	0	0	0	0	0	0	0
Type 2	0	0	0	0	0	1	0	0
Type 3	0	1	1	1	0	1	0	1
Type 4	0	0	0	0	0	0	0	0
Type 5	0	0	0	0	0	0	0	0
Type 6	2	0	1	1	1	1	1	0
Type 7	0	0	0	0	0	0	0	0
Structure Engines								
Type 1	1	1	1	1	2	1	2	3
Type 2	0	0	0	0	0	2	0	0
Port-a-tanks	4	1	1	3	1	1	2	5
Portable pumps	3	0	0	2	0	2	2	"--"

Fire Department Name	Sherwood Forest Estates Fire District	Kaibab Estates West Special Fire District	Forest Lakes Fire District	Blue Ridge Fire District	Tusayan Fire District	High Country Fire Rescue	Williams Fire Department	Hualapai Fire and EMS
Agreements with Other Fire Response Agencies	Mutual aid agreements with Williams FD, High Country Fire Rescue, Ponderosa FD, and DFFM.	Mutual aid agreement with Ash Fork FD.	Mutual aid agreements with the Northern Gila County Chiefs Association, Heber-Overgaard FD, and the Arizona Mutual Aid Plan; agreements provide emergency support and allow reimbursement for consumable supplies and non-emergency activities such as training.	Mutual aid agreements with DFFM and several Northern Gila County FDs (including Payson FD and Pine-Strawberry FD); pursuing a mutual aid agreement with the I-40 Response Group in Navajo County (Winslow FD, Holbrook FD); also works closely with USFS (Mogollon Rim and Happy Jack Ranger Stations) within the Coconino National Forest.	Mutual aid agreements with DFFM, Grand Canyon NP, ADOT Airport, and the State of Arizona.	Mutual aid agreements with Williams FD, Ponderosa FD, and Sherwood Forest Estates FD.	CFRA with the State of Arizona for access to federal resources, plus mutual aid agreements with High Country Fire Rescue, Ponderosa FD, Camp Navajo, Ash Fork FD, and GFR.	Northern Arizona Fire District Kingman Fire Department Bullhead City Fire Department Lake Mohave Ranchos Fire Department Mohave Valley Fire Department Seligman Fire Department Pinion Pines Fire Department Fort Mohave Fire Department AMR/River Medical (Ambulance)

* Equipment and staffing numbers are current as of October 2025 and were compiled from available data.

Coconino County Sheriff's Office

The Coconino County Sheriff's Office (CCSO) is the county's primary law-enforcement agency, with its powers and duties defined under Arizona Revised Statutes 11-441 (CCEM 2023). Within the scope of the Emergency Operations Plan and Comprehensive Plan, CCSO is responsible for:

- Law enforcement, security, protection, and search and rescue in unincorporated areas.
- Coordinating with municipal police to support response and recovery in incorporated jurisdictions.
- Implementing evacuation and shelter-in-place orders, in coordination with CCEM and municipal law enforcement, under the Ready, Set, Go program.
- Maintaining the policies, plans, and procedures necessary to fulfill these responsibilities during any incident.

CCSO serves as the lead public-safety agency for Coconino County's remote and rural communities, providing law enforcement, jail operations, civil-process service, and search-and-rescue coverage across the county's expansive landscape (Coconino County 2015). During large-scale wildfires, CCSO coordinates closely with CCEM and municipal agencies to manage traffic, secure evacuation areas, and maintain access for fire crews while operating within unified command structures (CCEM 2023). CCSO's community-based policing model (assigning deputies to outlying areas and integrating volunteer programs) supports rapid, localized response across the WUI. The CCSO maintains policies and procedures that enable a seamless transition from routine patrol to emergency operations, supporting life safety and property protection during wildfire events (CCEM 2023).

State Response

The State of Arizona plays a critical role in wildfire response within Coconino County, particularly in areas not covered by a municipal fire department or organized fire district.

Arizona Department of Forestry and Fire Management (DFFM)

The DFFM is the lead state agency for wildfire management in Coconino County. DFFM is responsible for protecting State Trust lands and plays a central role in coordinating wildfire response across jurisdictional boundaries. The agency works closely with municipal fire departments, rural fire districts, federal land management agencies, and Tribal governments to ensure effective and seamless suppression efforts.

DFFM safeguards approximately 22 million acres of State Trust and private lands across Arizona (DFFM 2024b). Its statutory mandate includes wildfire suppression and management of State Trust resources (Arizona Legislature 2025). Beyond suppression, the agency administers State Fire Assistance and Wildland-Urban Interface grant programs, which fund fuels reduction, Firewise USA initiatives, and development of CWPPs (DFFM 2025b).

State Responsibility for Unincorporated Areas

Within Coconino County, many rural properties and subdivisions lie outside organized fire district boundaries. These unincorporated areas, along with checkerboard State Trust lands, fall directly under state responsibility. When wildfires ignite in these zones, DFFM provides initial attack and assumes suppression responsibility until additional resources can be engaged (DFFM 2024b). This arrangement ensures that all lands, regardless of jurisdiction, receive baseline wildfire protection (DFFM 2025c).

The agency also leverages its statewide cooperative fire agreements, including Good Neighbor Authority and Shared Stewardship agreements, to bring in additional support from local, federal, and Tribal partners when needed (DFFM 2024b, 2024c).

Interagency Coordination Under the Stafford Act

For wildfire incidents that are, or may become, declared emergencies or major disasters under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Arizona operates under a Master Cooperative Wildland Fire Management and Stafford Act Response Agreement with USFS, BLM, NPS, USFWS, and BIA (Southwest Coordination Center 2023). The agreement establishes protocols for coordinating equipment, personnel, services, and funding during wildfire and all-hazard incidents that qualify under the Stafford Act. It improves operational efficiency across overlapping jurisdictions and supports integrated response among state, federal, local, and Tribal partners. Coconino County relies on this framework to facilitate unified wildfire response and cost-sharing during declared incidents.

Federal Response

Federal agencies play a central role in wildfire response within Coconino County, where large portions of the landscape are federally managed by USFS, NPS, BLM, and BIA. Federal wildfire response is guided by interagency policy, risk-based planning tools, and cooperative agreements that integrate federal suppression actions with state, local, and Tribal partners. Federal activities include initial attack, extended attack, resource mobilization, aviation operations, and the use of wildfire for resource benefit under appropriate conditions.

Federal responsibilities within Coconino County fall primarily to three agencies:

- **U.S. Forest Service (USFS) –** Kaibab National Forest, Coconino National Forest, and the Apache-Sitgreaves National Forests
- **National Park Service (NPS) –** Grand Canyon National Park
- **Bureau of Land Management (BLM) –** Arizona Strip District, Hassayampa Field Office
- **Bureau of Indian Affairs (BIA) –** supporting Tribal wildfire response and protection on trust lands (see Tribal Response below)

U.S. Forest Service (USFS)

Three National Forest units intersect Coconino County: the Kaibab National Forest, the Coconino National Forest, and the Apache-Sitgreaves National Forests, which together encompass more than two million acres (USDA and USFS 2015b, 2018). Wildfire response on these lands is guided by USFS fire

management plans that outline initial attack protocols, pre-planned control features such as Potential Operational Delineations (PODs), and strategies for managing naturally ignited fires when conditions allow (see PODs section below).

USFS maintains cooperative fire agreements with DFFM, NPS, BLM, and local fire districts, enabling cross-boundary response, resource sharing, and cost-sharing during extended attack incidents. Depending on incident complexity, federal engines, hand crews, hotshot crews, smokejumpers, dozers, and aviation resources may be mobilized (USDA and USFS 2015b, 2018). In Coconino County, USFS response is dispatched through AIDC and supported by the Southwest Area Coordination Center during high-activity periods (National Interagency Coordination Center 2025).

Potential Operational Delineations

The Rocky Mountain Research Station's Wildfire Risk Management Science (WRMS) Team co-developed Potential Operational Delineations (PODs) to support risk-informed wildfire planning by identifying strategic response options in advance of incidents. PODs are spatial units defined by potential control features, such as roads, ridgelines, and other landscape barriers, that integrate information on fuels, forest conditions, and fire potential. Reference the USFS's story map to learn about how the PODs were delineated: https://www.arcgis.com/apps/Cascade/index.html?appid=073b66277b6540328f40b772dfab7c6f.

PODs cover much of Coconino County, with higher concentrations around Flagstaff, Williams, Sedona, and the Grand Canyon. These delineations combine local operational knowledge with spatial analysis to support wildfire response planning, fuel treatment prioritization, and pre-planned suppression opportunities in areas of elevated exposure.

PODs have been implemented on more than 40 National Forests nationwide and are often developed across jurisdictional boundaries. Coverage is more limited in remote areas with few access points or natural barriers, though additional PODs may be added as planning needs evolve. Figure 4.3 in Chapter 4 shows PODs identified by the USFS within the planning area. For additional information, see the USFS PODs project website (https://www.fs.usda.gov/research/rmrs/projects/pods).

National Park Service (NPS) – Grand Canyon National Park

NPS conducts fire management activities within Grand Canyon National Park in accordance with the park's Fire Management Plan, which provides direction on the use of fire to meet resource objectives and guides suppression actions as needed (NPS 1995). Fire management in undeveloped and wilderness areas is carried out consistent with NPS policies, including minimum-tool requirements and the restoration of natural fire regimes where appropriate (NPS 1995). The General Management Plan also notes that NPS works jointly with adjacent entities on regional planning and resource protection efforts, though it does not specify wildfire-specific coordination mechanisms (NPS 1995).

Bureau of Land Management (BLM)

Although BLM administers smaller land areas within Coconino County compared to USFS or NPS, the agency is responsible for wildfire suppression on BLM-managed lands and supports interagency response for fires that threaten multiple jurisdictions (DFFM 2024a). BLM engines, crews, and overhead personnel are dispatched through AIDC, and the agency participates in cooperative fire management agreements with DFFM and USFS (DFFM 2024a).

Tribal Response

Based on available information, fire and emergency response within Tribal lands in Coconino County involves the Hualapai Tribe, Navajo Nation, the Hopi Tribe, and the Havasupai Tribe. Wildfire protection and all-hazards response are managed by each Tribe in coordination with the Bureau of Indian Affairs (BIA), DFFM, USFS, and CCEM. When incidents cross jurisdictional boundaries, partners operate under the National Incident Management System (NIMS) and unified command to ensure coordination, efficiency, and respect for Tribal sovereignty. A summary of Tribal fire and emergency response capabilities for each of these four Tribes is included below.

Hualapai Fire & EMS

The Hualapai Fire & EMS Department provides fire protection and emergency response services for the Hualapai Tribe, whose reservation includes lands along the western edge of Coconino County. The department is headquartered in Peach Springs and serves Tribal communities as well as transportation corridors that cross the reservation. Hualapai firefighters provide structural and wildland fire suppression, emergency medical response, rescue services, and fire prevention and education programs. The department works closely with regional partners, including Tribal, federal, state, and county agencies, to coordinate mutual aid and support wildfire response across jurisdictional boundaries. Through training, cooperative agreements, and interagency coordination, the Hualapai Fire Department contributes to regional efforts to reduce wildfire risk and protect communities, natural resources, and cultural values.

Navajo Nation Fire and Rescue Services

Navajo Nation Fire and Rescue Services (NNFRS) was established in 1985 and has grown into a full-service emergency agency (NNFRS 2024). Its mission is to safeguard life, health, property, and Navajo sovereignty while providing fire suppression, EMS, hazardous materials response, technical rescue, and prevention programs. The department operates eight stations, including Tuba City and Twin Arrows within Coconino County, staffed by career and volunteer firefighters trained to NFPA 1001 standards (NNFRS 2024). NNFRS responds to over 1,000 calls annually, most EMS and vehicle accidents, but structure and vegetation fires remain significant threats, with single incidents sometimes causing over $50,000 in losses (NNFRS 2024). Between Fiscal Years 2021 and 2023, NNFRS logged hundreds of mutual and automatic aid responses, highlighting its role in the regional interagency system and ensuring coordinated wildfire protection for Navajo communities in the county (NNFRS 2024).

Hopi Structural Fire and Rescue Department

The Hopi Structural Fire and Rescue Department was established in 2015 after the BIA discontinued structural fire services (BIA 2015). To bridge the gap, the Tribe and BIA signed a mutual and automatic aid agreement, later supplemented for equipment and training support (BIA 2015). The Hopi Structural Fire and Rescue Department provides structural and wildland fire suppression, EMS, hazardous materials response, rescues, and fire prevention education. Initial capacity was built through volunteer recruitment and NFPA-standard training, with continued investment from the Tribe to support operations (Hopi Tribe 2025). Today, the department is the primary fire service on the Hopi Reservation and works closely with the Hopi Emergency Response Team, Hopi Resource Enforcement Services, and outside partners (including BIA Hopi Agency, Coconino County, DFFM, and FEMA) for larger or complex incidents that may extend across jurisdictional lines (Hopi Tribe 2025).

Havasupai Tribe

The Supai Fire Station, located in Supai Village at the bottom of Havasu Canyon, provides 24/7 fire suppression and emergency medical response for the remote Havasupai community (Grand Canyon 2025). With no road access, firefighters rely on foot, mule, and helicopter support to reach incidents along the canyon trails and at Havasu Falls (Grand Canyon 2025). The station maintains a Type 6 wildland engine, portable pumps for water-based firefighting, and basic life-support equipment, and it coordinates closely with BIA, Grand Canyon National Park, and regional air-medical providers (Grand Canyon 2025). A nearby helicopter landing zone allows for rapid evacuations when needed (Grand Canyon 2025). This facility represents the lifeline for emergency response in one of the most isolated areas of Coconino County, ensuring protection for both residents and the thousands of visitors who access the reservation each year.

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CHAPTER 3 – WILDFIRE RISK AND POST-FIRE HAZARDS

PURPOSE

This chapter provides a comprehensive assessment of wildfire risk in the planning area by combining both quantitative and qualitative approaches. Through computer simulations of wildland fires under very high fire danger conditions specific to the local area, the Quantitative Wildfire Risk Assessment (QWRA) provides a spatial, science-based, and data-driven analysis of wildfire hazard and vulnerability to values of concern. The result is an area-wide wildfire risk map that enables comparisons across the planning area using consistent modeling parameters, supporting high-level planning and prioritization. However, because the fire modeling does not account for suppression efforts or structure-to-structure ignition, localized factors such as water availability, proximity of firefighting resources, building materials, and egress complications must be evaluated qualitatively. To provide a more comprehensive understanding of wildfire risk, this chapter integrates both the QWRA analysis and context-specific qualitative analyses of fire behavior, suppression capacity, and community exposure.

In addition to evaluating wildfire risk, this chapter examines potential post-wildfire debris-flow and flooding hazards. This assessment incorporates findings from *Post-Wildfire Debris-Flow & Flooding Assessment: Coconino County, Arizona* (Loverich et al. 2017) to provide a more comprehensive understanding of cascading post-fire risks.

QUANTITATIVE WILDFIRE RISK ASSESSMENT

The completion of a QWRA provides land managers, fire officials, and planners with critical information to develop targeted strategies for reducing wildfire threats. This assessment not only guides planning efforts but also supports outreach and education initiatives to engage community members in minimizing fire-related risks. For this CWPP, areas of high wildfire hazard and risk are identified using the QWRA process through the modeling of fire behavior, burn probability, and fire intensity, along with evaluating the exposure and susceptibility of structures, critical infrastructure, and highly valued resources and assets (HVRAs).

Stakeholder and expert input further guide the QWRA process, ensuring recommended fuel treatments are prioritized according to wildfire risk. For further details on fuels treatments, refer to Chapter 4.

The QWRA provides a community- and landscape-level overview of wildfire risk and is not recommended for use at smaller scales (such as for a property-level analysis). It is also not recommended for use in determining insurance rates or policies. This QWRA is a model, and as such has inherent biases, missing data, and other shortcomings, though every effort has been made to include the best available data and use the most robust scientific processes. Also note that just because an area is shown as high or low risk does not mean that that area will be burned or not burned in a wildfire; a low-risk area can still be affected by wildfire under certain conditions. This QWRA is also not intended for use during active wildfire events, but rather only as a tool for pre-fire planning.

In addition to the desktop QWRA, this CWPP also leverages a field wildfire hazard assessment, completed in August 2025, which is discussed in the Qualitative Risk Considerations section of this chapter and in Appendix C.

FRAMEWORK

Wildfire risk is a function of two key components: the **hazard** itself and the **vulnerability** of the values exposed to that hazard. These QWRA components are described below.

Wildfire Hazard

Wildfire hazard is shaped by the probability of a fire occurring and its potential intensity. Probability is influenced by factors such as fire regimes, ignition frequency (both natural and human-caused), fuels, fire behavior, topography, and weather. Intensity depends on fuel characteristics, including vegetation type, density, continuity, and moisture content, as well as weather and terrain.

Vulnerability

Vulnerability is determined by two subcomponents: exposure and susceptibility. Exposure refers to the proximity of assets to wildfire hazards, particularly within the home ignition zone (the area extending up to 200 feet from a structure) and the surrounding environment. Susceptibility reflects how likely those assets are to be damaged if exposed. This is influenced by factors such as building materials and design features (including roofing, vents, siding, fencing, decks, and balconies).

This CWPP uses the QWRA framework in Scott et al. (2013) (Figure 3.1).

Figure 3.1. Quantitative Wildfire Risk Assessment (QWRA) framework.
Derived from Scott et al. (2013).

Process Overview

Hazards, which consist of flame length (intensity) and burn probability, were assessed using the FlamMap and RANDIG models, as well as weather/fire danger analysis tools such as FireFamily Plus, which are integrated within the Interagency Fuel Treatment Decision Support System (IFTDSS). Exposure and vulnerability data, which include building footprints, critical infrastructure, and locations of HVRAs, were obtained from public sources.

Fire behavior modeling was conducted using a sustained wind speed of 19 miles per hour. This value was derived from analysis of multiple remote automated weather stations (RAWS) across the county, using the Auto 97th percentile values to represent high fire danger conditions. The selected wind speed reflects an average of these high-end conditions and was reviewed in consultation with fire management personnel serving on the CWPP Core Team. Based on this collaborative review, 19 miles per hour was determined to be a reasonable and representative wind input for modeling wildfire behavior across the county. Fire behavior modeling was conducted using data from a RAWS located at an elevation representative of average county conditions.

SWCA generated a landscape file for the Coconino County and surrounding region in IFTDSS, with Core Team input guiding the refinement of fuel models, response functions, and relative importance values, resulting in tailored fire behavior outputs and risk scoring.

Finally, the hazard values (probability and intensity) were multiplied with the vulnerability values (exposure and susceptibility) to produce a numeric output representing the probability of damage (or loss) to an asset throughout the vegetated (burnable) landscape.

Data Collection

The spatial data required for this QWRA are summarized in Table 3.1. Both burn probability and flame length require inputs on landscape characteristics (e.g., topography and fuels) and weather conditions (e.g., humidity, temperature, shading, and wind).

Table 3.1. Spatial Data Inputs for the QWRA

Inputs	Source	Type
Burn Probability	IFTDSS, LANDFIRE	Hazard/Probability
Flame Length	IFTDSS, LANDFIRE	Hazard/Intensity
Critical Infrastructure - transmission lines, communication towers, and power plants	Homeland Infrastructure Foundation-Level Data (HIFLD)	Vulnerability/Exposure
Critical Infrastructure – Substations	Environmental Systems Research Institute (ESRI)	Vulnerability/Exposure
Critical Infrastructure – Special Use Communication Sites	U.S. Forest Service	Vulnerability/Exposure
Critical Infrastructure – Cell Towers	Arizona Geo Hub	Vulnerability/Exposure
Critical Infrastructure – Pipelines	U.S. Energy Information Administration	Vulnerability/Exposure
Building Footprint HVRAs	Coconino County	Vulnerability/Exposure

Identification of Hazards and Vulnerability

Hazards

Burn Probability

Figure 3.2 illustrates the likelihood of a specific location on the landscape burning, which is represented as burn probability. Burn probability takes several factors into account, including fire size, frequency, rate of spread, and weather conditions (IFTDSS n.d.a). Medium to high burn probabilities are concentrated within Coconino's southern half, particularly in wooded areas.

Recent large fires, such as the 2025 Blind, Dragon Bravo, and White Sage fires, have altered burn probability in the area. Areas that have experienced recent large fires exhibit reduced burn probabilities in the model due to changes in fuel conditions (i.e., post-fire landscapes with less combustible material burn less readily under simulated peak fire season conditions compared to pre-fire conditions). It should also be noted that low burn probability does not mean "no" probability. For example, a 20% burn probability means that one in five ignitions under very high fire danger conditions would reach and burn that location.

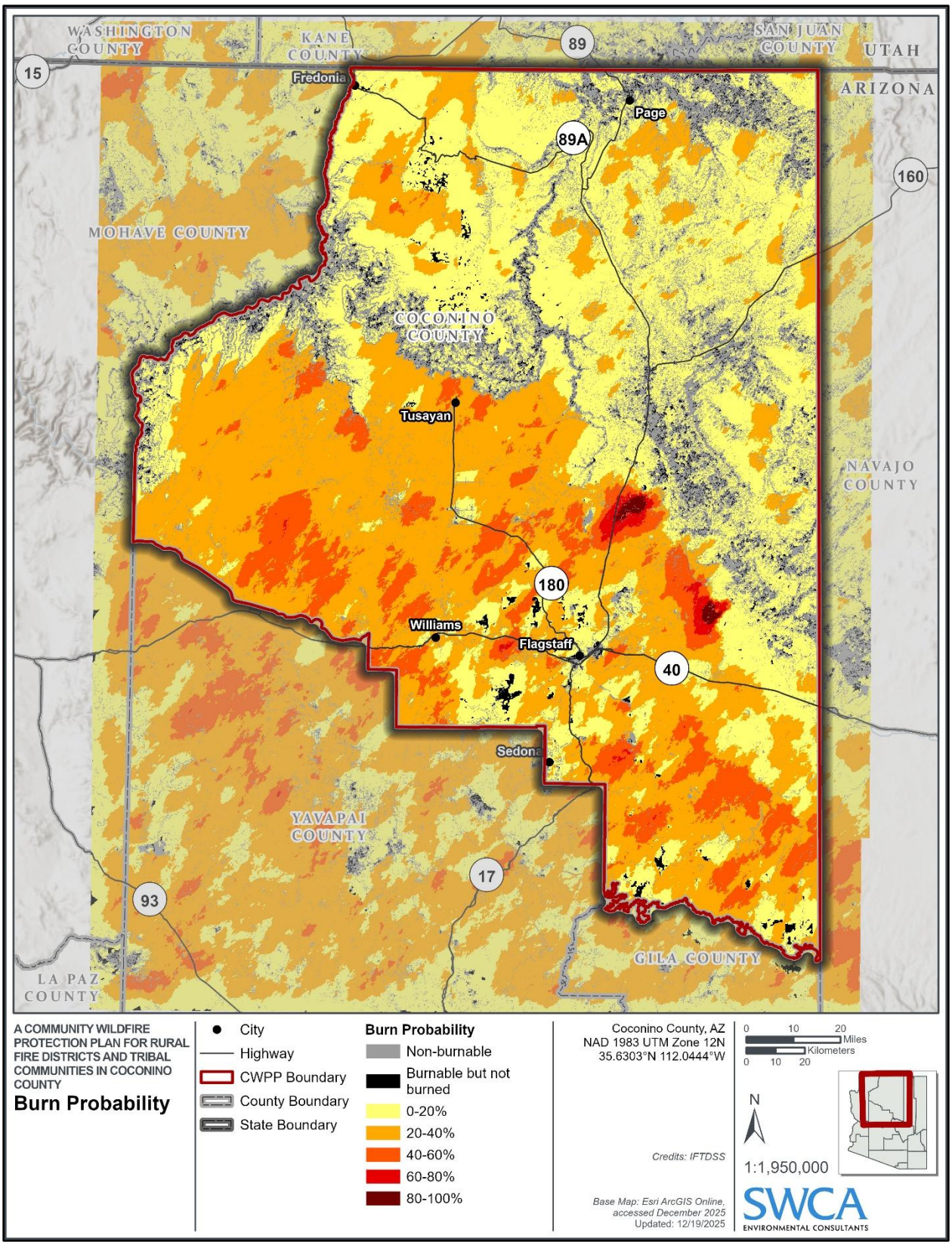

Figure 3.2. Burn probability in the CWPP planning area.

Flame Length

Figure 3.3 illustrates the flame length classifications for the planning area. Flame lengths are determined by fuels, weather, and topography. Flame length is a measure of the intensity of the hazard in the QWRA equation. Direct attack by hand crews is usually limited to flame lengths less than 4 feet, while engines and heavy equipment can utilize direct attack on flames up to 8 feet. Tactics generally move from direct to indirect attack with flame lengths in excess of 8 feet.

Flame lengths vary across the county, with higher flame lengths (8 feet and higher) scattered around north-central and southern portions of the county, particularly in and around populated corridors such as Tusayan, Williams, Kaibab Estates West, Sherwood Forest Estates, Red Lake, Blue Ridge, Forest Lakes Estates, Clints Well, and others. Lower-elevation grass fuels typically produce shorter flame lengths and have the highest likelihood of successful suppression, while higher-elevation timber fuels are more susceptible to crown fires. Mid-elevation brush and timber fuels exhibit flame lengths and suppression potentials that fall between these extremes.

It's important to recognize the limitations of fuel models in urban and developed environments. These models are designed primarily to simulate wildland fire behavior and do not account for the complexity of urban fuels, such as buildings, vehicles, landscaping, wood piles, and other combustible materials. LANDFIRE typically classifies urban and developed areas as "non-burnable," which assumes they do not support fire spread.

Vulnerability

Response Functions

Response Functions (RFs) measure the susceptibility of a HVRA to wildfire, indicating how fire affects these resources based on intensity (IFTDSS n.d.b). Defined by experts, RFs assign a value change ranging from -100 to +100, where -100 represents total loss and +100 denotes substantial benefit. The RFs assigned to each HVRA are based on flame length classes, which represent different levels of fire intensity. The longer the flame length, the higher the intensity and the flame's impact to structures and HVRAs.

Highly Valued Resources and Assets

BUILDINGS

Building footprints (Figure 3.4) data were obtained from Coconino County and are used to identify the locations and extents of structures, including residences and businesses, across the planning area. Incorporating these data into the QWRA allows for accurate mapping of structures across the landscape and helps assess the exposure of built environments to wildfire risks.

Since the model typically classifies the immediate areas around buildings as "non-burnable," building footprints were buffered by 0.5 mile to ensure this area is treated as 'burnable' in the analysis.

INFRASTRUCTURE

The infrastructure dataset (Figure 3.5) for the QWRA was developed through a comprehensive process that combined data from critical infrastructure inventories, community assessments, public outreach

efforts, and Core Team input. This dataset was further supplemented with HVRA data acquired from various public sources. The identified infrastructure HVRAs include structures, power lines, transmission lines, substations, power plants, pipelines, communication towers, and communication sites. These data are essential to the QWRA, as they indicate key locations on the landscape where values that support communities are present.

Critical infrastructure was buffered by varying distances to address areas classified as “unburnable” around these assets (see Table 3.2). Frequently, a non-burnable space exists between HVRAs and adjacent fuels; adding this buffer effectively classifies the HVRAs adjacent to fuels as “burnable” features. Though the fire spread models do not simulate structure burning (“urban” fuels show as “unburnable”), this allows the risk to be projected into the most threatened developments on the edge of the WUI.

Table 3.2. Critical Infrastructure and Buffer Distances

Critical Infrastructure Type	Buffer Distance
Pipelines and transmission lines	240 meters (0.15 mile)
Cell towers, communication towers, power plants, and substations	0.5 mile

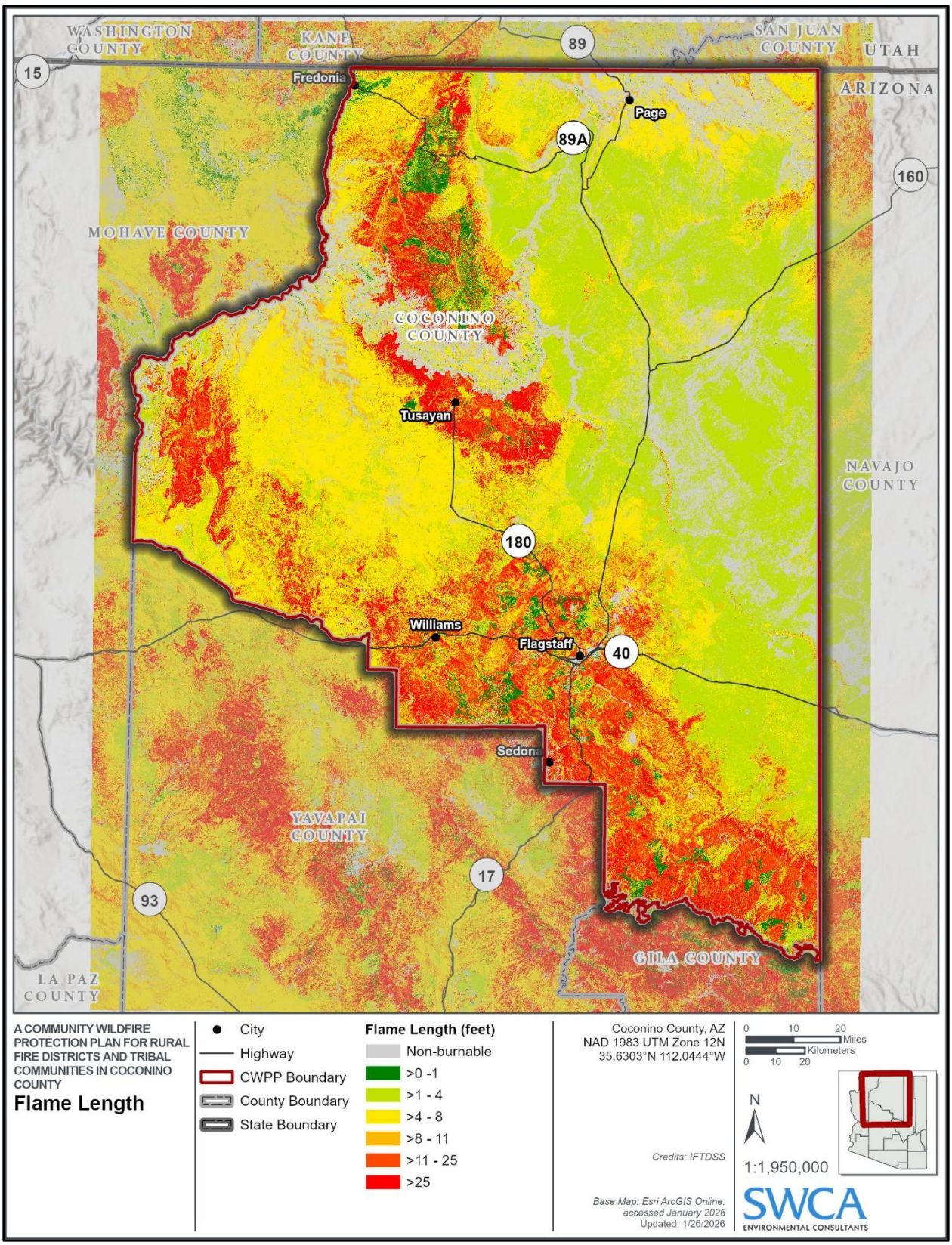

Figure 3.3. Flame length classifications in the planning area (using 19-mile-per-hour wind conditions).

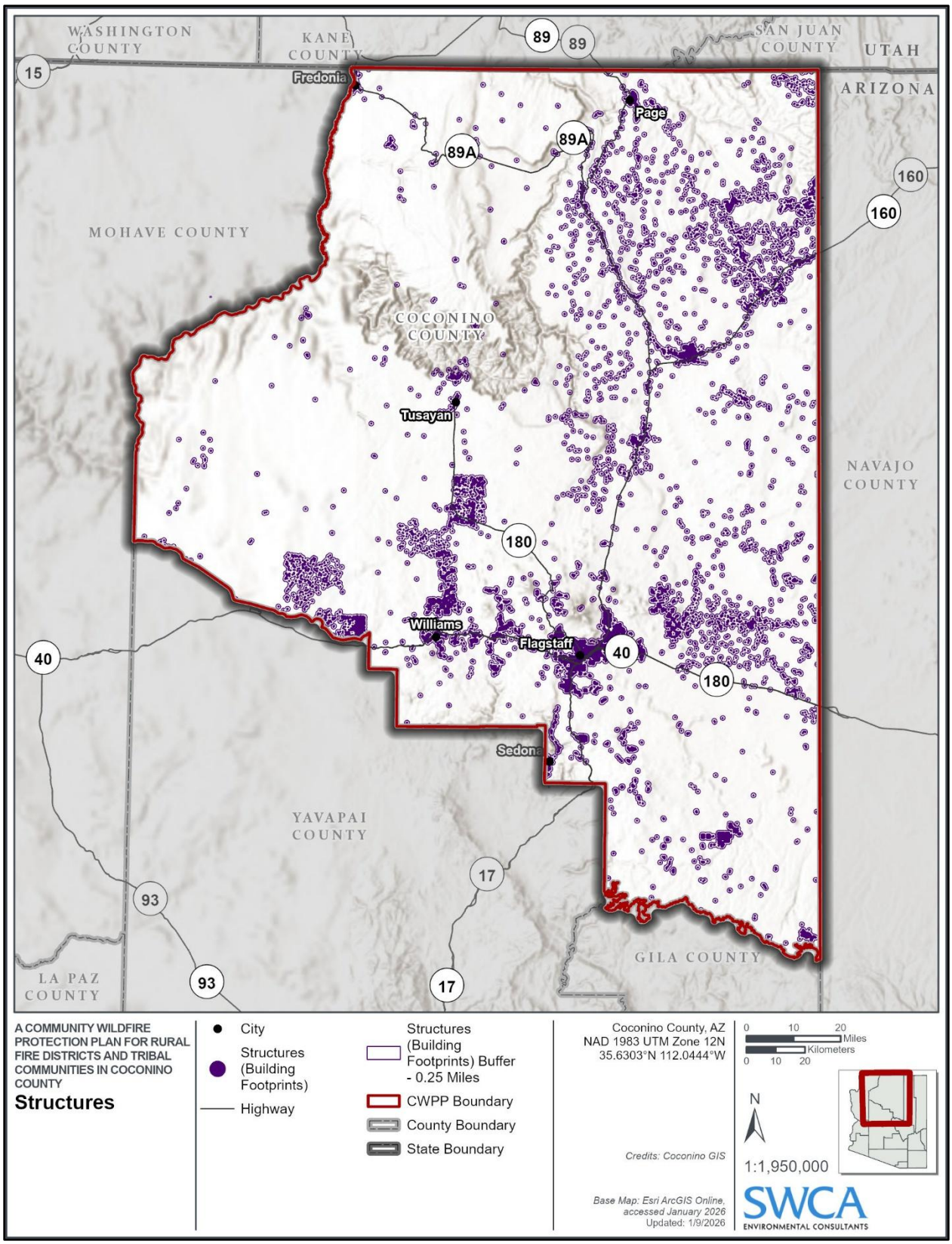

Figure 3.4. Planning area QWRA input – building footprints.

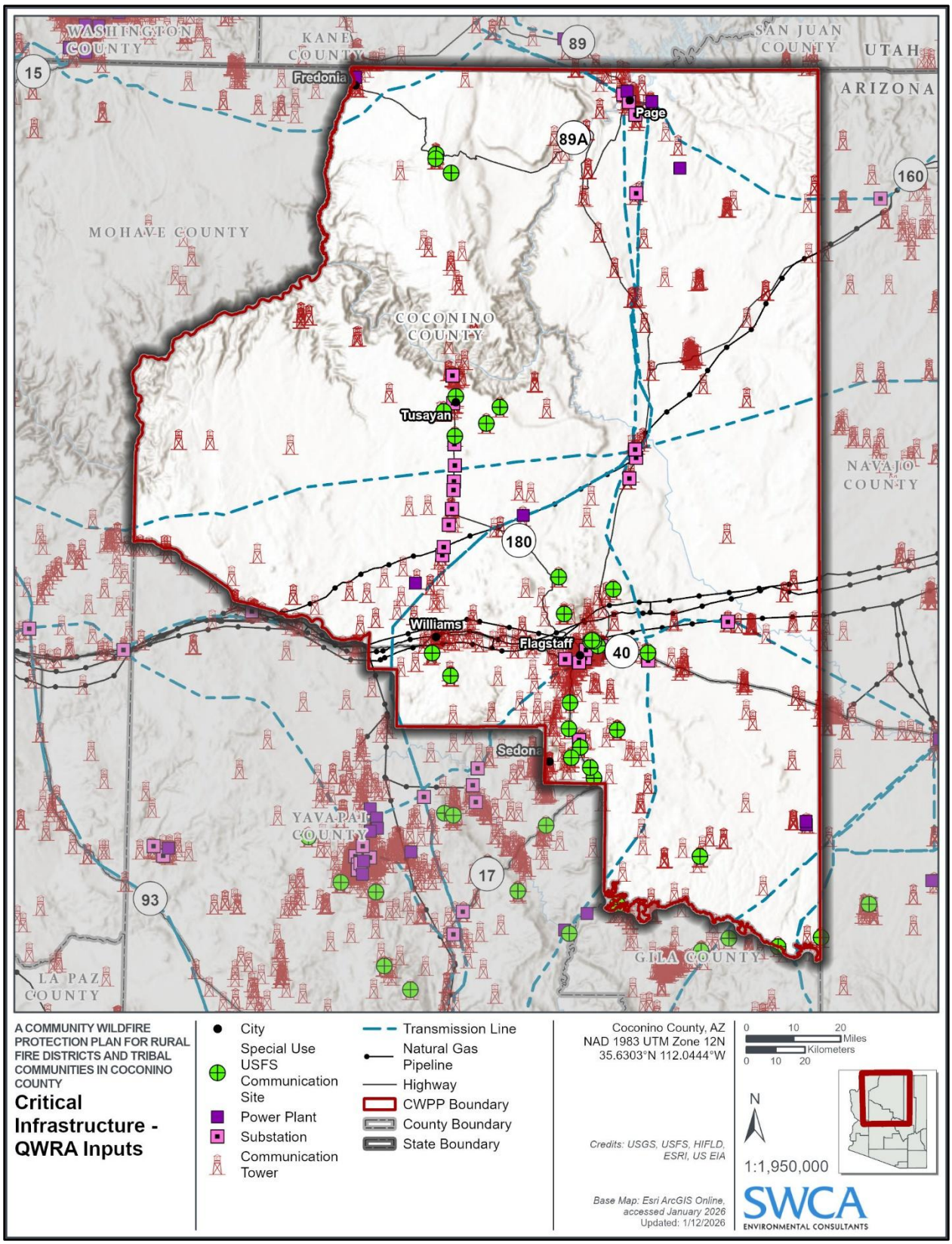

Figure 3.5. Planning area QWRA input – HVRA: infrastructure.

RISK MODELING AND SCORING

Landscape Fire Behavior

Landscape fire behavior modeling was executed in IFTDSS (FlamMap/RANDIIG) using peak fire season condition parameters (IFTDSS n.d.c). These settings model fire behavior under very high fire weather conditions. The model uses data from nearby RAWS to determine conditions for live and dead fuel moistures and wind speed and direction. Specifically, a wind speed of 19 miles per hour was used for the modeling.

Weighting and Relative Importance

To develop a quantitative risk product (Wildfire Risk to Structures and Infrastructure) the HVRAs must be weighted with a relative importance value (Scott et al. 2013). Relative importance values for this risk assessment were assigned as 70% for structures and 30% for critical infrastructure (Figure 3.6). Structures were weighted higher because the loss of homes and community buildings generally has a greater overall impact on the community than the loss of individual pieces of critical infrastructure. For example, the loss of a wooden utility pole, while disruptive, typically represents a smaller economic and social impact compared with the loss of a residence or other occupied structure.

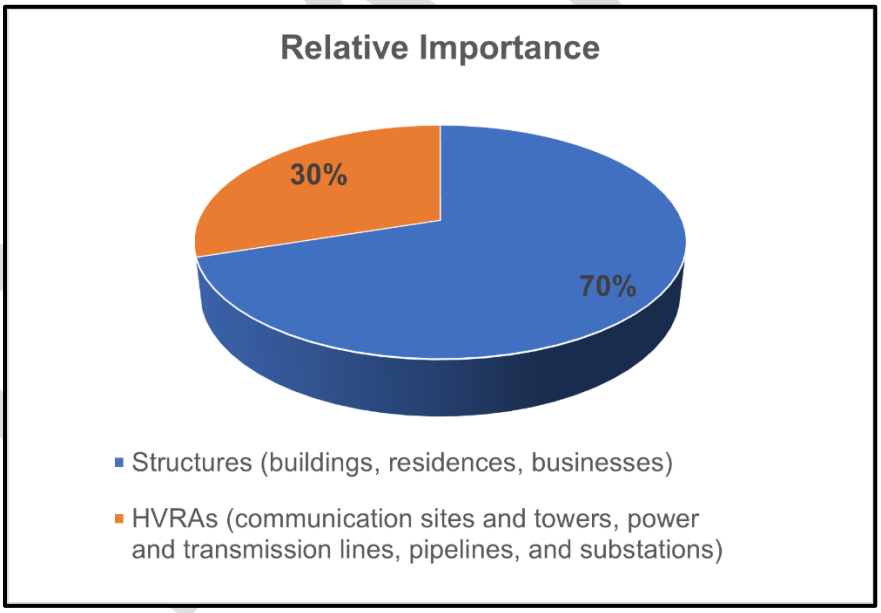

Figure 3.6. Relative importance of collaboratively selected HVRAs for the planning area.

QWRA Results

The Wildfire Risk to Structures and Critical Infrastructure map (Figure 3.7) highlights high and very high wildfire risk along populated corridors, where wildland fuels overlap with infrastructure and buildings. Areas with elevated risk typically have a high density of both structures (buildings and residences) and fuels. It is important to note that this QWRA assesses wildfire risk specifically to structures and HVRAs.

Therefore, areas without these assets, such as forests, watersheds, or undeveloped lands, show no data in this analysis.

This does not imply that these areas are unimportant or without wildfire hazard. One of the strengths of the QWRA framework is its flexibility: managers can incorporate additional values they seek to protect, such as natural resources, recreational areas, or ecological features, into the analysis. By doing so, the framework can identify areas where those values are most exposed to wildfire hazards, helping prioritize mitigation actions across both built and natural resources. This focus on structures and HVRAs aligns with the CWPP's objective of prioritizing communities and critical infrastructure, while still allowing the framework to be expanded to address other values of concern.

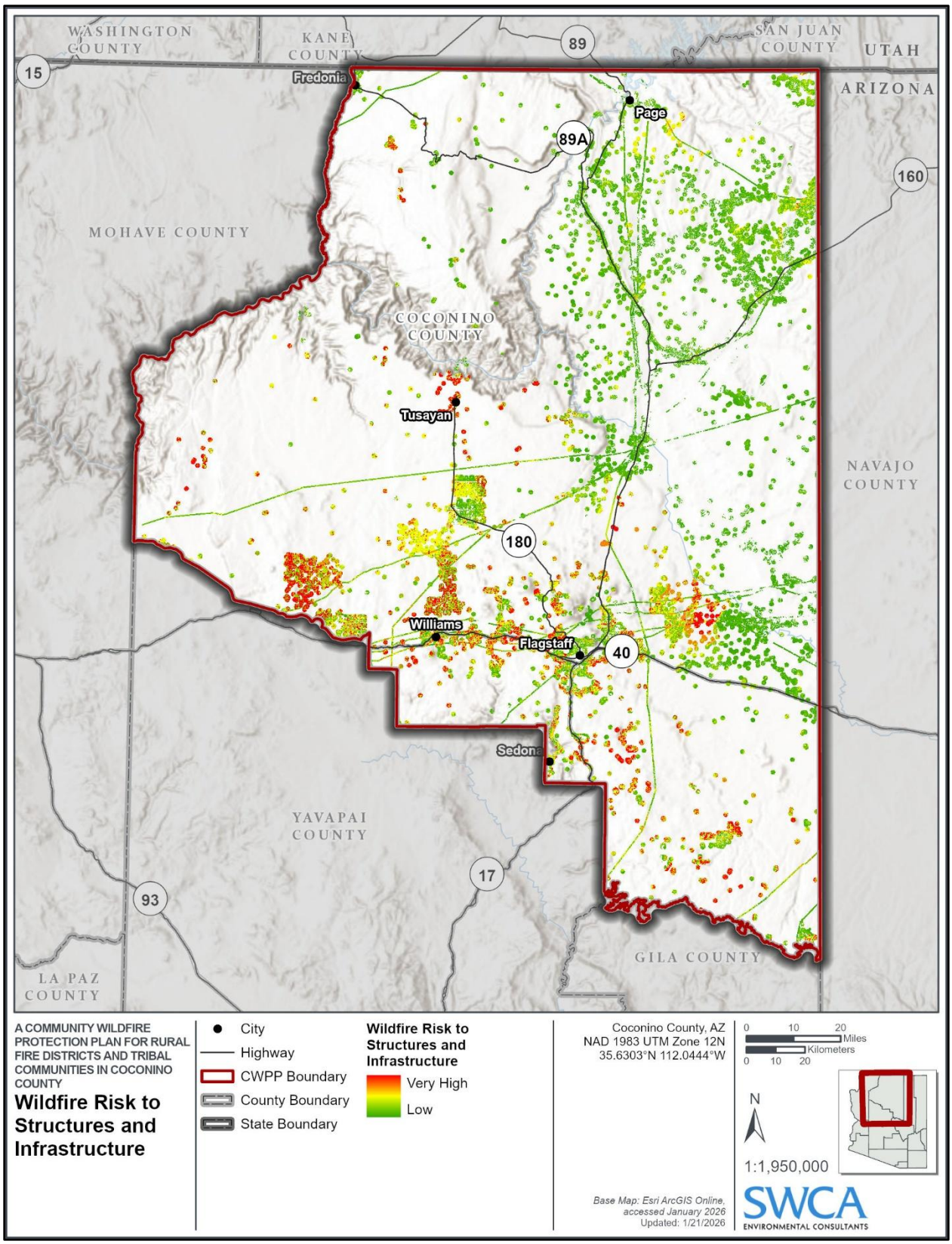

Figure 3.7. Wildfire risk to structures and infrastructure in the planning area.

QUALITATIVE RISK CONSIDERATIONS

While the QWRA offers a powerful, science-based, data-driven framework for evaluating wildfire hazard and exposure across the planning area, it is designed primarily for large-scale, landscape-level analysis. As such, it does not incorporate all the localized and context-specific factors that influence real-world wildfire outcomes and community vulnerability. Factors such as the distance from firefighting resources, availability of water supply, ornamental vegetation (particularly in urban settings), evacuation constraints, and opportunities for successful containment are not included within the model's inputs.

Additionally, the QWRA modeling does not simulate structure-to-structure ignition (i.e., urban conflagrations), which is a key driver of wildfire spread in densely developed areas. Likewise, broader community context at the local level, such as preparedness levels, public outreach effectiveness, and response capacity fall outside of the scope of large-scale quantitative modeling.

To complement the large-scale insights provided by the QWRA, this section integrates qualitative analysis focused on local conditions and concerns. Together, the quantitative and qualitative approaches provide a more complete and nuanced understanding of wildfire risk in the planning area. Specifically, this section presents findings from on-the-ground community hazard assessments.

FIELD-BASED COMMUNITY HAZARD ASSESSMENTS

Community hazard assessments were conducted in August 2025 using a modified version of the NFPA Wildland Fire Risk and Hazard Severity Form 1144. This form is based on the NFPA Standard for Reducing Structure Ignition Hazards from Wildland Fire 2013 Edition (NFPA 2013). The purpose of the community hazard assessment and subsequent ratings is to identify fire hazards and risks not otherwise discernible through desktop analysis and to prioritize areas requiring mitigation and more detailed planning. These assessments should not be seen as tactical pre-suppression or triage plans.
The community hazard assessment helps to drive the recommendations for mitigation of structural ignitability, community preparedness, and public education.

Communities were delineated based on Census designated areas, county subdivisions, proximity to fire districts, and development patterns (e.g., analyzing landscape features and the built environment to provide more tailored and actionable information). Each community (Figure 3.8) was rated based on conditions within the community and immediately surrounding structures, including access, adjacent vegetation (fuels), defensible space, adjacent topography, roof and building characteristics, available fire protection, and placement of utilities. Each score was given a corresponding descriptive rating of low, moderate, high, or extreme (Table 3.3). The full community assessment findings are detailed in Appendix C.

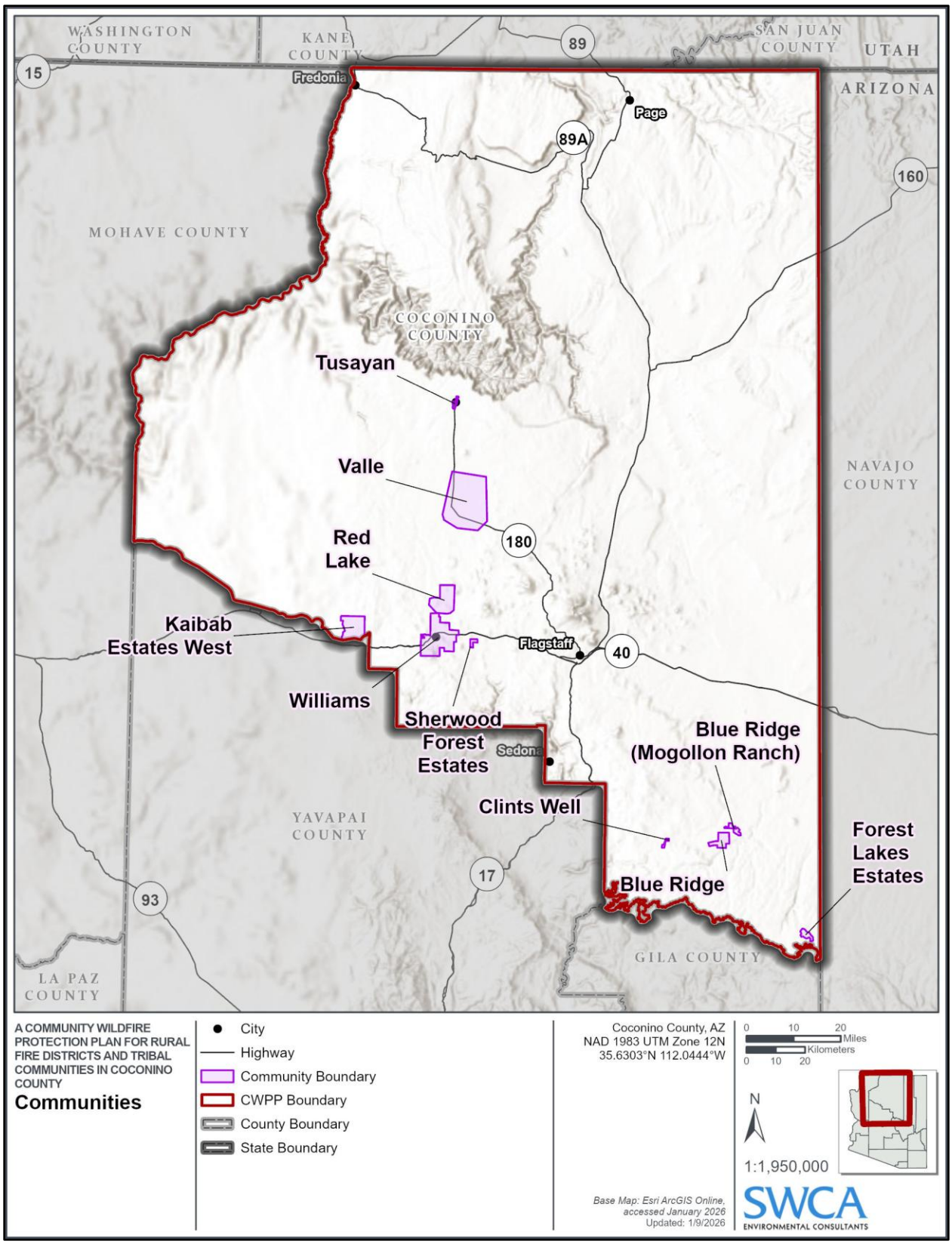

Figure 3.8. Communities within the planning area.

Table 3.3. Field-Based Community Hazard Assessment Ratings

Community	Community Wildfire Hazard Rating (Lowest Possible is 25%)
Blue Ridge	75% High
Forest Lakes Estates	58% Moderate
Clints Well	79% High
Kaibab Estates West	79% High
Red Lake	73% High
Sherwood Forest Estates	58% Moderate
Tusayan	65% High
Valle	72% High
Williams	57% Moderate

Note: Appendix C summarizes current mitigation activities, recommended actions, and values at risk for each community, while Appendix J addresses community evacuation planning.

Post-Wildfire Debris-flow and Flooding Risk

Overview of the 2017 Post-Wildfire Debris-Flow and Flooding Assessment

The *Post-Wildfire Debris-Flow & Flooding Assessment: Coconino County, Arizona* (Loverich et al. 2017) evaluated countywide vulnerability to post-fire flooding and debris flows and included two components: 1) a broad, county-level screening assessment and 2) two detailed pilot studies (Williams and Fort Valley). At the time of publication, the study estimated that up to 34% of buildings and 26% of critical facilities in Coconino County were at elevated risk of post-fire flooding if no actions were taken to reduce severe wildfire potential. Additionally, approximately 593 homes, 13 dams, and numerous other critical facilities (including major transportation corridors, water supply infrastructure, and public utilities) were located within identified debris-flow risk zones.

The study concluded that forest-health initiatives could reduce post-fire flood and debris-flow risk by as much as 58%, but emphasized that such treatments must occur at the full watershed scale, including areas currently designated as wilderness, to achieve maximum benefit. Overall, the assessment demonstrated that many populated areas and key infrastructure assets in Coconino County face significant post-fire flood and debris-flow exposure, but that risk can be substantially reduced through a combination of vegetation management, forest-health treatments, development guidelines, emergency action planning, public education, flood-warning systems, and infrastructure resilience measures.

Post-Wildfire Debris Flow Risk Corridors

To evaluate potential post-fire debris-flow impacts, this CWPP incorporates the findings of the *Post-Wildfire Debris-Flow & Flooding Assessment: Coconino County, Arizona* (Loverich et al. 2017). To maintain alignment with the countywide scope of this CWPP, the analysis focuses on the countywide results presented in the study, specifically the map for debris flow risk corridors (DFRCs). This map identifies areas where post-fire debris flows pose a significant risk to public infrastructure and private lands across Coconino County (Figure 3.9).

Note: Post-fire debris flow corridor data are based on a 2017 county-scale analysis and are subject to limitations in resolution and current applicability. Conditions on the ground may have changed due to recent wildfires, prescribed fire, and other land management activities. As a result, this dataset should be used as a general planning tool, and site-specific conditions should be evaluated when assessing risk.

Recent events highlight these limitations. For example, the community of Tusayan experienced significant flash flooding in August 2023 despite having limited mapped debris flow corridors in close proximity. This event underscores that post-fire flooding risk may extend beyond mapped areas, particularly where recent fire activity has altered watershed conditions.

Additional information regarding post-fire recovery, restoration strategies, and funding sources is provided in Appendix F.

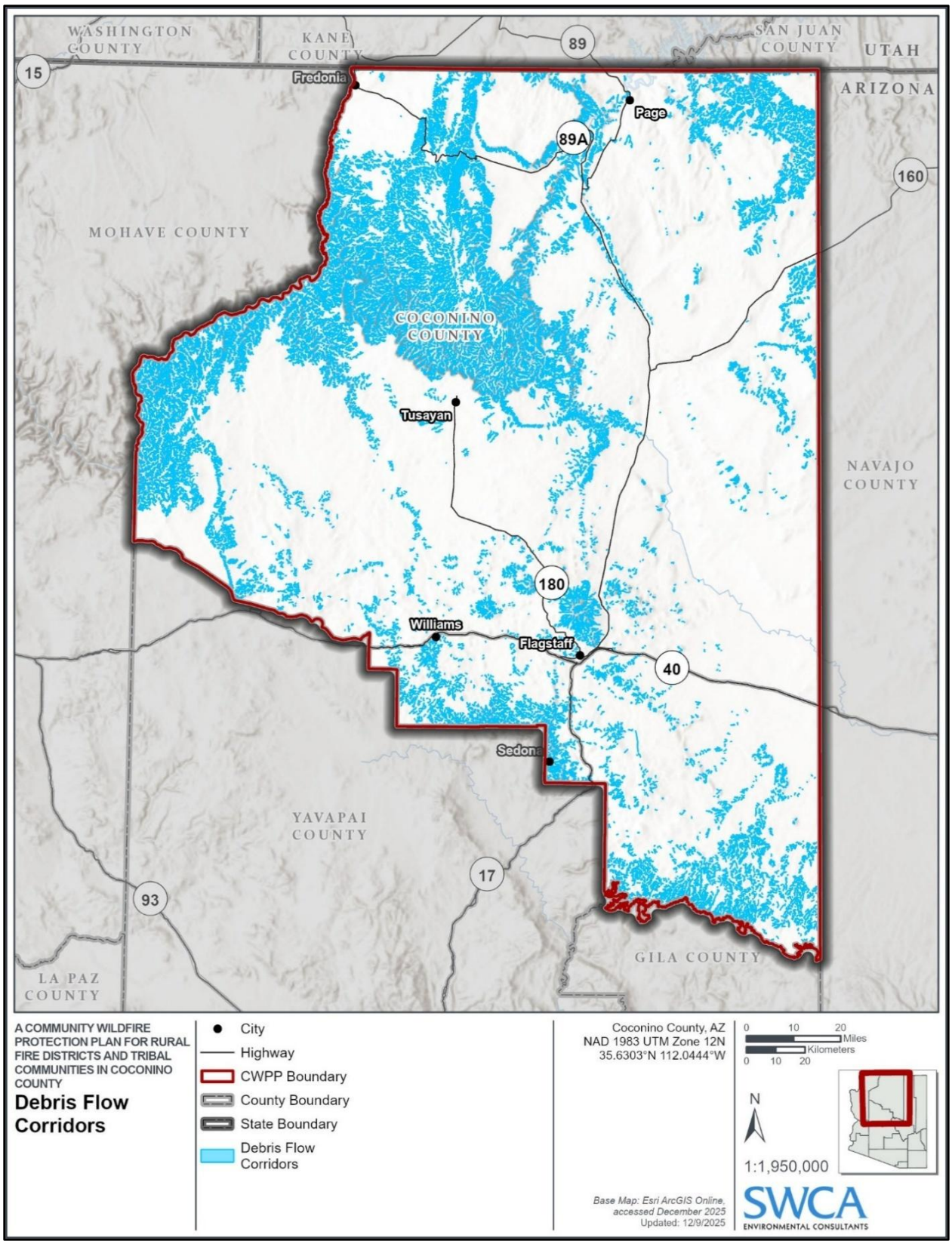

Figure 3.9. DFRC map.

Source: Loverich et al. (2017)

Potential Treatment Areas

This CWPP builds on the 2017 study by integrating burn-probability modeling to identify corridors where wildfire likelihood overlaps with post-fire debris-flow risk. Burn-probability outputs were combined with the DFRC to highlight areas where elevated burn potential coincides with mapped debris-flow hazards. Figure 3.10 illustrates these intersections, enabling the CWPP to pinpoint corridors that are both susceptible to debris flows and likely to experience wildfire.

Corridors with both high burn probability and mapped debris-flow risk should be prioritized for hazardous-fuel treatments to reduce potential debris sources, paired with post-fire resilience actions that help limit downstream impacts. Areas with higher burn likelihood should receive correspondingly higher treatment priority.

Delineation Process

Areas of the landscape with burn probability values greater than 0 (>0%) were intersected with debris flow risk corridors. To focus on priority and manageable treatment areas, locations with zero burn probability were removed. The remaining areas were then grouped by burn probability thresholds to generate priority level (Table 3.4).

Table 3.4. Treatment Priority Categories

Burn Probability Class (%)	Treatment Prioritization Category
Non-burnable	None – category was removed
0–20	Low
20–40	Medium
40–100	High

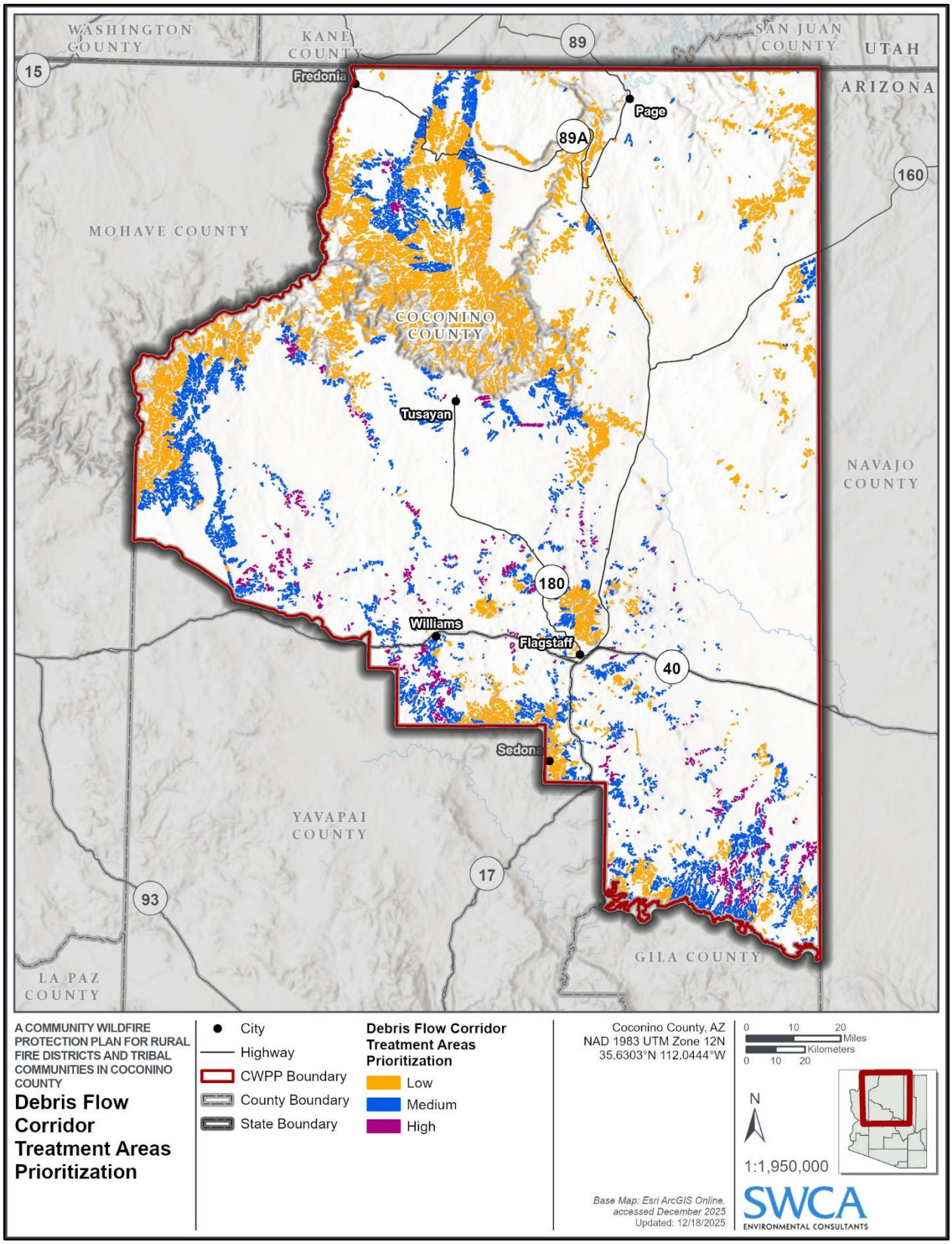

Figure 3.10. DFRCs with a high probability of burning.

Mitigation Strategies

This section outlines general mitigation actions designed to reduce the likelihood and severity of post-fire debris flows within Coconino County. These actions build upon and complement the mitigation recommendations identified by Loverich et al. (2017). The resulting mitigation strategy focuses on reducing ignition potential and fire behavior in high-priority corridors, strengthening community and infrastructure resilience, and improving preparedness for post-fire flood and debris flow hazards.

Fuels Treatment and Forest Health

1. Hazardous fuel reduction in high-priority areas (Figure 3.10)
    a. Prioritize mechanical thinning, mastication, and targeted prescribed fire in corridors and source watersheds where high burn probability overlaps with DFRCs.
    b. Focus on slopes, headwater basins, and upper drainages that contribute to the greatest sediment transport potential.
    c. Coordinate with the USFS, DFFM, and Tribal partners to align treatment boundaries across jurisdictions.
2. Strategic fuel breaks and fire behavior modification
    a. Establish or reinforce fuel breaks upslope or upstream of high-priority areas to slow fire spread into high-hazard drainages.
    b. Modify canopy and ladder fuels to reduce the likelihood of uncharacteristically high-severity fire that triggers debris-flow initiation.
    c. To reduce high severity fire effects during wildfire events, introduce prescribed fire to help reduce heavy fuel loads and restore fire adapted forests and grasslands. .
3. Vegetation restoration and watershed health
    a. Promote long-term forest health treatments on a watershed scale (e.g., thinning for stand resilience, invasive species removal, reforestation with fire-adapted species) that reduce severe burn potential.
    b. Restore degraded meadows and riparian areas that provide natural sediment attenuation.

Infrastructure and Built Environment Resilience

1. Structural hardening and drainage improvements
    a. Encourage flood-resilient construction or retrofits in locations downstream of DFRCs (e.g., improved foundation drainage, flood-resistant materials, reinforced culverts, sediment basins).
    b. Promote defensible space and ember-resistant zones around structures in drainage-adjacent neighborhoods.
2. Critical infrastructure protection
    a. Assess and retrofit high-risk infrastructure (including roads, culverts, bridges, utility corridors, and communication facilities) located within or downstream of DFRCs.
    b. Incorporate DFRC data into capital-improvement planning for culvert sizing, stormwater controls, and drainage conveyance upgrades.

Post-Fire Emergency Response and Flood Preparedness

1. Develop post-fire emergency action plans
    a. Establish protocols for post-fire BAER-style rapid assessments following wildfires in or near DFRCs.
    b. Pre-identify priority locations for emergency actions such as wattles, debris barriers, check dams, flood barriers, and channel clearing.
    c. Identify pre-fire stream channel/watershed restoration opportunities to reduce post-fire flooding impacts before a wildfire occurs.
    d. Pre-identify priority locations for emergency actions such as wattles, debris barriers, check dams, flood barriers, and channel clearing.
2. Flood forecasting, monitoring, and warning systems
    a. Expand or enhance early-warning systems (e.g., ALERT gauge network, rain-rate thresholds tied to debris-flow models).
    b. Integrate DFRCs into county emergency alert zones and evacuation planning.
    c. Prepare public-facing post-fire flood hazard maps for rapid deployment after wildfire containment.

Land-Use Planning and Development Guidelines

1. Assess development standards in DFRC areas and adjacent landscapes
    a. Encourage new development to avoid DFRC footprints and downstream hazard zones where feasible.
    b. Update zoning codes, subdivision standards, or hillside ordinances to require:
        i. Adequate drainage design for debris-laden flows
        ii. Increased setbacks in drainages
        iii. Use of engineered stormwater controls for new projects
2. Pursue integration with county plans
    a. Integrate DFRC considerations into the County Comprehensive Plan and Hazard Mitigation Plan.
    b. Encourage agencies to use DFRC and burn-probability information during permit review and plan approvals.

Community Awareness, Outreach, and Education

1. Public education on post-fire flooding and debris-flow hazards
    a. Develop community-specific education materials for neighborhoods in or downstream of DFRCs.
    b. Provide guidance on personal flood preparedness, defensible space, and home hardening that reduces ignition and flood vulnerability.
2. Pre-fire and post-fire outreach
    a. Conduct annual outreach before monsoon season to residents near DFRCs.

b. After wildfire events, quickly communicate updated post-fire debris-flow forecasts, risk zones, and protective actions.

Cross-Agency Collaboration and Funding

1. Interagency coordination
   a. Work with the USFS, DFFM, National Weather Service, Tribal governments, and municipalities to coordinate treatments and emergency response.
   b. Align DFRC priorities with ongoing forest health partnerships (e.g., FWPP, GFFP, 4FRI).
2. Funding and grant opportunities (see Appendix I for a full list of grant opportunities related to watershed protection).
   a. Pursue FEMA Hazard Mitigation Grant Program (HMGP) and Flood Mitigation Assistance funding for infrastructure upgrades and watershed resilience.
   b. Pursue USFS Collaborative Forest Landscape Restoration Program (CFLRP), WUI grants, and state hazard-mitigation funding for high-priority DFRC-adjacent fuel treatments.

CHAPTER 4 – MITIGATION STRATEGIES

This chapter provides project, implementation, and fuel treatment recommendations as part of a comprehensive wildfire mitigation strategy, including actions to improve preparedness and resiliency before and after a wildfire. Details on past and current planning efforts are in Appendix B; post-fire response and rehabilitation are in Appendix F.

Recommendations in this chapter were developed collaboratively with local, state, federal, and Tribal stakeholders, as well as community members. Feedback received from public outreach was used to craft and tailor project recommendations. Appendix G contains a summary of the public outreach process and public input, including feedback gathered during in-person public meetings and information from the community survey.

CWPP recommendations follow the Cohesive Strategy's three main goals: resilient landscapes, fire-adapted communities, and safe, effective wildfire response. Many actions can be implemented by homeowners or at the community level (see Appendix D for preparedness resources). Funding sources are in Appendix I.

Recommendation matrices in this chapter serve as an action plan, meeting DFFM CWPP requirements (DFFM 2025d) and aligning with the 2020 Arizona Forest Action Plan. Projects should be implemented collaboratively and often align with priorities in other local CWPPs.

As a non-regulatory document, CWPP recommendations are not mandatory but provide guidance to mitigate wildfire risk. Implementation is at the discretion of county representatives, land managers, homeowners, and stakeholders. Subject matter experts should be involved in project planning, implementation, and maintenance to balance ecological and risk reduction goals. Projects should aim to provide co-benefits to the community and ecosystem.

Enhancing community wildfire resilience requires coordination across regional plans and local frameworks. A list of proposed community-specific projects, many already in local fire protection district strategic plans, is in Appendix C. Their inclusion highlights the CWPP's commitment to local collaboration, especially with rural and Tribal communities.

Cohesive Strategy Goal 1: Resilient Landscapes

Recommendations to restore and maintain landscapes are focused on vegetation management and hazardous fuel reduction.

Creating resilient landscapes is important for communities to become capable of withstanding and recovering from various disturbances, including wildfires and flooding. This section addresses the importance of building resilient landscapes by providing countywide project recommendations (Table 4.2), addressing broad areas of concern (Figure 4.1), identifying priority fuel treatment areas (Figure 4.2) and firesheds (Figure 4.4), and highlighting past treatment areas since 2018 (Figures 4.5 - 4.7, Table 4.1).

Project recommendations were developed collaboratively with the Core Team, incorporating their expertise, awareness of public input, and local knowledge. These recommendations apply countywide, focusing on landscape-scale treatments, wildfire risk mitigation for critical infrastructure, and future project prioritization. They also emphasize cross-boundary fuel treatments and improving community outreach on fuels reduction. Project timelines were set based on wildfire hazards, mitigation needs, preparedness, funding, leadership, and staff capacity.

The following information and guidance is provided at a broad scale since this is a county CWPP. Community specific project recommendations have been developed and can be viewed in Appendix C.

Areas of Concern

To better prioritize resilient landscape recommendations, the CWPP Core Team delineated broad areas of concern within the Coconino County planning area using a variety of mapping products and local expertise. The areas of concern are used to demonstrate locations in the planning area that should be prioritized for mitigation actions to reduce risk to structures and assets. Figure 4.1 identifies areas of concern across the Coconino County planning area. These areas are not exhaustive and should be supplemented with other agency priorities for watershed treatments, forest heath priorities and other existing and planned treatments to reduce wildfire risk and protect valued assets (i.e., priority fuel treatment areas described below).

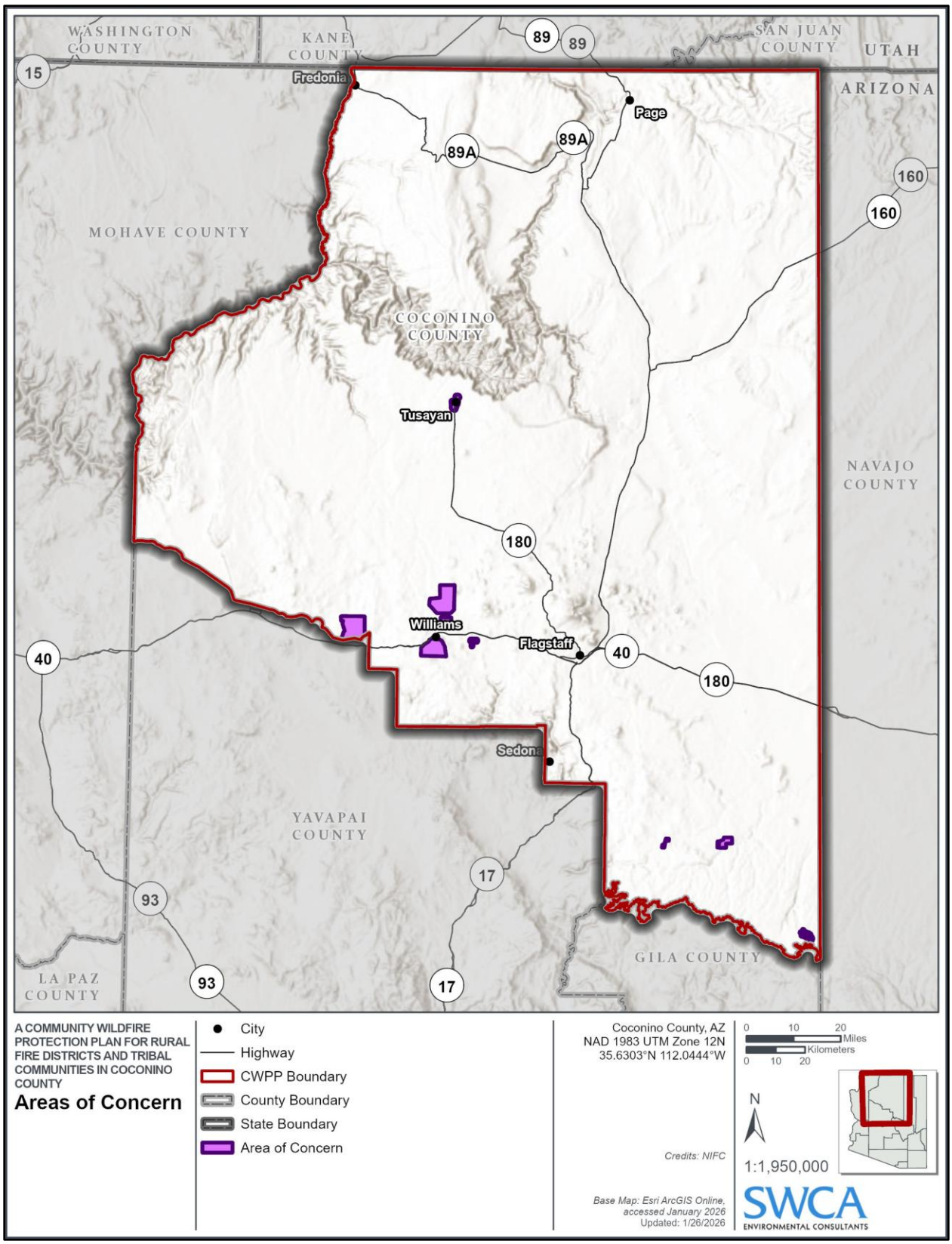

Figure 4.1. Areas of concern in the Coconino County CWPP planning area.

Priority Fuel Treatment Areas

The planning area lies almost entirely within overlapping priority landscapes identified at both the state and federal levels, aligned with the USFS Wildfire Crisis Strategy (2022) and displayed in Figure 4.2. Within the planning area, Arizona State lands and national forest systems provide landscape-level treatment areas to combat the national wildfire crisis.

In Coconino County, prevailing southwest winds influence land managers to prioritize landscape-level treatments south of values at risk, such as critical infrastructure and communities. Potential operational delineations (PODs) (Figure 4.3), Firesheds (Figure 4.4), and past fuel treatment areas (Figure 4.6) are identified in this section, providing publicly available and active federal landscape treatments, such as the 4FRI.

State and Federal Wildfire Resilience Priority Areas

At the state level, Coconino County falls within Arizona's Shared Stewardship Agreement, established to collaborate with the USFS focusing on implementation of fuels treatment projects across National Forest lands to mitigate existing wildfire risk and threats to communities, infrastructure, cultural resources, natural resources, and watershed health (DFFM 2024c). At the federal level, the county falls within USFS lands, including the Coconino, Kaibab, and Apache-Sitgreaves national forests, which focuses national resources on the most at-risk communities and landscapes across the western United States (Figure 4.2) (USFS 2015a).

Four Forest Restoration Initiative (4FRI)

Established in 2010, 4FRI encompasses approximately 2 million acres across national forest lands and is an effective forest restoration effort between four forests in northern Arizona including: Kaibab, Coconino, Kaibab, Apache-Sitgreaves, and Tonto national forests. Three of the four forests in the planning area are a part of this initiative including the Kaibab, Coconino, and Apache-Sitgreaves national forests along with a shared stewardship agreement with DFFM (USFS 2015a). To learn more about the 4FRI, visit: https://4fri.org/.

Treatments within the planning area of 4FRI range between mechanical, commercial thinning; hand thinning; burning projects; and timber harvest projects. Figure 4.7 shows 4FRI timber harvest fuel treatments throughout the planning area including completed, current, 5-year plan, and contracted projects.

Aligning Potential Operational Delineations (PODs)

The USFS in partnership with the Rocky Mountain Research Station Wildfire Risk Management Science Team developed Potential Operational Delineations (PODs) for the purposes of creating wildfire preplanning management strategies for land managers and landscape-scale wildfire response teams. PODs use existing potential control features such as ridges, rivers, roads, and fuel type transitions. PODs combine local fire knowledge with advanced spatial analytics to help managers develop a common understanding of risks and management opportunities (USFS 2025).

Recommended fuel treatment projects in this CWPP may partially follow POD boundaries in areas where fuel management objectives coincide with landscape characteristics and potential control features. Figure 4.3 displays PODs identified by the USFS throughout Coconino County.

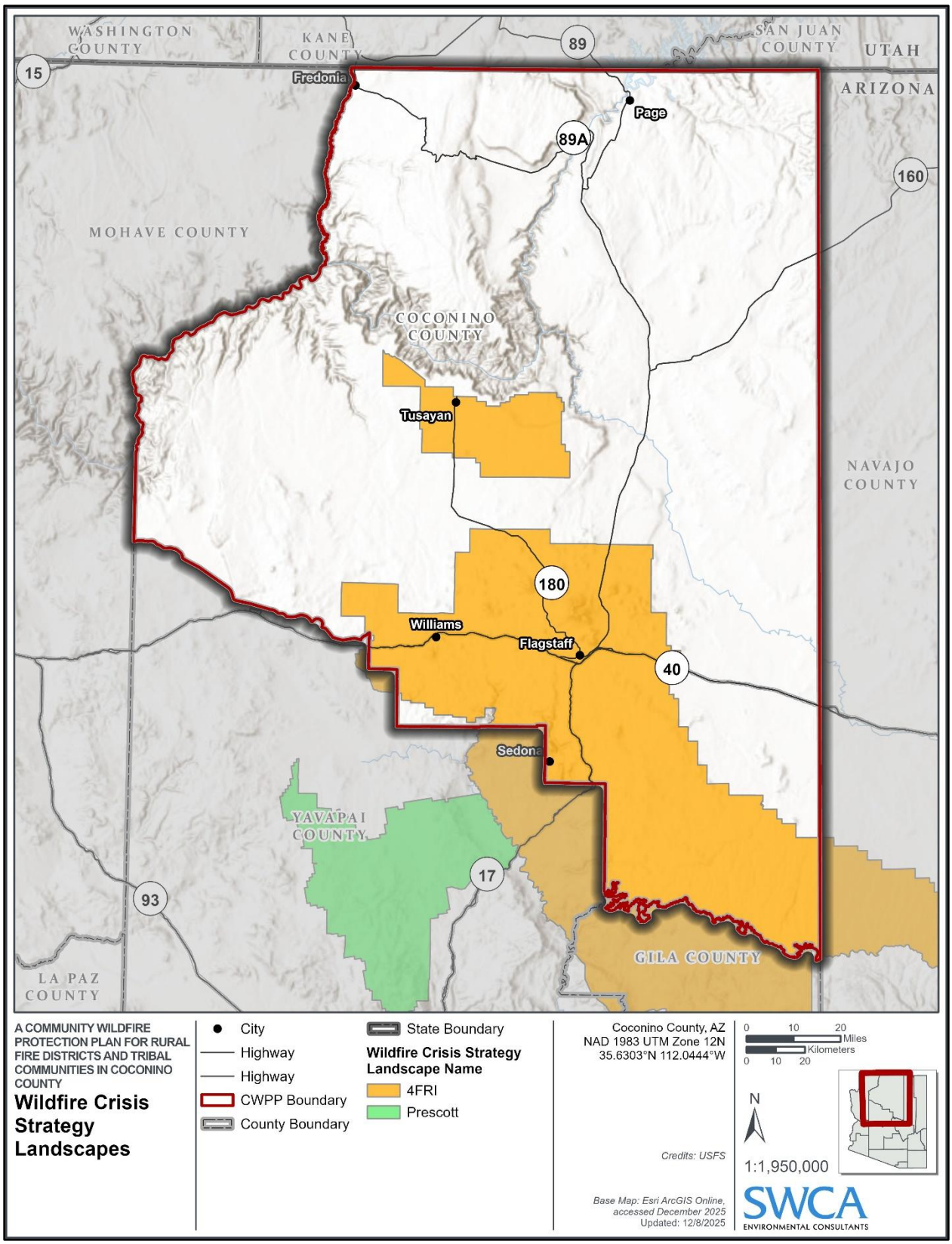

Figure 4.2. Wildfire Crisis Strategy landscapes in the Coconino County CWPP planning area.

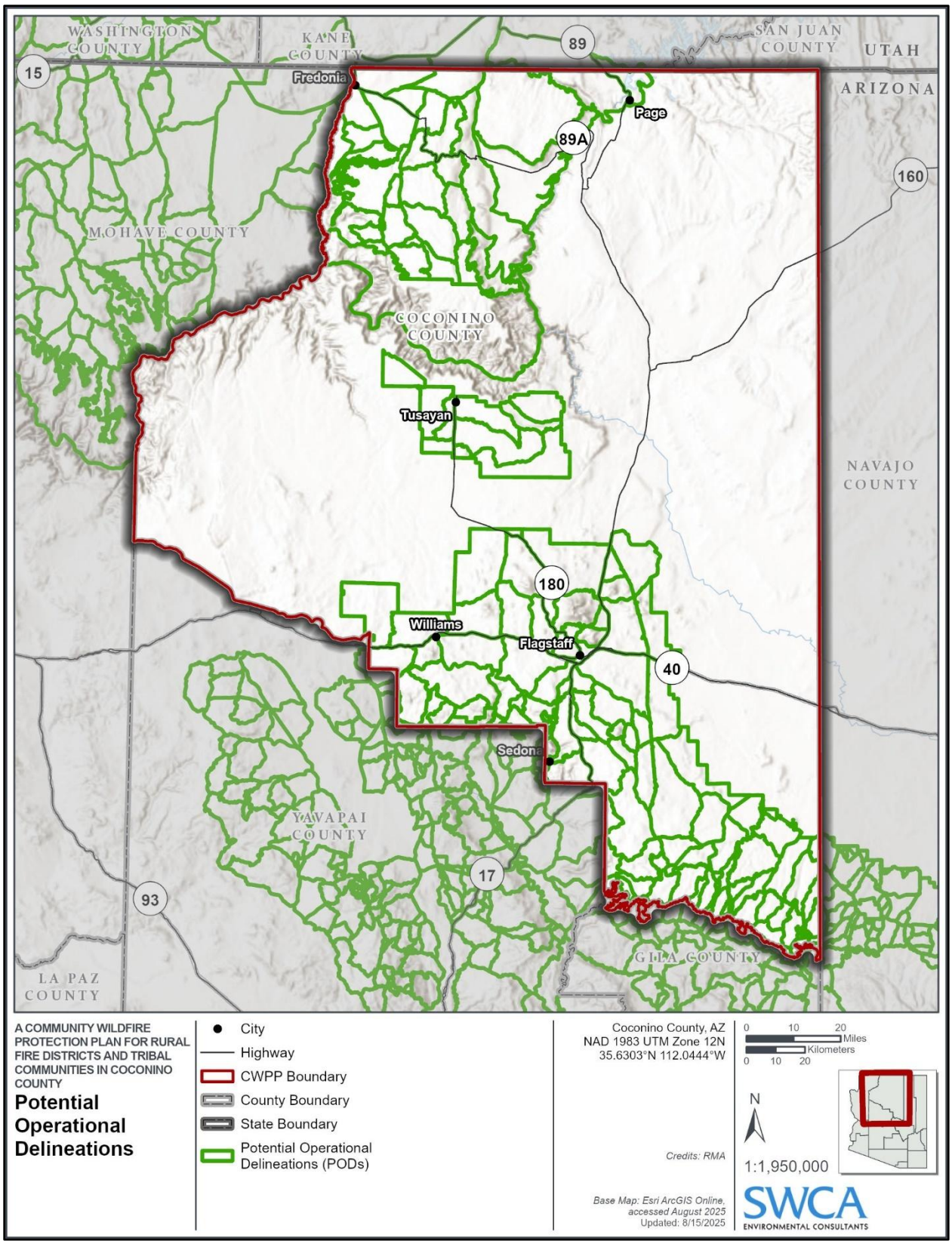

Figure 4.3. PODs defined by the USFS across the Coconino County CWPP planning area and surrounding counties.

Firesheds

Firesheds delineate fire ignition locations and where those are likely or not likely to spread to communities and exposed buildings. These data are available through the Fireshed Registry, a geospatial portal that displays agency forest and fuel management investments in relation to historical and predicted fire activity in alignment with the regional and forest 5-year action plans (Rocky Mountain Research Station 2019).

Fireshed maps do not measure wildfire risk; instead they show the source of exposure to better understand priority fuel treatments that are needed near communities to help reduce the risk of fire transmission from national forests to developed areas (Rocky Mountain Research Station 2019). Figure 4.4 displays high-risk firesheds in Coconino County and all areas to the south of the planning area, distinguished between USFS and all other land jurisdictions. Firesheds to the south of the planning area are essential to understand where fuel treatments should be prioritized to enhance protection of fire transmission across boundaries.

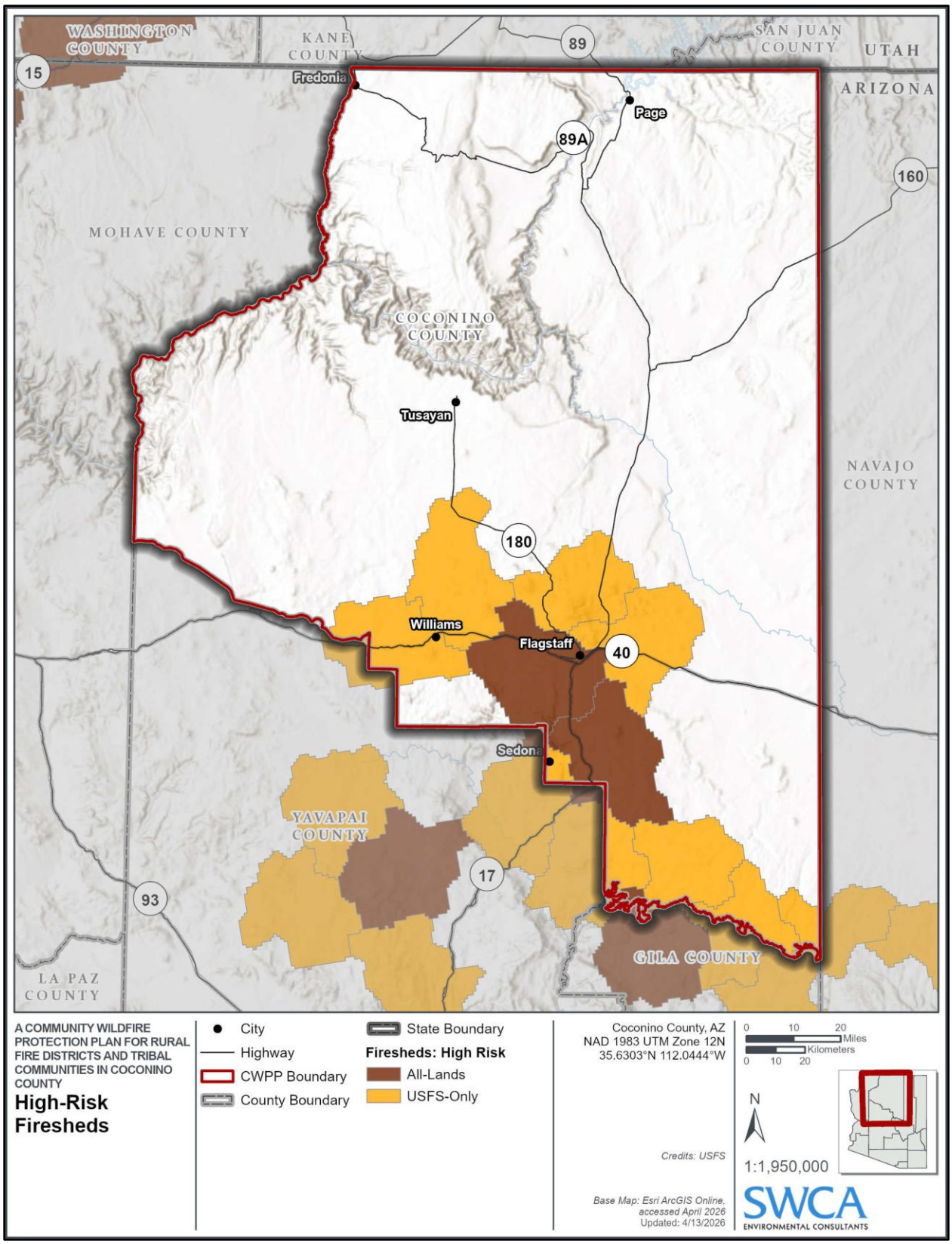

Figure 4.4. Firesheds in the planning area.

Dominant Fuel Types and Recommended Treatments

Dominant fuel types across Coconino County's planning area vary, each requiring different recommended fuel treatments and methods. The fuel types in Coconino County with associated acreages are displayed in the Fuels and Topography section of Chapter 2 (Figure 2.3; Table 2.1).

Recommended projects to enhance wildfire resilience were developed collaboratively with the Core Team and meant to be applied across a range of fuel types (Table 4.2). Fuels treatment methods that could be implemented across the County, including defensible space, fuel breaks, prescribed burning, grazing, and larger-scale treatments are described in detail in Appendix E.

When planning specific projects, fuel and land cover specifics should be discussed and mapped with appropriate land managers and other subject matter experts to ensure projects align with local land management and ecosystem function objectives. Every effort should be made to align treatments with the Arizona Forest Action Plan (DFFM 2020) with consideration of all appropriate best management practices and sound science. Treatments should be strategically located to maximize effectiveness of other existing and ongoing projects, such as 4FRI (Figure 4.7). Additionally, treatments should occur where fuels overlap areas of high wildfire risk (see Figure 3.7 in Chapter 3), countywide priority treatment areas for action (see Figure 4.1), and fireshed priority areas (see Figure 4.4).

Ecological Impacts Considerations

Proper consideration should also be given to any ecological impacts resulting from these projects. All projects should adhere to the National Environmental Policy Act (NEPA), Endangered Species Act, National Historic Preservation Act, Clean Water Act, Arizona Native Plant Law, and other regulatory compliance mechanisms when conducted on lands requiring compliance considerations.

More specifically, broader ecosystem function and health should be considered to ensure projects do not negatively impact habitat. Opportunities for multi-benefit projects should be identified; many mitigation actions overlap actions that restore or improve wildlife habitat, ecosystem function, and overall landscape resilience. Actions that meet or contribute to a variety of goals and objectives and align with multiple planning documents can be a more effective use of limited funding or lead to funding applications that are more competitive.

Past Fuel Treatment Accomplishments

Fuels management of both public and private land in the WUI and beyond is essential to reducing risk to communities and critical infrastructure during a wildfire event, as well as meeting the criteria of the National Cohesive Strategy Goal 1. For many years, Coconino County has actively planned and executed fuel treatment projects in coordination with fire districts, municipal, county and state agencies, utilities, and non-profit organizations.

Various treatment methods were used across federal, state, Tribal, county, municipal, and private lands. The most common treatment methods used in Coconino County included timber harvest, prescribed burns, fire use, and broadcast burns, as depicted in Figure 4.5.

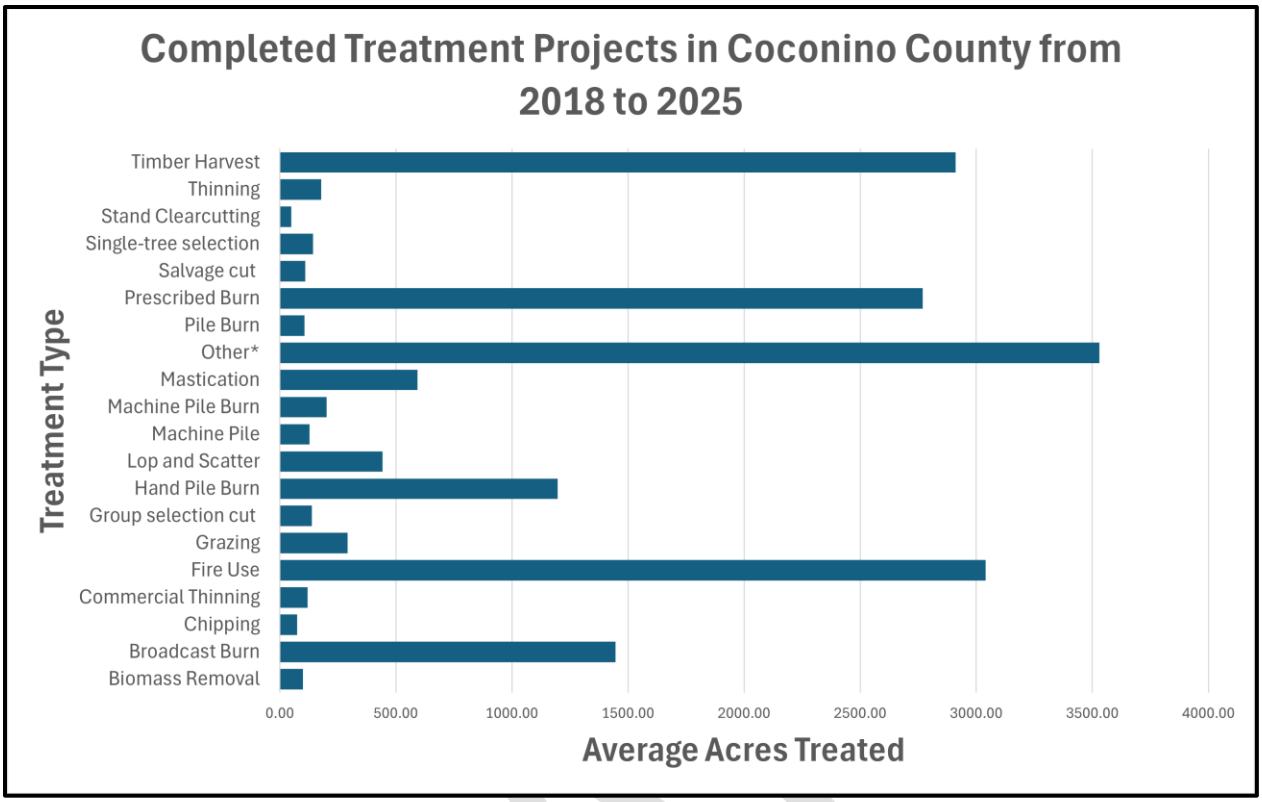

Figure 4.5. Completed fuels treatment methods in Coconino County from 2018 to 2025.

* Other includes a variety of hazardous fuels treatment types completed by the Arizona Conservation Corps Veterans Fire Corps.

Past treatments accomplished in Coconino County's planning area are publicly available through two online map portals from the Treatment and Wildfire Interagency Geodatabase (TWIG) and USFS. Both include updated information on past, current, and future treatment plans. All treatment data across Coconino County completed since 2018 are displayed in Figure 4.6. The total acreage of fuels treatments completed in Coconino County varies across jurisdictions and includes prescribed fire, wildfire managed for resource benefit, mechanical thinning, and other treatment types, particularly in earlier years when fire was the dominant treatment method (Table 4.1).

Table 4.1. Total Acres Treated in Coconino County Since 2018

Year	Total Acres Treated	
	TWIG Treatments	4FRI Treatments
2018	210.47	31,990.78
2019	1,521.72	28,912.71
2020	1,986.14	47,667.43
2021	3,374.53	64,115.99
2022	4,398.26	65,973.94
2023	4,292.45	60,094.32
2024	988.16	N/A
2025	855.49	N/A

Year	Total Acres Treated	
	TWIG Treatments	4FRI Treatments
Total	**10,534.37**	**298,755.18**

TWIG Fuels Treatments

Approximately 10,534 acres of all jurisdictional lands in Coconino County were treated between 2018 and 2025 (Figure 4.6). Treatments were primarily focused south of vulnerable communities due to the prevailing southwest winds. Current and planned treatments are available through both the TWIG website and webmap.

For more information on TWIG, visit: https://reshapewildfire.org/home

The webmap is available at: https://reshapewildfire.org/twig/layers

4FRI Fuels Treatments

In Coconino County, approximately 298,755 acres of USFS land were treated between 2018 to 2023 (Figure 4.7), including prescribed fire, wildfire managed for resource benefit, mechanical thinning, and other fuels treatments. Most treatment projects were primarily focused south of vulnerable communities due to the prevailing southwest winds. Updated information on current and planned 4FRI treatment projects is available through the USFS website and webmap.

For general information, visit: https://www.fs.usda.gov/r03/natural-resources/forest-management/four-forest-restoration-initiative-geospatial-data

The webmap is available at:
https://usfs.maps.arcgis.com/apps/dashboards/405832b821194f568fb5c150f3be93db

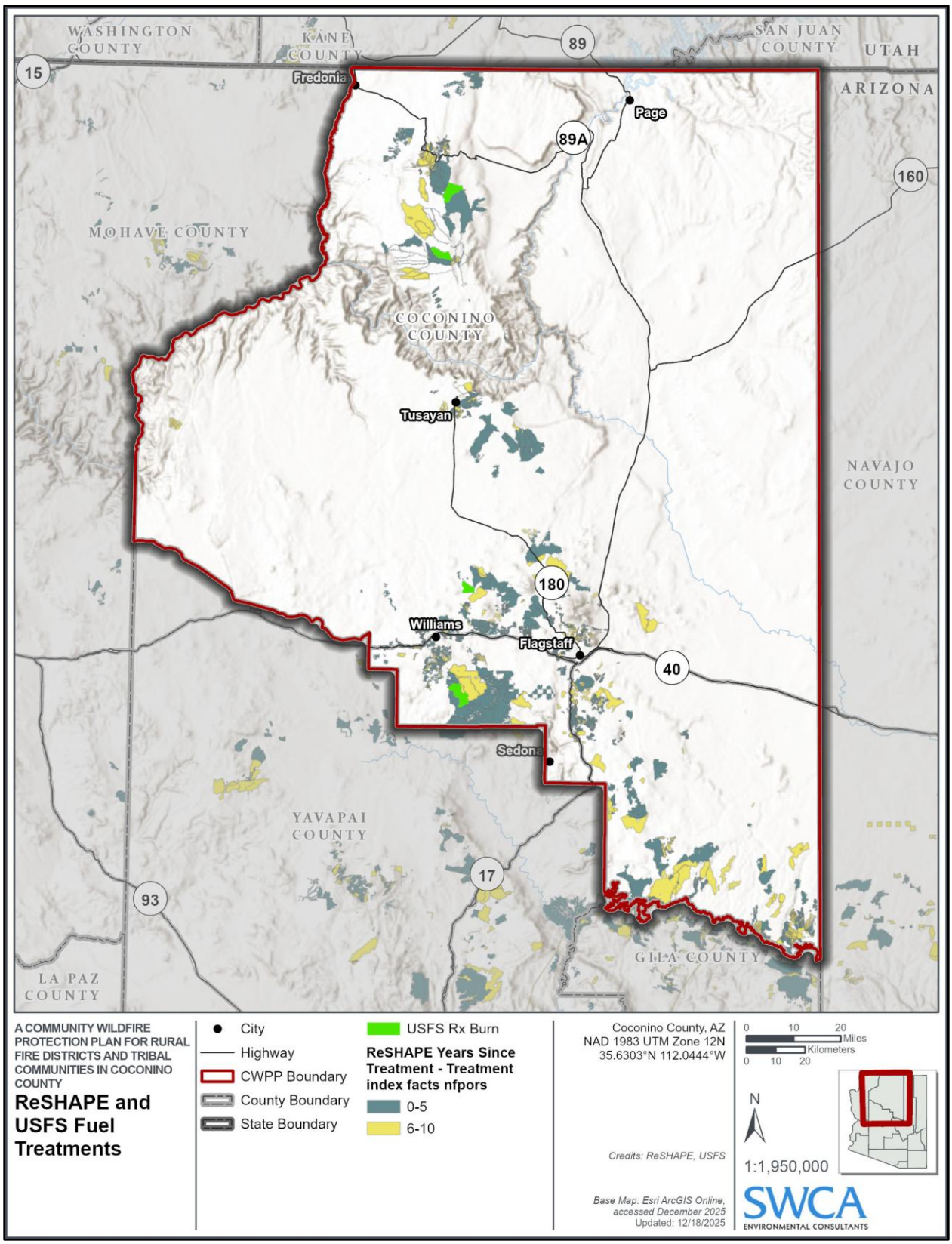

Figure 4.6. ReSHAPE and USFS fuel treatments in Coconino County since 2018.

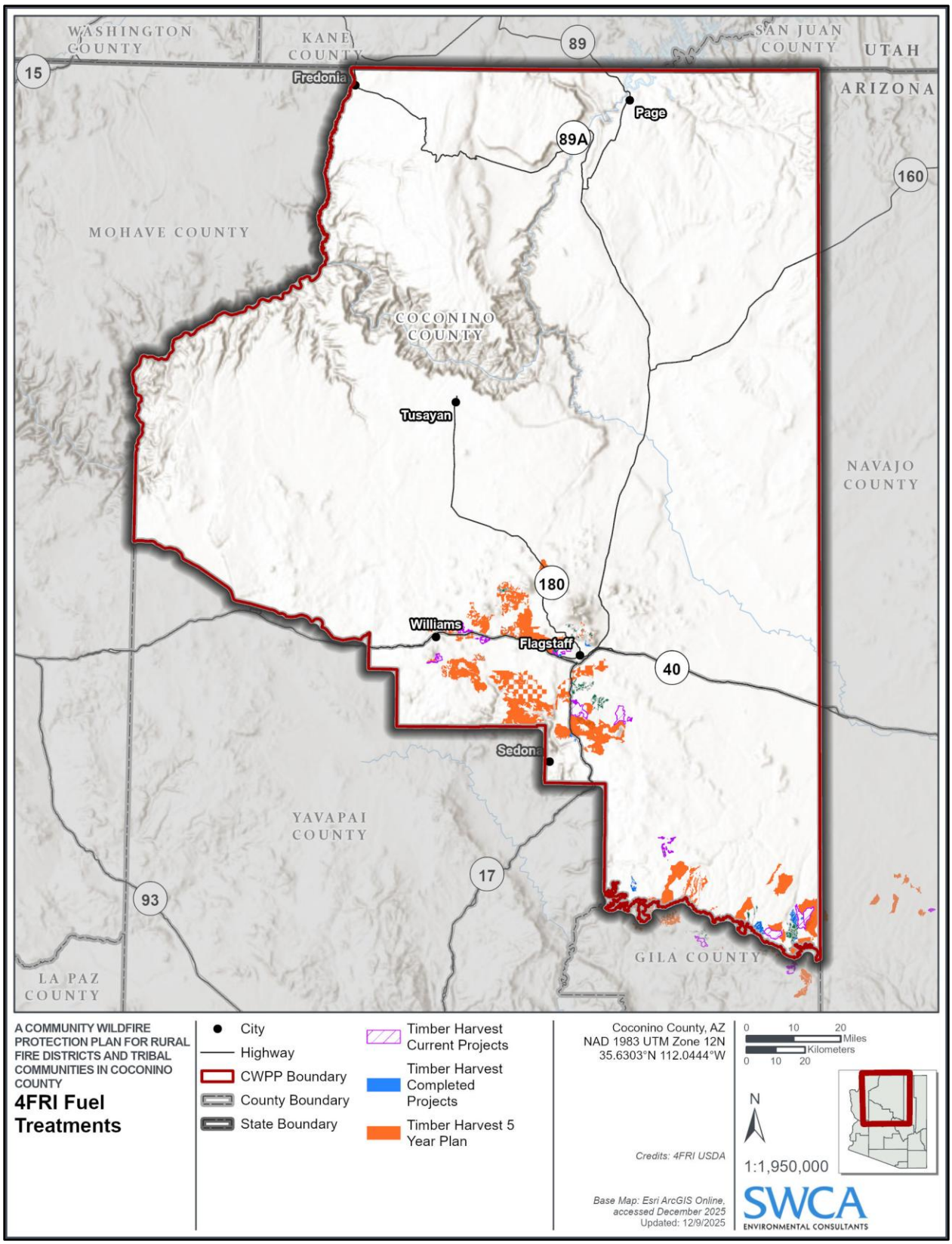

Figure 4.7. Completed 4FRI fuels treatments across Coconino County since 2018.

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Recommendations for Resilient Landscapes

Table 4.2. Recommendations to Create Resilient Landscapes (Vegetation Management)

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Management/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
RL #1	H	2026 - 2032	**Connect gaps in treatments in high wildfire risk areas to provide cross-jurisdictional landscape level resilience** Design a long-term strategic plan for landscape level treatments by collaborating with other jurisdictions across boundaries. The strategic plan would foster a cohesive effort between jurisdictions by agreeing upon the same goals and objectives for prioritizing treatment efforts to benefit landscape-level efforts.	Countywide	All Agencies	• Develop a long-term strategic plan for landscape level treatment across multiple jurisdictional boundaries • Utilize QWRA approach to identify remaining gaps in treatments • Consider use of PODs to connect treatment areas and institute state land PODs in conjunction with DFFM • Fill in 4FRI gaps through multiagency collaborative process • Continue with ongoing project treatments and maintenance • On private lands, look at measures to provide discounted thinning programs or subsidies/cost-share grants to support actions by private residents • Increase Good Neighbor Authority projects across all jurisdictions and prioritize implementation near critical infrastructure, communities and neighborhoods • Increase Good Neighbor Authority (GNA) projects where applicable, particularly near critical infrastructure, communities, and neighborhoods, and use memoranda of understanding (MOUs) or other agreements to support cross-boundary collaboration for long-term landscape-level treatment planning • Utilize prescribed fire where appropriate in conjunction with trained and certified crews and following an approved burn plan • Consider the introduction of a watershed fee on water bills to help fund continued restoration in watersheds throughout the County	• Identify same goals and objectives for treatment efforts • Provide more consistency with fuel treatment projects across all jurisdictions • Enhance collaboration between agencies	• All agencies collaborate on developing a long-term strategic plan for landscape level treatment across multiple jurisdictional boundaries, focused near and around rural communities. • Improve coordination of wildfire mitigation across jurisdiction boundaries • Create more Good Neighbor Authority (GNA) agreements across all jurisdictions • Prioritize fuels treatment projects on the southern boundaries of communities and neighborhoods. • Enhance efficiency in funding pursuit and implementation	• Joint Chiefs' Landscape Restoration Partnership • Landscape Scale Restoration (LSR) Competitive Grant Program • DFFM Healthy Forest Initiative Grants •
RL #2	M	Ongoing	**Improve wildfire prevention and resilience education and outreach to communities** This initiative seeks an opportunity to improve education and outreach about wildfire prevention and resilience to communities, especially in areas where fire risk is high. Outreach efforts should emphasize importance of fuel treatments around homes and surrounding landscapes. Many fire chiefs emphasized the challenges faced to provide education and outreach to their communities, one of which includes lack of funding to allocate towards education and outreach.	Countywide	GFFP, County, ERI	• Create education and outreach campaign focused on Coconino County specific vegetation types and fire regimes • Provide science-based materials on appropriate treatment types tailored to specific fire regimes. • Communicate research in a simple manner to serve diverse readership • Lean on Fire Districts and local trusted figures to disseminate information • Create a Coconino County branded image for pre and post treatment homes and landscapes that can be used to dispel myths about defensible space and thinning activities • Use already treated areas as case studies to represent good treatment approaches • Engage academic institutions in sharing research to the public	• Provide coherent and consistent communication to all residents • Increase awareness of overall purpose and intent of thinning projects • Enhance community involvement with supporting thinning, prescribed fire, and other fuels reduction projects • Combat misinformation and public misperception on thinning activities, prescribed fire, and other fuels reduction projects	• Create stream-lined countywide outreach materials that distinguish pre and post treated areas around homes and landscapes. • Utilize local Fire Districts and local trusted figures to distribute outreach information throughout communities. • Create materials that educate the local residential and visitor population on importance of fuels treatment projects and wildfire prevention measures.	• BIA - Tribal Climate Resilience Annual Awards Program • State Fire Assistance / Wildland Urban Interface Grants • Good Neighbor Citizenship (GNC) Grants • Wildland Urban Interface Grant Program • NIFC - Fire Prevention, Education, and Mitigation • EPA Grant Programs • USFS Urban and Community Forestry Program

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Management/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
RL #3	M	2026 - 2031	**Increase green waste removal initiatives across all communities** Bolster biomass removal countywide by increasing capacity and supporting green waste removal initiatives and locations throughout the county.	Countywide	County	• Provide support to fire districts to continue and expand existing green waste removal efforts. • Seek funding to purchase hauling equipment (i.e., dump truck, trailer, etc.) • Develop a schedule and pick up cycle for green waste in rural areas • Seek contractor to support the program • Consider green waste disposal site material to be used for bioenergy • Identify and establish additional green waste disposal sites in centralized locations throughout the County • Consider goat grazing to reduce green biomass. • Look for subsidies/grants to support initiatives • Increase Wood for Life program – expand firewood availability- prioritizing resources to areas with high numbers of elderly or underserved residents. Consider impacts to related businesses and explore opportunities for potential collaboration or partnerships with related businesses (e.g., Chiz for Che, Dakota Logging, Koho for Hopi, and the Red Feather Development Group,).	• Incentivize landowners to conduct biomass removal on properties • Encourage community members to reduce biomass around properties and increase defensible space • Provide fuelwood to Tribal and elderly communities throughout the county through Wood for Life	• Identify future green waste disposal sites near communities that do not have existing sites. • Seek subsidies/grants that support green waste removal initiatives • Enhance relationship with Wood for Life program to distribute wood from thinned properties to adjacent Tribal communities.	• State Fire Assistance/Wildland Urban Interface Grants • Community Challenge Grant • Firewise USA Program

RL #4	H	2026 - 2028	**Improve resilience of critical infrastructure across the county and within communities**
			Create fuels reduction and wildfire mitigation plans around critical energy, water and communication infrastructure (e.g., substations, water treatment plants, communication towers) across the county and within communities. Most of these rural communities heavily rely on one single point of infrastructure within their communities; therefore, it is crucial to protect these structures from damage or destruction from wildfire.
				Countywide	ADEQ, County Emergency Management, Federal Agencies, Arizona Power Supply, Water Improvement Districts	• Identify all critical infrastructure across the county and determine associated fire risk
						• Design fuels reduction and wildfire mitigation plans specifically around critical infrastructure
						• Collaborate with agencies that own and manage infrastructure to strategize wildfire mitigation efforts
						  ○ Powerlines and substations: Arizona Power Supply
						  ○ Water treatment facilities: Coconino County and Arizona Department of Environmental Quality (ADEQ)
						  ○ Communication towers: tower owners, phone carriers (e.g., Verizon, AT&T), public safety (e.g., Police departments), and government agencies (e.g., USFS)
						• Seek funding opportunities to implement fuels reduction projects targeting reducing wildfire risk around critical infrastructure
						• Request an annual meeting between the County and APS to mutually identify locations of needed vegetative treatments within ROW in high-risk areas of the WUI and support the Core Team in obtaining grants necessary to implement vegetative fuel reduction projects adjacent to the ROW
							• Protect critical infrastructure from wildfire destruction across all communities
							• Ensure facilities such as water treatment plants and substations are defensible and can withstand wildfires
							• Enhance collaboration with agencies that manage infrastructure by improving fuels reduction and wildfire mitigation
							• Prioritize protection of communication infrastructure from wildfires especially for rural communities
								• Prioritize fuel treatment plans around all critical infrastructure throughout the communities.
								• Establish close relationships with agencies that own and manage critical infrastructure to strategize wildfire mitigation efforts.
								• Continue to seek funding opportunities for implementation of fuels reduction projects targeting mitigation around critical infrastructure within rural communities.
									• State Fire Assistance/Wildland Urban Interface Grants
									• DFFM Healthy Forest Initiative Grants
									• DEMA Mitigation Grants Programs
									• USFS - Community Wildfire Defense Grant (CWDG)

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Management/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
RL #5	M	2027 - 2032	**Create a countywide fuels management crew to assist elderly, low-income, and disabled residents, within fire districts and communities, with defensible space implementation** Enhance community engagement by conducting thinning, pruning, and other biomass removal efforts around individual properties, especially to those who are not physically or financially capable. Most of the communities in the county meet these criteria and often need assistance with implementing thinning treatments around their properties and hauling biomass off their properties.	Countywide (prioritize fire district-based implementation)	GFFP, County, and DFFM in association with fire districts	• Incentivize property owners to remove biomass from properties by setting up community prizes and giveaways for conducting fuels treatments ○ Example: Forest Lakes offered a raffle entry for a $100 gift certificate to a local restaurant for those who removed biomass, dropped off to a green waste site, and provided a receipt as proof. • Identify individual contractors, compose and distribute a list (including local personnel) or utilize DFFM prison crews, to offer biomass removal services especially for those who are physically incapable • Explore tax credit opportunities or subsidies for residents that remove biomass from properties • Work with county officials to create a countywide ordinance on biomass densities within property boundaries • Seek funding to develop a few centralized green waste removal sites across the county • Work with National Forest Foundation, Wood for Life Program coordinators to utilize wood as firewood for Tribal communities. Consider impacts to related businesses and explore opportunities for potential collaboration or partnerships with related businesses (e.g., Chiz for Che, Dakota Logging, Koho for Hopi, and the Red Feather Development Group,). • Work with insurance agents/brokers to identify potential for insurance premium incentives • Introduce the IBHS Wildfire Prepared Home program countywide • Leverage ongoing urban wildland research to promote increased participation (i.e., Dr Mahmoud research on percent of resilient homes needed to reduce risk of urban conflagrations) • Consider Firewise Communities Recognition wherever possible • Work with youth groups to organize community cleanup days • Work with a grant writer to procure grant funding to support program overhead	• Enhance engagement of individual property owners to actively remove biomass around properties • Reduce hazardous fuels within community • Increase community resilience to wildfires by reducing fuels to compliment adjacent defensible space properties • Ensure those that are disabled, elderly, low income, and physically incapable of reducing fuels around properties can have defensible space around their properties • Collaborate with DFFM crews to assist with fuels reduction and biomass removal around individual properties in communities	• Maintain a list of countywide/ community-level contractors and DFFM prison crew contacts for biomass removal services assistance. • Establish and uphold a countywide ordinance on biomass densities around properties. • Create countywide incentives for property owners to remove biomass from properties. • Seek subsidies and grants for rural communities for biomass removal efforts.	• Wildland Urban Interface Grant Program • Urban Land Institute Community Action Grants • DFFM Hazard Fuels Mitigation Grants • DFFM Healthy Forest Initiative Grants • State Fire Assistance/Wildland Urban Interface Grants • DFFM Tree Grants • Community Challenge Grant • BIA - Tribal Climate Resilience Annual Awards Program • USFS - Community Wildfire Defense Grant (CWDG) • USFWS - National Fire Plan WUI Community Fire Assistance
RL #6	H	2027 - 2030	**Create a countywide multi-jurisdictional invasive species management plan** Many invasive species across Coconino County such as cheatgrass and giant reed increase overall fire risk across the county. An invasive species management plan can assist with mitigating these fire-prone species to help mitigate wildfire risk across all jurisdictions, particularly around critical infrastructure and communities.	Countywide	All agencies (primarily NRCS, ADOT, and DFFM)	• Collaborate with multiple agencies on management of invasive species to help maintain consistency of treatment across all jurisdictions • Enable community residents and property owners to remove fire prone invasive weeds around properties • Work with infrastructure agencies to target invasive species removal around infrastructure and roadways to reduce fire risk threats • Organize community workdays to remove invasive species around community	• Reduce fire risk across all communities, properties, and critical infrastructure • Provide an opportunity to collaborate with other agencies to ensure treatment plans remain consistent across all jurisdictions • Enhance community engagement through educating invasive species identification and organizing community workdays	• Create and maintain an invasive species database accessible for all jurisdictions • Promote awareness to communities on invasive species management and correlation to wildfire risk. • Provide incentives to communities for removal of invasive weed species.	• DFFM Invasive Plant Grant • Re wild Grants • USFS and Western Forestry Leadership Coalition - Landscape Scale Restoration Competitive Grant Program • State Fire Assistance/Wildland Urban Interface Grants • DFFM Healthy Forest Initiative Grants

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Management/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
RL #8	M	2026 - Ongoing	**Design post-fire rehabilitation and restoration projects focused on rural communities** To prepare the county and communities for post-wildfire effects, creating post-fire rehabilitation and restoration projects can help maintain quality watershed and landscape level health. These projects would focus on stabilizing soil, mitigate heavy erosion, and reduce substantial flooding events.	Countywide (focused on all fire districts and Tribal communities)	County Flood Control District	• Work with County Flood Control District to assist with securing funding and prioritizing preparation for flood events, especially across rural communities in the county. • Conduct flood risk assessments and identify areas of high flood risk in all communities, then seek solutions to improve and mitigate flood risk • Provide the communities with proper flood mitigation equipment to install around their properties (e.g., sandbags, portable flood gates) • Incorporate native plant seeding events after wildfires, especially plants that are highly successful after wildfires and stabilize soil • Seek funding to install culverts, diversion systems and reservoirs in communities to help divert water flow during flood events • Construct sediment basins in communities • Ensure flood control mitigation efforts are protecting critical infrastructure • Install erosion control structures including silt fences, straw wattles, and jute netting • Maintain culverts to ensure proper drainage • Construct emergency spillways and drainage dips to protect roads and bridges • Identify contractors and crews that can assist those with disabilities, elderly and low-income homeowners with flood mitigation infrastructure around their properties • Conduct annual inspections around communities to identify flood risk, erosion control maintenance needs, areas that need improvement, and any other flood mitigation structure improvements needed • Update the *2017 Post-Wildfire Debris-Flow & Flooding Assessment: Coconino County, Arizona* study • Implement watershed restoration projects identified under the Post-Fire Emergency Response and Flood Preparedness section in Chapter 3	• Prepare communities with proper infrastructure to mitigate devastating flooding events especially after wildfires • Establish relationships between county and rural communities • Assist rural communities to become more resilient to post-wildfire impacts and preparedness in the event of an emergency • Protect critical community assets such as roads, water resources, infrastructure, emergency responder buildings and equipment, and properties • Ensure annual flood mitigation assessments are conducted for each community to ensure erosion control and flood mitigation equipment is maintained and functional • Assist rural communities who do not have access to equipment and funds necessary for flood mitigation control	• Inspect and maintain flood control equipment on an annual basis to ensure proper function. • Seek funding sources for equipment upgrades when needed. • Identify resources to assist those who are elderly and physically incapable of constructing flood mitigation structures around their properties.	• FEMA - Flood Mitigation Assistance Grant • FEMA - Emergency Management Performance Grant • NRCS - Environmental Quality Incentives Program • NRCS - Emergency Watershed Protection Program • EPA Catalog of Federal Funding Sources: Land Resources • EPA Catalog of Federal Funding Sources: Water Resources
RL #9	H	Ongoing	**Create countywide watershed protection projects** Debris flow from wildfires can greatly impact major watershed resources statewide. Therefore, creating a countywide watershed protection project can help mitigate detrimental impacts from wildfires to Arizona's major watersheds. Collaborating with multiple agencies, including Salt River Project (SRP), to create this plan will help reduce wildfire risk throughout key watersheds in the county.	Countywide	County, USFS, DFFM	• Implement fuels reduction projects along the Upper Colorado River, Little Colorado River, and Verde River watersheds. • Collaborate with multiple agencies to reduce fire risk and post-fire flooding across all jurisdictions • Seek contractors and funding opportunities to conduct mechanical thinning and prescribed fire treatments • Organize community workdays with communities and partners to help remove invasive species along watersheds	• Reduce fire risk within watersheds across the county • Protect the county and Arizona's major water resources from wildfire, debris and contamination • Enhance watershed health and wildfire resilience • Collaborate with multiple agencies in protecting watershed resources and treatments are consistent across all jurisdictions • Remove biomass within watersheds	• Identify contractors to conduct mechanical thinning and prescribe fire treatments. • Collaborate with other land management agencies including USFS, DFFM, BLM, and Coconino County to create and implement long term treatment plans that align with Arizona's 2020 Forest Health Act and 4FRI. • Maintain invasive species removal along watersheds	• EPA Catalog of Federal Funding Sources: Water Resources • NRCS - Emergency Watershed Protection Program • NRCS - Environmental Quality Incentives Program • DFFM Healthy Forest Initiative Grants • U.S. Endowment for Forestry and Communities - Innovative Finance for National Forests Grant Program

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Management/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
RL #10	M	2027 - 2032	**Enhance post-fire recovery coordination, planning, and assistance programs** Strengthening coordination between public agencies, NGOs, and recovery partners while developing funding mechanisms and assistance programs can improve long-term landscape, community, and economic recovery following wildfire and post-fire hazard events.	Coconino County	Coconino County Flood Control District, watershed partners, DFFM, NGOs	• Coordinate with public agencies, NGOs, and community organizations to improve post-fire recovery planning and implementation • Support development of state- and local-level post-fire recovery funding and cost-share assistance programs • Identify and maintain startup funding resources for unmet individual, community, landscape, and economic recovery needs following wildfire and post-fire hazard events • Develop partnerships to assist private landowners with post-fire landscape recovery and rehabilitation resources • Improve coordination between recovery organizations to streamline resource delivery and reduce duplication of efforts • Identify opportunities to integrate post-fire recovery planning into existing emergency management, watershed, and resilience initiatives • Support long-term recovery strategies that address watershed health, infrastructure impacts, economic disruption, and community resilience	• Improve coordination and efficiency of post-fire recovery efforts across jurisdictions and organizations • Increase access to recovery funding and technical assistance for communities and private landowners • Support long-term landscape rehabilitation and watershed recovery following wildfire • Reduce economic and social impacts associated with post-fire hazard events • Strengthen community resilience and recovery capacity after wildfire disasters	• Maintain coordination among partner agencies and organizations to evaluate recovery program effectiveness • Periodically assess post-fire recovery funding gaps and unmet community needs • Update recovery resource inventories and partnership networks as programs and agencies evolve • Monitor implementation of recovery and rehabilitation projects to inform future recovery planning efforts	• EPA Catalog of Federal Funding Sources: Water Resources • NRCS - Emergency Watershed Protection Program • NRCS - Environmental Quality Incentives Program • DFFM Healthy Forest Initiative Grants • U.S. Endowment for Forestry and Communities - Innovative Finance for National Forests Grant Program
RL #11	M	2027 - 2032	**Expand post-fire research, monitoring, and hazard assessment systems** Expanding post-fire research, debris flow monitoring, and hazard assessment systems can improve understanding of wildfire recovery needs and support more effective mitigation, preparedness, and recovery actions.	Coconino County	Coconino County Flood Control District, watershed partners, DFFM, NGOs, universities and research institutions	• Expand post-fire debris flow, flooding, erosion, and watershed monitoring systems throughout the County • Improve coordination and data sharing between agencies responsible for wildfire recovery, hydrology, weather, and hazard monitoring • Conduct research and assessments to better understand post-fire landscape recovery, watershed response, and hazard vulnerability • Develop interconnected monitoring and early warning systems for post-fire debris flows and flood events • Utilize GIS, remote sensing, and field-based assessments to identify high-risk areas and track post-fire recovery conditions • Incorporate post-fire monitoring findings into emergency preparedness, mitigation planning, and recovery strategies • Partner with academic and research institutions to support long-term wildfire recovery and resilience studies	• Improve understanding of post-fire hazards and landscape recovery processes • Enhance early warning and situational awareness for post-fire flooding and debris flow events • Support data-driven mitigation, preparedness, and recovery decisions • Improve protection of communities, infrastructure, watersheds, and natural resources following wildfire • Strengthen long-term resilience planning through improved research and monitoring capabilities	• Maintain and periodically update monitoring equipment, data systems, and hazard assessment tools • Conduct regular inspections and calibration of monitoring infrastructure and warning systems • Update post-fire hazard assessments and recovery datasets following wildfire events • Continue interagency coordination and data-sharing efforts to support long-term monitoring and research objectives	• EPA Catalog of Federal Funding Sources: Water Resources • NRCS - Emergency Watershed Protection Program • NRCS - Environmental Quality Incentives Program • DFFM Healthy Forest Initiative Grants • U.S. Endowment for Forestry and Communities - Innovative Finance for National Forests Grant Program

*Non-federal funding sources listed in this table are subject to change annually. Availability, program priorities, and eligibility criteria may vary, and this information should be confirmed with each funding agency before planning or applying for grants.

Cohesive Strategy Goal 2: Fire Adapted Communities

Recommendations for fire-adapted communities include public education and outreach actions and actions to reduce structural ignitability.

Recommendations for Public Education and Outreach

Landscape actions alone are not enough to reduce wildfire hazard; public education and engagement are vital for preventing human-caused ignitions, lowering home ignition risks, and building community resilience. Lack of knowledge or action—such as not creating defensible space or keeping hazards near structures—increases risk.

Effective strategies include wildfire home assessments, workshops on home hardening, promoting fire-resistant building and landscaping, and organizing community cleanups. Public engagement through events, social media, information booths, meetings, flyers, and newsletters raises awareness and encourages participation. Educating the community improves preparedness, reduces strain on emergency resources, and supports safe evacuations during wildfires.

Coconino County recognizes the need for well-informed fire-adapted communities and has therefore prioritized public engagement during the CWPP development process through public events, advertisements, and an online survey. **See Table G.1 and Appendix G for examples of public outreach efforts during the CWPP planning process.**

Coconino County has also hosted vital information found in this CWPP in an interactive online story map, which can be found here: https://cwpp-coconinocounty.hub.arcgis.com/.

Recommendations for Fire-Adapted Communities

Carrying out fuels reduction treatments on public land will not effectively reduce fire risk in itself. If owners have not carried out mitigation on their properties, the risk of home ignition and home-to-home spread remains high. A lack of attention in the home ignition zone places firefighters' lives are at risk when carrying out structural defense.

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Table 4.3. Recommendations for Creating Fire-Adapted Communities (Public Education and Reducing Structural Ignitability)

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Lead Agency/ Partnering Agencies	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
FAC #1	M	2026 - 2030	**Seek funding to hire a Wildfire Preparedness Coordinator(s)** Hiring a countywide Wildfire Preparedness Coordinator will serve to support fire districts in education, outreach efforts, resources, grant applications, and assisting communities to become Firewise certified. Explore if fire district-based implementation is more practical.	County Wide	County Emergency Management in association with fire districts	• Support fire districts in education and outreach efforts • Develop a central website for fire districts to access with links to available grants • Provide grant writing support and assistance • Expand staffing for FAC programs and education with additional staff and community volunteer training (Fire Ambassador Program) • Provide guidance to other entities in the County • Collaborate with fire districts and community ambassadors to help identify areas within communities that need assistance with wildfire resilience and response • Promote Firewise landscaping, home hardening, and preparedness • Guide communities through the NFPA Firewise Recognition process • Consider adopting IBHS principles in conjunction with NFPA • Maintain a list of residents in need of evacuation assistance by fire district/community.	• Provide consistency across communities within the county • Promote wildfire resilient communities • Assist rural fire districts with securing funding • Provide guidance to fire districts with writing grants and providing resources for grants • Assist communities to become recognized as Firewise.	• Design outreach and education materials to distribute to communities across the county • Develop and maintain a website with fire district grant resources • Provide grant writing assistance to all fire districts • Create and maintain an active list of homeowner's with disabilities and/or need assistance with evacuations divided by Fire District/community • Help rural communities achieve Firewise recognition	• State Fire Assistance / Wildland Urban Interface Grants • Good Neighbor Citizenship (GNC) Grants • Wildland Urban Interface Grant Program • NIFC - Fire Prevention, Education, and Mitigation • EPA Grant Programs USFS Urban and Community Forestry Program
FAC #2	M	2027 - 2030	**Promote adoption of nationally recognized wildfire preparedness programs** Encourage and promote the use of nationally recognized, science-based home hardening and defensible space programs, such as the IBHS Wildfire Prepared Home program and Firewise USA, through County-led outreach, education, and incentive-based initiatives.	Countywide	Coconino County, Fire Districts, HOAs and community organizations, DFFM, and insurance industry partners	• Promote adoption of the IBHS Wildfire Prepared Home designation and Firewise USA standards through coordinated County messaging and outreach • Explore development of County-supported incentives (e.g., recognition, cost-share, or rebates) for residents and neighborhoods achieving IBHS or Firewise standards • Partner with local fire districts and community organizations to host outreach events (e.g., home assessments, demonstration days, community workdays) • Coordinate with insurance and industry partners to communicate potential insurance benefits associated with IBHS designations • Target outreach and program implementation in high and very high wildfire risk areas	• Increase adoption of proven, science-based wildfire mitigation measures at the parcel and neighborhood scale • Reduce structure ignitability and community vulnerability to wildfire • Align County efforts with nationally recognized standards, improving consistency and credibility • Enhance community engagement and participation in wildfire preparedness activities • Support potential access to insurance benefits and mitigation incentives for residents	• Track participation in IBHS and Firewise programs across the County • Monitor the number of homes and communities achieving recognition or designation • Conduct periodic outreach and education updates to maintain program visibility and participation • Evaluate the effectiveness of incentive programs and adjust as needed to increase participation	• Firewise USA Program® Grants • NIFC - Fire Prevention, Education, and Mitigation • DFFM State Fire Assistance/Wildland Urban Interface Grants • Council of Western State Foresters - Wildland Urban Interface Grant Program • Urban Land Institute - Community Action Grants • DFFM Community Challenge Grants
FAC #3	H	2026 - 2031	**Create guidance programs and funding support for County Fire Districts to provide parcel level home hazard assessments** Conducting home hazard assessments at the parcel level can assist individual homeowners to gain a better understanding of how to mitigate properties to become more resilient to wildfires.	Countywide	County	• Empower and support fire districts to carry out assessments • Utilize software packages that collect data based on IBHS Wildfire Prepared Home standards. • Provide guidance online for individual homeowners to follow on a platform easily accessible to members of the public • Provide training materials and outreach support • Create online platform to record assessment results to be housed by County • Create a dashboard to deliver results to residents and track their progress • Consider additional training for assessors, such as a Wildfire Mitigation Specialist certification	• Incentivize homeowners to reduce fuel hazards around properties • Increase awareness of wildfire mitigation efforts for individual homeowners • Provide support and guidance for homeowners to follow and track their progress	• Identify funding for Fire Districts to conduct home hazard assessments • Provide annual training opportunities for Fire Districts and other community representatives to conduct home hazard assessments • Maintain and regularly update online platform with assessment results • Maintain homeowner dashboard with progress updates on mitigating hazards around properties.	• Environmental Systems Research Institute - ESRI Grants • NFPA • DFFM Rural Fire Capacity Grant

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Lead Agency/ Partnering Agencies	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
FAC #4	H	2026 - 2031	**Assess and support wildfire risk transfer options in high-risk areas** Engage with state agencies, insurers, and partners to better understand and communicate available risk transfer options (such as traditional insurance, state-supported programs, and mitigation-based incentives) to help improve homeowner access to coverage in high-risk areas.	Countywide	County, State insurance regulators, insurance providers, DFFM, local fire districts	• Coordinate with state agencies and insurance representatives to better understand insurance availability and constraints in high-risk wildfire areas • Identify and communicate existing risk transfer mechanisms (e.g., traditional insurance markets, state-supported programs, surplus lines, and mitigation-based incentives) • Promote recognized mitigation programs such as Firewise USA and the Insurance Institute for Business & Home Safety Wildfire Prepared Home program to support improved insurability • Support education and outreach to homeowners on how mitigation actions may influence coverage availability and premiums • Coordinate with state and regional efforts to ensure consistency with broader insurance and wildfire policy initiatives	• Improve understanding of insurance and risk transfer options available to homeowners in high-risk areas • Support informed decision-making by residents regarding mitigation and coverage options • Align County efforts with existing state and private market initiatives • Reinforce the connection between wildfire mitigation and insurability	• Maintain coordination with state agencies and insurance partners to track changes in insurance availability and policy • Periodically update County outreach materials to reflect current risk transfer options and mitigation incentives • Monitor participation in mitigation programs that may influence insurability	• Firewise USA Program Grants • NIFC - Fire Prevention, Education, and Mitigation • DFFM State Fire Assistance/Wildland Urban Interface Grants • DFFM Community Challenge Grants
FAC #5	H	2026 - 2031	**Work to shift the paradigm to emphasize the homeowner's role in wildfire mitigation in partnership with hazardous fuels projects** Helps to provide homeowner's responsibility and greater big picture understanding of wildfire mitigation efforts to increase resiliency to wildfires	Countywide	County	• Emphasize the importance of home hardening and home ignition zones through a targeted education campaign with community tailored materials for residents • Seek grant funding to support initiative • Provide local contractor lists for home hardening/Firewise assessments and materials (i.e., vent covers, tree trimming, etc.) • Consider incorporating materials and education into school curriculum to educate across age groups and provide upstream effects to parents and guardians • Consider adopting IBHS principles in conjunction with NFPA • Partner with insurance companies to share information on insurability and measures homeowners can take to retain insurance in high risk WUI areas.	• Provide homeowners with greater understanding and overall purpose of reducing fuels and home hardening around individual properties • Increase awareness of wildfire mitigation efforts at a neighborhood/community scale • Enhance communities within the county to become more fire adaptive • Encourage grants, cost-share, and/or tax credits for home hardening efforts	• Identify funding opportunities for hazards fuels reduction projects for homeowners in rural communities. • Provide and maintain an online portal with a list of contractors willing to conduct hazardous fuels reduction around homes, home hardening materials, and Firewise assessments. • Collaborate with insurance companies to share information on insurance and mitigation actions for homeowners in high risk WUI areas.	• NIFC - Fire Prevention, Education, and Mitigation • DFFM State Fire Assistance/Wildland Urban Interface Grants • DFFM Community Challenge Grants • USFS National Fire Plan - State & Volunteer Fire Assistance • Tribal Access to Emerging Private Markets for Climate Mitigation and Forest Resilience • Insurance Services Office - Mitigation Online • USFWS - National Fire Plan WUI Community Fire Assistance • USDA/DOI - National Fire Plan State and Volunteer Fire Assistance

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Lead Agency/ Partnering Agencies	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*

FAC #6	H	2026 - 2031	**Adopt a two-pronged approach to address wildfire risks associated with short-term and vacation rental properties**
			Creating education materials tailored to short-term and vacation rentals that includes policy and enforcement of wildfire restrictions can help to inform this sector of the population and engage these property owners in wildfire resilience actions.
				Countywide	County	**Education:**
						• Develop targeted outreach materials for rental property owners, property management companies, and guests, emphasizing defensible space, fire restriction compliance, and safe behavior during high fire danger periods.
						• Require that all short-term rental listings include current fire restriction information, penalties for noncompliance, and emergency contact numbers.
						Policy and Enforcement:
						• Collaborate with the County Board of Supervisors to explore creating ordinances for all properties such as:
						  ○ Establishing clear consequences for fire restriction violations during any stage of wildfire restrictions including suspension or revoking rental unit permits and registration.
						  ○ Requires proof of defensible space compliance as part of the rental permit registration and renewal process.
						• Utilize a FAC Coordinator to enforce the ordinance on communities, especially those with high rates of registered vacation rentals (i.e., Airbnb, VRBO)
						• Rental unit owners require signage and a signed agreement with occupants regarding fire bans, use of fireworks, etc. during fire restrictions
							• Educating rental property homeowners on wildfire restriction compliance, especially during elevated wildfire danger
							• Provides clear guidelines and consequences for rental property owners regarding wildfire restriction violations
							• Ensure all community members between permanent residents, visitors, and temporary residents abide by wildfire restrictions and prevention practices
							• Require higher standards for rental property permit registrations by ensuring compliance with defensible space recommendations and wildfire restrictions
								• Create a countywide ordinance for short-term rental properties on defensible space and fire restriction compliance for rental tenants.
								• Enforce ordinance for rental property owners with strict and well-defined consequences for any violations during wildfire restrictions.
									• NIFC - Fire Prevention, Education, and Mitigation
									• DFFM State Fire Assistance/Wildland Urban Interface Grants
									• DFFM Community Challenge Grants
									• USFS National Fire Plan - State & Volunteer Fire Assistance
									• Tribal Access to Emerging Private Markets for Climate Mitigation and Forest Resilience
									• USFWS - National Fire Plan WUI Community Fire Assistance

**Non-federal funding sources listed in this table are subject to change annually. Availability, program priorities, and eligibility criteria may vary, and this information should be confirmed with each funding agency before planning or applying for grants.*

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COHESIVE STRATEGY GOAL 3: SAFE, EFFECTIVE, RISK-BASED, WILDFIRE RESPONSE

Recommendations for all jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

Recent wildfires in and around the county, such as the Dragon Bravo fire, underscore the importance of safe and effective wildfire response, and highlight the multifaceted challenges in responding to wildfire in WUI and urban areas. A balanced wildfire response requires integrated pre-fire planning cooperation and collaborative efforts between various levels of government, response agencies, and the public. This intricate issue emphasizes the importance of effective, efficient, and coordinated emergency response across jurisdictions and landscape units.

Often during wildfire incidents, resources are stretched thin due to fire personnel committed to other ongoing fires. Increased community preparedness through education is a key factor in supporting local fire departments, in particular education regarding emergency notifications and evacuation protocols.

This section provides recommended actions that various agencies as well as the public could implement to support safe, effective wildfire response (Table 4.4).

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Recommendations for Safe and Effective Fire Response

Table 4.4. Recommendations for Safe and Effective Wildfire Response

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Lead Agency/ Partnering Agencies	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
FR #1	H	2026 - 2027	**Carry out a comprehensive Fire District Needs Assessment** Rural fire districts across the County need equipment, communication upgrades and more resources to conduct work in their districts. By seeking a countywide assessment to all fire districts, the county can gain a better sense of equipment inventory and capability to respond to incidents for each fire district.	All response areas	County	• Develop a portal to track equipment, training, and apparatus needs for each Fire District (use and update data collect from CWPP Fire District survey) • Identify, fund, and designate personnel to carry out needs assessment • Seek funding opportunities (i.e., with County Grants Specialist, Hub Site) to assist fire districts in securing grants to support procurement of equipment and apparatus • Modify/update equipment when feasible to improve efficiency and wildfire suppression tactics • Secure funding for Unmanned Aircraft Systems (UAS) in addition to T3 help for prescribed burns, treatment implementation, fire-related aspects of land management • Develop a platform with equipment, personnel, and resource list for Fire District access during an emergency	• Improve resource needs across all fire districts within the County • Facilitate sharing of resources between agencies (equipment and personnel) • Enhance fire district capacity to respond to fires and other emergency response mechanisms • Ensure fire districts can secure funding to be properly equipped with upgraded and maintained equipment and resources needed for fire response.	• Develop and maintain a portal consisting of fire district equipment needs, available equipment, training, and qualifications • Identify funding sources for fire districts to update and modify equipment • Annually inspect equipment and check for upgrade needs	• Federal Excess Personal Property (FEPP) Program • FEMA - Assistance to Firefighters Grants • DFFM Rural Fire Capacity Grant • U.S. Fire Administration Grants • Department of Interior - Slip-On Tanker Unit Acquisition
FR #2	H	2026 - 2029	**Conduct a countywide dispatch and communications needs assessment to improve interoperability and coordination** Conducting a countywide assessment of dispatch and emergency communications systems, or organizing a coalition of partners, can help identify opportunities to improve interoperability, coordination, and modernization of fire response communications across jurisdictions.	Countywide	County, DFFM, USFS, local fire districts, emergency management, law enforcement, regional communications partners	• Conduct a countywide assessment of existing dispatch systems, infrastructure, and capabilities • Identify gaps in interoperability, communication protocols, coverage (e.g., repeaters), and response coordination • Evaluate opportunities for improved coordination, including shared services, co-location, or regional partnerships • Assess feasibility of system upgrades, technology modernization, and integration across jurisdictions • Establish or formalize a multi-agency coordination group or coalition to guide improvements • Identify funding opportunities for communications infrastructure, equipment, and system upgrades	• Improve interoperability and communication between fire response agencies • Enhance coordination and efficiency of multi-jurisdictional wildfire response • Identify cost-effective and scalable solutions for dispatch and communications improvements • Support equitable emergency response capabilities across all communities	• Periodically update the needs assessment to reflect system changes, growth, and emerging technologies • Maintain coordination among partner agencies to track implementation progress • Monitor performance of communications systems and infrastructure (e.g., repeaters, coverage gaps)	• USDA Community Facilities Direct Loan and Grant Program • DEMA Emergency Management Performance Grant • U.S. Fire Administration Grants • DFFM - Post-Wildfire Infrastructure Assistance Program

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Lead Agency/ Partnering Agencies	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
FR #3	H	2026 - 2028	**Enhance and Improve Community Awareness of Emergency Preparedness** Most fire districts and rural communities need support to improve emergency preparedness outreach. Enhancing resident engagement and knowledge can be achieved by expanding awareness of emergency alerts, evacuation routes, and wildfire resources through incentives, educational materials, and clear community signage for evacuation routes.	Countywide	All agencies	• Collaborate with County Emergency management to launch a comprehensive emergency preparedness campaign combined with a "Know your Zone" initiative to boost resident enrollment in notifications and pre-plan for evacuations • Promote county emergency alert notification enrollment, dispatch line, and wildfire monitoring resources (i.e., cocowildfire.org, Fire Watch Duty, InciWeb, WildCad) through websites, schools, libraries, health centers, post office, local newspaper, and community centers to disseminate information • Provide clear instructions on how to enroll in and update emergency notification preferences (i.e., Coconino County Alerts and National Weather Service) ○ **Coconino County Alerts:** Automated alert system based on location throughout the county. ○ **National Weather Service:** Alerts for critical fire weather conditions including red-flag warnings, fire watches, and fire danger in area. • Partner with community organizations, HOAs, and neighborhood ambassadors to reach underserved or disconnected populations • Partner with HOAs and neighborhood ambassadors to plan and implement annual community-scale evacuation drills	• Support enhancement of situational awareness to communities during fire season and other disaster events • Increase number of residents enrolled in emergency alert systems • Ensure equitable access to critical safety information during emergencies • Improve public understanding of evacuation alerts (Ready, Set, Go) and emergency protocols • Prepare communities to evacuate during an emergency • Incorporate HOA and community ambassador involvement in public outreach and initiating annual evacuation drills • Engage the community in familiarizing with emergency evacuation routes and procedures	• Increase outreach material and information regarding county emergency notification systems and community specific emergency evacuation routes • Implement annual evacuation drills for the communities • County to provide all districts/community representatives with list of contacts that are enrolled in evacuation alerts annually • Assist communities in understanding the three phases of Ready, Set, Go and evacuation zones • Ensure emergency evacuation routes are clearly marked within communities	• State Farm - Good Neighbor Citizenship Grants • DEMA - Mitigation Grants Program • State Farm - Good Neighbor Citizenship Grants • USDA/DOI - National Fire Plan State and Volunteer Fire Assistance
FR #4	M	2027 - 2032	**Increase access to wildfire response training** Provide more opportunities for rural fire districts to receive NWCG wildfire response training by creating more training sessions and flexible opportunities.	Countywide	DFFM, County	• Increasing NWCG course access, especially for volunteer fire districts with limited funding or staffing capacity to send staff to fire training elsewhere. • Provide more flexible hours for NWCG training (virtual, weekends, evenings, monthly, etc.) • Seek opportunities to collaborate with NWCG training across fire districts (or centralized areas across the county)	• Enable fire districts to respond to fires within their response areas, especially if other wildland fire resources are committed to other incidents • Increase fire response staffing capacity especially in rural areas • Provide more diversity of personnel qualifications in fire districts • Provide fire districts with more flexibility in conducting fuels reduction treatment projects (i.e., prescribed burns)	• Offer and advertise NWCG course training opportunities annually • Identify funding sources for fire district staff to attend NWCG training	• NFPA Grant Sources • USFS Fire Management Grants • First Nations Capacity Support Grant • DFFM Rural Fire Capacity Grant • Department of Interior - Slip-On Tanker Unit Acquisition • FEMA - Staffing for Adequate Fire and Emergency Response (SAFER) • EPA - Tribal Environmental General Assistance Program
FR #5	M	2027 - 2030	**Support enhancement of situational awareness during fire season** Provide more public outreach material to promote fire preparedness and resources to monitor ongoing wildfires.	Areas at highest risk based on QWRA	DFFM, Arizona Power Supply	• Continue to install smoke alert cameras and provide livestream for public viewing • Secure funding to enhance more drone reconnaissance for live wildfire updates • Encourage public awareness and reporting of fires by working with community ambassadors and HOAs • Promote resources for community members to view before active wildfire season begins, especially during any community events.	• Engage the public and community residents to be aware of wildfires and potential evacuations • Enhance more community engagement by working with HOAs and community ambassadors to promote awareness and other outreach materials	• Seek funding to install and maintain smoke alert cameras, drones, and live wildfire update streaming • Create community outreach materials to promote wildfire awareness and reporting • Host community events to promote wildfire awareness to communities	• First Nations Capacity Support Grant • DFFM Rural Fire Capacity Grant • U.S. Fire Administration Grants

Project ID	Priority (H,M,L)	Timeline for Action	Project Description	Location	Lead Agency/ Partnering Agencies	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Examples of Funding Sources*
FR #6	M	2027 - 2030	**Create an online roster/network of wildfire personnel and resources within Coconino County** A collaborative online platform designed for all resources to list equipment and personnel availability. The platform is meant to help provide knowledge of other resources, capabilities, and available equipment. Sharing resources can also help some districts where funding opportunities are limited to upgrading equipment.	All response areas	County, DFFM	• Develop an online tool for compiling available wildfire personnel by listing qualifications and equipment availability • Provide outreach support to disseminate tools • Collaborate with multiple agencies to contribute personnel and equipment availability to ensure adequate fire response especially during high fire danger	• Enhance collaboration and resource sharing between agencies • Improve staffing and funding constraints • Identify a possible equipment cache location • Provide districts with more opportunities to combat issues with securing funding for equipment needs	• Collaborate with multiple jurisdictions to maintain portal • Create and maintain a countywide portal of staff qualifications and equipment availability • Enable fire district chiefs' access to portal to update qualifications, personnel, and equipment regularly	• Federal Excess Personal Property (FEPP) Program • FEMA - Assistance to Firefighters Grants • DFFM Rural Fire Capacity Grant • U.S. Fire Administration Grants

FR #7	H	2026 - 2031	**Develop a communication plan to improve multiagency coordination with a focus on rural communities**
			The plan would require identification of "dead" communication zones and aim to improve communications, especially in rural communities. This may require installation of additional repeaters or providing portable repeaters.
				Countywide	County Emergency Management	• Assess the effectiveness of existing communications in all communities
						• Analyze areas with blank zones/poor communications and seek solutions to improve by:
						  ○ Identifying locations to install additional repeaters (permanent or portable)
						  ○ Consider setting up portable repeaters where permanent installation is not feasible
						• Consult with regional fire adapted community coordinator or county emergency management officials to seek funding for additional repeaters
							• Reduce dispatch delays and overcrowding radio towers
							• Improve overall communications especially during emergency situations
							• Ensure all communities have additional means of communication in case a wildfire burns through one repeater system
							• Assist rural communities to receive adequate communications and notifications
							• Improve emergency response times, especially for rural communities
								• Conduct annual communication system assessments throughout all rural communities across the county
								• Adress and mitigate "dead zones" especially in areas within community boundaries
								• Secure funding to maintain communication systems across the county on an annual basis
									• DEMA - Emergency Management Performance Grant
									• USDA Community Facilities Direct Loan and Grant Program
									• DFFM - Post Wildfire Infrastructure Assistance Program

FR #8	M	2026 - 2027	**Identify fire district response zones** Many fire districts across the county's emergency response zones typically encompass a larger geographic area than allocated jurisdictional zones. Identify areas and communities across the county that are not associated with a fire district (unincorporated areas) but occur within a fire district's emergency response area.	All response areas	County, Fire Districts	• Work with the County to determine the extent of the issue and root cause of areas having no fire response • Update and maintain fire district jurisdiction and response zone maps • Consider withholding building permits in areas with no formal fire response • Begin an outreach campaign to educate residents about the risk of living in an area without fire response and ways to access fire response (i.e., subscription services or pay per response programs) • Encourage rural communities without fire response to vote to incorporate to bolster tax base for fire response capacity • Seek funding opportunities to enhance proper compensation for fire districts responding to areas outside of their jurisdiction	• Clearly identify and map fire response areas of fire districts • Ensure there are no isolated communities without fire response resources • Identify means to reduce development in areas without fire resources • Assist fire districts with justification for increased staffing capacity and equipment needs • Provide understanding of fire district staffing and equipment needs • Reduce areas experiencing no fire response resources • Bolster tax base for fire response capacity	• Create and maintain interactive fire district response zone maps, ensure fire district chiefs have access to modify zones as needed. • Reduce and mitigate areas without any fire response resources • Seek additional funding sources to increase fire response capacity to reach communities outside of a fire district	• DFFM Rural Fire Capacity Grant • U.S. Fire Administration Grants • Environmental Systems Research Institute - ESRI Grants • DFFM American Rescue Plan Act Grant
FR #9	M	2026 - 2030	**Enhance fire staffing through recruitment training programs for paid staff and volunteers** Provides an opportunity for rural fire districts to increase staffing capacity and provide opportunities.	Countywide	County, Fire Districts	• Initiate recruitment and training programs, including enrolling recruits/volunteers in training courses to obtain universal certifications (i.e., EMT, Wildland Firefighter Type 2, FAL 1) • Work with Coconino Community College and/or Northern Arizona University to support and bolster recruitment • Secure funding to build new crew quarters to house out-of-town volunteers and crews • Partner with local institutions and the county to promote recruitment by setting up table booths at job fairs, social media posts, and providing flyers to disseminate information	• Improve staffing capacity for rural fire districts • Provide hands on training and experience for college students in the county • Increase recruitment interest by providing housing and training certification courses	• Identify funding sources to maintain housing resources and enroll recruits/volunteers in training and certification courses • Maintain relationship with local colleges for recruitment opportunities • Create outreach materials to enhance engagement and recruitment	• FEMA - Assistance to Firefighters Grants • EPA Specific Grant Programs • EPA - Tribal Environmental General Assistance Program • DFFM - Rural Fire Capacity Grant • ADEQ - Emergency Response Fund • FEMA - Staffing for Adequate Fire and Emergency Response (SAFER) • EPA - Tribal Environmental General Assistance Program

*Non-federal funding sources listed in this table are subject to change annually. Availability, program priorities, and eligibility criteria may vary, and this information should be confirmed with each funding agency before planning or applying for grants.

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CHAPTER 5 – MONITORING AND EVALUATION

All CWPP stakeholders seek meaningful outcomes, but achieving risk reduction takes significant time and resources. To measure progress, both quantitative and qualitative evaluation of goals is necessary.

Monitoring and reporting support long-term assessment of ecosystem changes and management impacts. Protocols should be tailored to specific regions and project types for reliable data. While HFRA doesn't require CWPP project tracking, regular monitoring and evaluation are important, especially as policies and preparedness levels evolve.

The 2026 Coconino County CWPP Project Tracking Application, available on the CWPP hub site, https://cwpp-coconinocounty.hub.arcgis.com enables local land managers to collaboratively track project progress and share quick stats like acres treated or funds spent with the community.

MONITORING STRATEGIES

It is recommended that project monitoring be a collaborative effort. There are many resources for designing and implementing community-based, multiparty monitoring that could support and further inform a basic monitoring program for the CWPP (Egan 2013).

Table 5.1 identifies monitoring strategies for various aspects of all categories of CWPP recommendations and the effects of their implementation, both quantifiable and non-quantifiable, for assessing the progress of the CWPP and increasing the sustainability of projects.

Monitoring fuel treatment projects is necessary for assessing the efficacy of proposed actions and evaluating how projects support environmental sustainability and wildfire resiliency. Establishing monitoring protocols can help project managers better understand how well the proposed treatment methods and prioritized actions fulfill planned goals and objectives. Recording and sharing monitoring results is crucial for establishing benchmarks and determining long-term fuel treatment strategies.

Table 5.1. Recommended Monitoring Strategies

Strategy	Task/Tool	Remarks
Project Tracking System	Online tracking tool to track risk reduction projects spatially.	The interactive tool is easily updated and identifies areas that require additional efforts. Update monthly if possible

Strategy	Task/Tool	Remarks
Photographic record (documents pre- and post-fuels reduction work, evacuation routes, workshops, classes, field trips, changes in open space, treatment type, etc.)	Establish field GPS location; photo points of cardinal directions; keep photos protected in archival location.	Moderate cost, repeatable over time; used for programs and tracking objectives
Number of acres treated (by fuel type, treatment method)	GPS/GIS/fire behavior prediction system – this can be monitored within the Project Tracking System	Evaluating costs, potential fire behavior
Number and acres of home ignition zones/defensible space treated to reduce fuels Number and cost of home hardening improvements to reduce ignitability (include grants and cost-share programs)	GPS – This can be monitored within the Project Tracking System	Fuels reduction Structure protection
Number of residents/citizens participating in any CWPP projects and events	Meetings, media interviews, articles	Evaluate culture change objective Annual lessons learned review encouraged among stakeholders
Number of homeowner contacts (brochures, flyers, posters, etc.)	Visits, phone	Evaluate objective Annual lessons learned review encouraged among stakeholders
Number of jobs created, contracts, grants	Project Tracking System	Evaluate local job growth
Education outreach: number, kinds of involvement	Workshops, classes, field trips, signage; Project Tracking System	Evaluate objectives Annual lessons learned review encouraged among stakeholders
Fire Response: changes in agency response capacity	Collaboration, grants to fund fire department needs such as new personnel and equipment	Evaluate mutual aid Annual review
Codes and policy changes affecting CWPP	Qualitative	CWPP changes
Wildfire acres burned, human injuries/fatalities, infrastructure loss, environmental damage, suppression, and rehabilitation costs	Wildfire records	Compare with 5- or 10-year average
Number of home assessments completed and completing a comprehensive summary of risk to homes.	Web-based mapping, field surveys	Evaluate existing home risk assessment data Record home assessments and summarize risks, monitor homeowner implementation of recommendations, and conduct follow-up within 6–12 months to assess barriers and progress.
Number of curbside risk assessments completed and completing a comprehensive summary of risk.	Web-based mapping, field surveys	Align risk assessment data with Wildfire Partners
Number of medical incidents attached to wildfire suppression incidents.	After action reviews, meetings, records of medical incident reports	Determine causes and possible mitigation actions
Number of structures lost per wildfire incident accompanied by weather and fire behavior data.	National Weather Service, field surveys, public input	Establish trends and correlations before, during, and after wildfire disasters.

Strategy	Task/Tool	Remarks
Evacuation evaluation and preparedness	Surveys and workshops	Maintain a list of residents needing assistance during emergency events
Depending on the treatment type and location, other factors should also be monitored. These include ecological indicators such as biodiversity, soil health, and carbon impacts.	Biological surveys and soil tests	Compare post-treatment conditions with pre-treatment conditions

Project Tracker

Within the project's home page, https://cwpp-coconinocounty.hub.arcgis.com, an interactive web-based tool has been designed to communicate CWPP projects within a project tracking application [LINK TO BE ADDED LATER]. The application is designed to provide real-time updates to the public and facilitate multiagency coordination and collaboration. The tracking system is available for internal use with a public-facing dashboard and the following features:

- Project database
- Project entries and sub-entries into the database
- Funding tracking
- Milestone and goal tracking
- Project constraint/opportunity tracking
- Project progress tracking
- Agency delegation
- Ability to attach images or other files to project records
- Spatially delineated project locations/working areas

Externally, the project tracker displays relevant information to the public in an easy-to-navigate dashboard. The dashboard contains project information such as acres treated, dollars spent, homes assessed, and public outreach events conducted. The monitoring strategies outlined in Table 5.1 can be applied to completed mitigation projects in conjunction with the project tracking application.

CWPP Evaluation Methods

CWPPs are intended to provide information, guidance, and recommendations to reduce the risk of wildfire damaging a community and the environment. However, as communities change through development and vegetation communities evolve, so does the risk of wildfire. The recommendations and methods to reduce risk must be dynamic to keep pace with changes in the WUI and the fire environment; therefore, consistent evaluations of the CWPP are imperative. Additionally, recently published research and case studies regarding wildfire risk should be considered when evaluating the CWPP.

SWCA ENVIRONMENTAL CONSULTANTS | STEPS TO EVALUATE A CWPP

1 IDENTIFY OBJECTIVES:

What are the goals identified in the plan?
How are they reached? Is the plan performing as intended?

- Structural ignitability
- Fuel treatments (landscape and home ignition zone)
- Public education and outreach
- Multi-agency collaboration
- Emergency notifications/response

2 ASSESS THE CHANGING ENVIRONMENT:

How have population characteristics and the wildfire environment changed?

Population change
- Increase or decrease
- Visitor levels
- Demographics

Population settlement patterns
- Distribution
- Expansion into the WUI

Vegetation
- Fuel quantity and type
- Drought and disease impacts

3 REVIEW ACTION ITEMS:

Are actions consistent with the plan's objectives?

- Check for status, i.e., completed/started/not started
- Identify completed work and accomplishments
- Identify lessons learned, challenges, and best practices
- Identify next steps congruent with other hazard mitigation planning efforts

4 ASSESS RESULTS:

What are the outcomes of the action items?

Multi-agency collaboration
- Who was involved in the development of the CWPP?
- Have partners involved in the development process remained involved in the implementation?
- How has the planning process promoted implementation of the CWPP?
- Have CWPP partnerships and collaboration had a beneficial impact to the community?

Risk assessment
- How is the risk assessment utilized to make decisions about fuel treatment priorities?
- Have there been new wildfire-related regulations?
- Are at-risk communities involved in mitigating wildfire risk?

Hazardous fuels
- How many acres have been treated?
- How many projects are cross-boundary?
- How many residents have participated in creating defensible space?

Structural ignitability
- Have there been updates to fire codes and ordinances?
- How many structures have been lost to wildfire?
- Has the CWPP increased public implementation of structural ignitability and hazard reduction strategies?

Public education and outreach
- Has public awareness of wildfire and mitigation strategies increased?
- Have residents, visitors, and second homeowners been involved in wildfire mitigation activities?
- Has there been public involvement?
- Have vulnerable populations been involved?

Emergency response
- Has the CWPP been integrated into relevant plans (e.g., hazard mitigation or emergency operations)?
- Is the CWPP congruent with other hazard mitigation planning efforts?
- Has availability and capacity of local fire departments changed since the CWPP was developed?
- Have egress routes been publicized and mitigated?

TIMELINE FOR UPDATING THE CWPP

Arizona Requirements

Per Arizona requirements, CWPPs:

- Require annual review to determine if changes are needed
- Require updates every 5 years if significant changes have occurred
- Are considered expired if they are over 10 years old, necessitating a full revision

In alignment with recommended practices and Arizona requirements, the CWPP will be reviewed annually by the Core Team to assess progress, evaluate the project list, and determine whether any changes are needed. A formal update will be considered every 5 years, especially if significant changes occur in local conditions, wildfire risk, or relevant planning documents.

Updates may also be needed sooner if conditions change. Triggers for an early update include an extensive wildfire or other disaster event, changes to the local planning outlook (e.g., a significant update to the hazard mitigation plan), or local adoption of new wildfire-related codes and ordinances.

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
4FRI	Four Forest Restoration Initiative
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AIDC	Arizona Interagency Dispatch Center
ARS	Arizona Revised Statutes
ATSDR	Agency for Toxic Substances and Disease Registry
BAER	Burned Area Emergency Rehabilitation
BLM	Bureau of Land Management
BMRD	Black Mesa Ranger District
CCEM	Coconino County Emergency Management
CCSO	Coconino County Sheriff's Office
CDC	Centers for Disease Control and Prevention
CERT	Community Emergency Response Team
CIG	Conservation Innovation Grants
Cohesive Strategy	National Cohesive Wildland Fire Management Strategy
County	Coconino County
CRS	Congressional Research Service
CWA	Clean Water Act
CWPP	community wildfire protection plan
DEMA	Arizona Department of Emergency and Military Affairs
DFFM	Arizona Department of Forestry and Fire Management
DFRC	debris flow risk corridor
DHS	Department of Homeland Security
DOE	Department of Energy
DOI	U.S. Department of the Interior
ECP	Emergency Conservation Program
EFRP	Emergency Forest Restoration Program
EMPG	Emergency Management Performance Grant
EOC	Emergency Operations Center
EOP	Emergency Operation Plan
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESRI	Environmental Systems Research Institute

EWP	Emergency Watershed Protection
FEMA	Federal Emergency Management Agency
FP&S	Fire Prevention and Safety
FRI	fire return interval
GACC	Geographic Area Coordination Centers
GFFP	Greater Flagstaff Forests Partnership
GIS	geographic information system
HCFR	High Country Fire Rescue
HFRA	Healthy Forests Restoration Act of 2003
HIZ	home ignition zone
HMP	hazard mitigation plan
HMPG	Hazard Mitigation Grant Program
HOA	homeowner association
HVRA	highly valued resource or asset
IBHS	Insurance Institute for Business & Home Safety
ICC	International Code Council
ICS	Incident Command System
IFTDSS	Interagency Fuel Treatment Decision Support System
IMT	Incident Management Team
KEWFD	Kaibab Estates West Fire District
NEPA	National Environmental Policy Act
NFF	National Forest Foundation
NFP	National Fire Plan
NFPA	National Fire Protection Association
NIFC	National Interagency Fire Center
NIMS	National Incident Management System
NIST	National Institute of Standards and Technology
NNFRS	Navajo Nation Fire and Rescue Services
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
POD	Potential Operational Delineation
PPE	personal protective equipment
QWRE	Quantitative Wildfire Risk Assessment

RAWS	remote automated weather station
SAF	Society of American Foresters
SAFER	Staffing for Adequate Fire and Emergency Response
SFEFD	Sherwood Forest Estates Fire District
SVI	Social Vulnerability Index
SWCA	SWCA Environmental Consultants
TFD	Tusayan Fire District
TWIG	Treatment and Wildfire Interagency Geodatabase
ULI	Urban Land Institute
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USFA	U.S. Fire Administration
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WFCA	Western Fire Chiefs Association
WFPP	wildfire protection plan
WRSC	Western Regional Strategy Committee
WUI	wildland-urban interface

GLOSSARY

Aspect: Cardinal direction toward which a slope faces in relation to the sun (NWCG 2024).

Active Crown Fire: A crown fire in which the entire fuel complex is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread. An active crown fire presents a solid wall of flame from the surface through the canopy fuel layers. Flames appear to emanate from the canopy as a whole rather than from individual trees within the canopy. Active crown fire is one of several types of crown fire and is contrasted with **passive crown fires**, which are less vigorous types of crown fire that do not emit continuous, solid flames from the canopy (SWCA).

Available Canopy Fuel: The mass of canopy fuel per unit area consumed in a crown fire. There is no post-frontal combustion in canopy fuels, so only fine canopy fuels are consumed. It is assumed that only the foliage and a small fraction of the branchwood is available (Wooten 2021).

Available Fuel: The total mass of ground, surface, and canopy fuel per unit area available for a fire, including fuels consumed in post-frontal combustion of duff, organic soils, and large woody fuels (Wooten 2021).

Biomass: Organic material. Also refers to the weight of organic material (e. g. biomass roots, branches, needles, and leaves) within a given ecosystem (Wooten 2021).

Burn Severity: A qualitative assessment of the heat pulse directed toward the ground during a fire. Burn severity relates to soil heating, large fuel and duff consumption, consumption of the litter and organic layer beneath trees and isolated shrubs, and mortality of buried plant parts (SWCA).

Canopy: The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand. Where significant height differences occur between trees within a stand, formation of a multiple canopy (multilayered) condition can result (SWCA).

Chain: Unit of measure in land survey, equal to 66 feet (20 m) (80 chains equal 1 mile). Commonly used to report fire perimeters and other fireline distances. Popular in fire management because of its convenience in calculating acreage (example: 10 square chains equal one acre) (New Mexico Future Farmers of America 2010).

Climate Change: A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods (California Governor's Office of Planning and Research [CA GOPR] 2020).

Communities at Risk (CAR): Defined by the HFRA as "Wildland-Urban Interface Communities within the vicinity of federal lands that are at high risk from wildfire."

Community Emergency Response Team (CERT): The CERT program educates volunteers about disaster preparedness for the hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. CERT offers a consistent, nationwide approach to volunteer training and organization that professional responders can rely on during disaster situations, allowing them to focus on more complex tasks (Ready 2021).

Community Wildfire Protection Plan (CWPP): A planning document that seeks to reduce the threat to life and property from wildfire by identifying and mitigating wildfire hazards to communities and infrastructure located in the WUI. Developed from the HFRA, a CWPP addresses issues such as wildfire response, hazard mitigation, community preparedness, or structure protection (SWCA).

Contain: A tactical point at which a fire's spread is stopped by and within specific containment features, constructed or natural; also, the result of stopping a fire's spread so that no further spread is expected under foreseeable conditions. For reporting purposes, the time and date of containment. This term no longer has a strategic meaning in federal wildland fire policy (Wooten 2021).

Control: To construct fireline or use natural features to surround a fire and any control spot fires therefrom and reduce its burning potential to a point that it no longer threatens further spread or resource damage under foreseeable conditions. For reporting purposes, the time and date of control. This term no longer has a strategic meaning in federal wildland fire policy (Wooten 2021).

Crown Fire: A fire that advances at great speed from crown to crown in tree canopies, often well in advance of the fire on the ground (NWCG 1998).

Defensible Space: The area around a home (or structure) that has been modified to reduce fire hazard by creating space between potential fuel sources (CSFS HIZ guide). Defensible space is divided into three zones based on the following distances from the home (or structure): 0 to 5 feet, 5 to 30 feet, and 30 to 100 feet. The size of the third zone may be extended to 200 feet or more for structures on steep slopes.

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil (SWCA).

Ecosystem: An interacting natural system including all the component organisms together with the abiotic environment and processes affecting them (SWCA).

Energy Release Component: A value related to the available energy within the flaming front at the head of a fire. Daily variations in the Energy Release Component are due to changes in the moisture content of the fuels present, both live and dead (NIFC n.d.).

Environmental Conditions: That part of the fire environment that undergoes short-term changes: weather, which is most commonly manifest as windspeed, and dead fuel moisture content (Wooten 2021).

Escape Route: A preplanned and understood route firefighters take to move to a safety zone or other low-risk area. When escape routes deviate from a defined physical path, they should be clearly marked (flagged) (SWCA).

Evacuation: The temporary movement of people and their possessions from locations threatened by wildfire (SWCA).

Fire-Adapted Community: A fire-adapted community collaborates to identify its wildfire risk and works collectively on actionable steps to reduce its risk of loss. This work protects property and increases the safety of firefighters and residents (USFA 2021b).

Fire Behavior: The manner in which fuel ignites, flame develops, and fire spreads and exhibits other related phenomena as determined by the interaction of fuels, weather, and topography (Fire Research and Management Exchange System 2021).

Fuel Break: Areas where vegetation and organic matter are removed down to mineral soil (SWCA).

Fire Environment: The characteristics of a site that influence fire behavior. In fire modeling the fire environment is described by surface and canopy fuel characteristics, windspeed and direction, relative humidity, and slope steepness (Wooten 2021).

Fire Frequency: A broad measure of the rate of fire occurrence in a particular area. For historical analyses, fire frequency is often expressed using the fire return interval calculation. For modern-era analyses, where data on timing and size of fires are recorded, fire frequency is often best expressed using fire rotation (SWCA).

Fire Hazard: Fire hazard is the potential fire behavior or fire intensity in an area, given the type(s) of fuel present—including both the natural and built environment—and their combustibility (CA GOPR 2020).

Fire History: The chronological record of the occurrence of fire in an ecosystem or at a specific site. The fire history of an area may inform planners and residents about the level of wildfire hazard in that area (SWCA).

Fire Intensity: A general term relating to the heat energy released in a fire (SWCA).

Fireline Intensity: Amount of heat release per unit time per unit length of fire front. Numerically, the product of the heat of combustion, quantity of fuel consumed per unit area in the fire front, and the rate of spread of a fire, expressed in kilowatts per minute (SWCA). This expression is commonly used to describe the power of wildland fires, but it does not necessarily follow that the severity, defined as the vegetation mortality, will be correspondingly high (Wooten 2021).

Fire Prevention: Efforts to stop human-caused wildfires. The goal of wildfire prevention is to limit the number of human-caused wildfires through programs targeting causes of wildfires such as campfire safety, equipment and vehicle use, firework safety, smoker education, burn permits, and target shooting safety. Preemptively powering down parts of the electricity grid during high wind events is an example of fire prevention.

Fire Regime: A measure of the general pattern of fire frequency and severity typical to a particular area or type of landscape: The regime can include other metrics of the fire, including seasonality and typical fire size, as well as a measure of the pattern of variability in characteristics (SWCA).

Fire Return Interval: Number of years (interval) between two successive fires in a designated area (SWCA).

Fire Severity: A qualitative measure of the immediate effects of fire on the fire severity ecosystem. It relates to the extent of mortality and survival of plant and animal life both aboveground and belowground and to loss of organic matter. It is determined by heat released aboveground and belowground. Fire severity is dependent on intensity and residence dependent of the burn. For trees, severity is often measured as percentage of basal area removed. An intense fire may not necessarily be severe (Wooten 2021).

Fire Risk: “Risk” takes into account the intensity and likelihood of a fire event to occur as well as the chance, whether high or low, that a hazard such as a wildfire will cause harm. Fire risk can be determined by identifying the susceptibility of a value or asset to the potential direct or indirect impacts of wildfire hazard events (CA GOPR 2020).

Flammability: The relative ease with which fuels ignite and burn regardless of the quantity of the fuels (SWCA).

Flame Length: The length of flames in the propagating fire front measured along the slant of the flame from the midpoint of its base to its tip. It is mathematically related to fireline intensity and tree crown scorch height (Wooten 2021).

Fuel Break: A natural or human-made change in fuel characteristics that affects fire behavior so that fires burning into them can be more readily controlled (NWCG 2024).

Fuel Complex: The combination of ground, surface, and canopy fuel strata (Wooten 2021).

Fuel Condition: Relative flammability of fuel as determined by fuel type and environmental conditions (SWCA).

Fuel Continuity: A qualitative description of the distribution of fuel both horizontally and vertically. Continuous fuels readily support fire spread. The larger the fuel discontinuity, the greater the fire intensity required for fire spread (Wooten 2021).

Fuel Loading: The volume of fuel in a given area generally expressed in tons per acre (SWCA). Dead woody fuel loadings are commonly described for small material in diameter classes of 0 to 0.25, 0.25 to 1, and 1 to 3 inches and for large material greater than 3 inches (Wooten 2021).

Fuel Management/Fuel Reduction: Manipulation or removal of fuels to reduce the likelihood of ignition and to reduce potential damage in case of a wildfire. Fuel reduction methods include prescribed fire, mechanical treatments (mowing, chopping), herbicides, biomass removal (thinning or harvesting or trees, harvesting of pine straw), and grazing. Fuel management techniques may sometimes be combined for greater effect (SWCA).

Fuel Model: A set of surface fuel bed characteristics (load and surface-area-to-fuel model volume ratio by size class, heat content, and depth) organized for input to a fire model (Wooten 2021).

Fuel Moisture Content: This is expressed as a percent or fraction of oven dry fuel moisture content weight of live and dead fuels. It is the most important fuel property controlling flammability. In living plants, it is physiologically bound. Its daily fluctuations vary considerably by species but are usually above 80 to 100 percent. As plants mature, moisture content decreases. When herbaceous plants cure, their moisture content responds as dead fuel moisture content, which fluctuates according to changes in temperature, humidity, and precipitation (Wooten 2021).

Fuel Treatment: The manipulation or removal of fuels to minimize the probability of ignition and/or to reduce potential damage and resistance to fire suppression activities (NWCG 2024). Synonymous with fuel modification.

Grazing: There are two types of grazing: traditional grazing and targeted grazing. Traditional grazing refers to cattle that are managed in extensive pastures to produce meat. Targeted grazing involves having livestock graze at a specific density for a given period of time for the purpose of managing vegetation. Even though both kinds of grazing manage fuel loading in range- and forested lands, targeted grazing is different in that its sole purpose is to manage fuels. Targeted grazing is done by a variety of livestock species such as sheep, goats, or cows (University of California, Agriculture and Natural Resources [UCANR] 2019).

Ground Fuels: Fuels that lie beneath surface fuels, such as organic soils, duff, decomposing litter, buried logs, roots, and the below-surface portion of stumps (Wooten 2021).

Hazard: A “hazard” can be defined generally as an event that could cause harm or damage to human health, safety, or property (CA GOPR 2020).

Hazardous Fuels: A fuel complex defined by type, arrangement, volume, condition, and location that poses a threat of ignition and resistance to fire suppression (NWCG 2024).

Hazardous Fuels Reduction: Any strategy that reduces the amount of flammable material in a fire-prone ecosystem. Two common strategies are mechanical thinning and controlled burning (Wooten 2021).

Hazard Reduction: Any treatment that reduces the threat of ignition and spread of fire (SWCA).

Highly Valued Resources and Assets (HVRAs): Landscape features that are influenced positively and/or negatively by fire. Resources are naturally occurring, while Assets are human-made (IFTDSS 2021).

Home Ignition Zone (HIZ): The home or structure plus surrounding area. HIZ extent depends on structural ignitability and defensible space (SWCA).

Ignition: The action of setting something on fire or starting to burn (SWCA).

Incident: An occurrence or event, either natural or person-caused, which requires an emergency response to prevent loss of life or damage to property or natural resources (Wooten 2021).

Influence Zone: An area that, with respect to wildland and urban fire, has a set of conditions that facilitate the opportunity for fire to burn from wildland fuels to the home and or structure ignition zone (NWCG 2024).

Initial Attack: The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire (SWCA).

Invasive Species: An introduced, nonnative organism (disease, parasite, plant, or animal) that begins to spread or expand its range from the site of its original introduction and that has the potential to cause harm to the environment, the economy, or to human health (USGS 2021).

Ladder Fuels: Fuels that provide vertical continuity allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease (SWCA).

Litter: Recently fallen plant material that is only partially decomposed and is still discernible (SWCA).

Manual Treatments: Felling and piling of fuels done by hand. The volume of material generated from a manual fuel treatment is typically too small to warrant a biomass sale therefore collected material is disposed of by burning or chipping. The work can be performed by either a single individual or a large, organized crew with powered equipment (UCANR 2021a).

Mechanized Treatments: Mechanical treatments pulverize large continuous patches of fuel to reduce the volume and continuity of material. Mechanical treatments can be applied as either mastication or chipping treatments. Both treatments shred woody material, but mastication leaves residue on-site while chipping collects the particles for transportation off site. Similar to hand treatments, mechanical treatments can target specific areas and vegetation while excluding areas of concern. In addition, mechanical treatment is easily scalable to large areas (>30 acres) with little added cost (UCANR 2021b).

Mitigation: Action taken before a wildfire ignites to reduce its severity and negative impacts such as the destruction of homes. Forest management, prescribed fire, home hardening, and defensible space are common wildfire mitigation strategies. Action taken after a wildfire ignites— emergency notification, fire suppression, and recovery programs—are not included in the definition of wildfire mitigation (Boulder County 2024k).

Mutual Aid: Assistance in firefighting or investigation by fire agencies, regardless of jurisdictional boundaries (NWCG 2024).

Native Revegetation: The process of replanting and rebuilding the soil of disturbed land (e.g., burned) with native plant species (USDA 2005).

Native Species: A species that evolved naturally in the habitat, ecosystem, or region as determined by climate, soil, and biotic factors (USDA 2005).

National Cohesive Strategy: The National Cohesive Wildland Fire Management Strategy is a strategic push to work collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress toward three goals:

- Resilient Landscapes
- Fire-Adapted Communities
- Safe and Effective Wildfire Response

Vision: To safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and as a nation, to live with wildland fire (Forests and Rangelands 2021).

Overstory: That portion of the trees in a forest which forms the upper or uppermost layer (SWCA).

Passive Crown Fire: A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods. Passive crown fire encompasses a wide range of crown fire behavior, from occasional torching of isolated trees to nearly active crown fire. Passive crown fire is also called torching or candling. A fire in the crowns of the trees in which trees or groups of trees torch, ignited by the passing front of the fire. The torching trees reinforce the spread rate, but these fires are not basically different from surface (SWCA).

Prescribed Burning: Any fire ignited by management actions under specific, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. Usually, a written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition (SWCA).

Rate of Spread: The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually, it is expressed in chains or acres per hour for a specific period in the fire's history (NWCG 2024).

Resilience: Resilience is the capacity of any entity – an individual, a community, an organization, or a natural system – to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience (CA GOPR 2020).

Response: Movement of an individual firefighting resource from its assigned standby location to another location or to an incident in reaction to dispatch orders or to a reported alarm (SWCA).

Slash: Debris left after logging, pruning, thinning, or brush cutting. Slash includes logs, chips, bark, branches, stumps, and broken trees or brush that may be fuel for a wildfire (SWCA).

Slope Percent: The ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent. One hundred feet of rise to 100 feet of horizontal distance equals 100 percent (NWCG 2024).

Suppression: The most aggressive fire protection strategy, it leads to the total extinguishment of a fire (SWCA).

Surface Fire: fire that typically burns only surface litter and undergrowth (National Geographic 2023).

Surface Fuel: Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants (SWCA).

Structural Ignitability: The ability of structures (such as homes or fences) to catch fire (SWCA).

Topography: The arrangement of the natural and artificial physical features of an area (SWCA).

Tree Crown: The primary and secondary branches growing out from the main stem, together with twigs and foliage (SWCA).

Understory: Low-growing vegetation (herbaceous, brush or reproduction) growing under a stand of trees. Also, that portion of trees in a forest stand below the overstory (SWCA).

Understory Fire: A fire burning in the understory, more intense than a surface fire with flame lengths of 1 to 3 meters (Wooten 2021).

Values and Assets at Risk: The elements of a community or natural area considered valuable by an individual or community that could be negatively impacted by a wildfire or wildfire operations. These values can vary by community and can include public and private assets (natural and human-made) – such as homes, specific structures, water supply, power grids, natural and cultural resources, community infrastructure-- as well as other economic, environmental, and social values (CA GOPR 2020).

Vulnerable Community: Vulnerable communities experience heightened risk and increased sensitivity to natural hazard and climate change impacts and have less capacity and fewer resources to cope with, adapt to, or recover from the impacts of natural hazards and increasingly severe hazard events because of climate change. These disproportionate effects are caused by physical (built and environmental), social, political, and/ or economic factor(s), which are exacerbated by climate impacts. These factors include, but are not limited to, race, class, sexual orientation and identification, national origin, and income inequality (CA GOPR 2020).

Wildfire: A “wildfire” can be generally defined as any unplanned fire in a “wildland” area or in the wildland-urban interface (WUI) (CA GOPR 2020).

Wildfire Exposure: During fire suppression activities, an exposure is any area/property that is threatened by the initial fire, but in National Fire Incident Reporting System (NFIRS) a reportable exposure is any fire that is caused by another fire, i.e., a fire resulting from another fire outside that building, structure, or vehicle, or a fire that extends to an outside property from a building, structure, or vehicle (USFA 2020).

Wildfire Influence Zone: A wildland area with susceptible vegetation up to 1.5 miles from the interface or intermix WUI (CA GOPR 2020).

Wildland: Those unincorporated areas covered wholly or in part by trees, brush, grass, or other flammable vegetation (CA GOPR 2020).

Wildland Fire: Fire that occurs in the wildland as the result of an unplanned ignition (CA GOPR 2020).

Wildland Fuels (aka fuels): Fuel is the material that is burning. It can be any kind of combustible material, especially petroleum-based products, and wildland fuels. For wildland fire, it is usually live, or dead plant material, but can also include artificial materials such as houses, sheds, fences, pipelines, and trash piles. In terms of vegetation, there are six wildland fuel types (Fuel Type: An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause a

predictable rate of spread or resistance to control under specified weather conditions.) The six wildland fuel types are (NWCG 2021a):

- Grass
- Shrub
- Grass-Shrub
- Timber Litter
- Timber-Understory
- Slash-Blowdown

Wildland Urban Interface (WUI): The zone of transition between unoccupied land and human development. It is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (USFA 2021a). In the absence of a CWPP, Section 101 (16) of the Healthy Foresters Restoration Act defines the wildland urban interface as " (I) an area extending ½ mile from the boundary of an at-risk community; (II) an area within 1 ½ miles of the boundary of an at-risk community, including any land that (1) has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community; (2) has a geographic feature that aids in creating an effective fuel break, such as a road or ridge top; or (3) is in condition class 3, as documented by the Secretary in the project-specific environmental analysis; (III) an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuels reduction to provide safer evacuation from the at-risk community." A CWPP offers the opportunity to establish a localized definition and boundary for the wildland urban interface (USFA 2020).

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