


Forest Service
U.S. DEPARTMENT OF AGRICULTURE

4FRI Rapid Assessment Report

SEPTEMBER 2022

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Introduction

Based on the 4FRI Restoration Strategy, a rapid assessment followed by an optimization effort are to be conducted by the Forest Service in collaboration with the 4FRI Stakeholder Group (SHG). This report is focused on the Rapid Assessment process described in the restoration strategy document.

> From 4FRI Restoration Strategy (11/2021):
>
> *Conduct a rapid assessment and optimization effort using best available science including priority firesheds on the Coconino and Kaibab NFs. Approximately 300,000-350,000 acres (over 20 years) will be assessed to prioritize which acres to treat to reduce the risk of wildfire the quickest beginning with FY2023 treatments. This approach uses new science to target acres to reduce risk, and lower costs by treating fewer acres in a shorter timeframe. The outcome will inform needs for a new larger-scale agreement or contract while we also resolve enabling conditions. This step uses best available science to partners with industry to be a part of the long-term approach.*
>
> *Work closely with the 4FRI Stakeholder Group to define priorities for project implementation and collaboratively conduct an optimization effort. The result of this effort will be collaboratively designed 5-year plans for timber and hazardous fuels for the Kaibab and Coconino NFs starting in FY23 (FY22 is covered under decision point #2). This assessment and optimization effort is expected to begin in January 2022 and be completed within several months.*

When the 4FRI phase 2 Request for Proposals (RFP) was cancelled, it was decided to conduct a rapid assessment to evaluate the opportunities for treatment strategies across the 4FRI area. The rapid assessment was designed to assess the Kaibab and Coconino NF only since the cancellation of the RFP did not have as much of an impact on the 5-year plans for the Apache-Sitgreaves and Tonto NFs.

Purpose

The purpose of the 4FRI rapid assessment is to provide a picture of the status of restoration activities on the 4FRI landscape focusing specifically on the Kaibab and Coconino to help prioritize and optimize mechanical treatments starting in fiscal year 2023. Past, ongoing, and future restoration activities planned in the forests' five-year plans will be quantified and displayed spatially in this report and provided to the 4FRI stakeholder group's optimization workgroup.

Objectives and Outcomes

- Assess the status of restoration activities across initiative area with a specific focus on the westside of the 4FRI area
- Provide a baseline for describing conditions and the need for restoration across the landscape
- Inform the timber and fuels five-year plan of work within the context of 4FRI restoration strategy and the wildfire crisis strategy
- Build a dataset that provides a comprehensive picture of what has been treated and what needs to be treated in the future
- Inform a strategy for how and when the work can be accomplished

Assumptions and methodology

Since 2014, the Forest Service 4FRI team has been providing the public and the stakeholder group a monthly update of restoration activities across the initiative. To get the most up to date information throughout the year, the data for those reports has been compiled directly from forest and district staff records and reports rather than utilizing the Forest Service ACtivity Tracking System (FACTS) database which has historically only been updated at the end of the year. This assessment uses data entered into the FACTS database since it is the system of record for tracking timber and fuels activities and allows for a more consistent approach to tracking activities. To establish a baseline using FACTS data, this report will provide a summary of 4FRI accomplishments across the initiative to date and then detail the restoration activities specifically on the Coconino and Kaibab using activities and wildfire data further back in time to present the status of the landscape more fully for those two forests.

Use of the FACTS database has increased over time as the underlying database has improved, more robust guidance has been developed, and reliance on the database for reporting accomplishments has become the standard. It is important to note that data for past activities was entered primarily as a mechanism for year-end reporting of accomplishments for established metrics. Additionally, the FACTS database is primarily a tabular database. Spatial data was not initially required so spatial data is not available for some past activities. Over time, reporting in FACTS has become more robust, however, this assessment is designed to extract more out of the data than was originally intended so some metrics may not be available for all activities and inconsistencies in the data may exist through time and between districts.

The database allows for multiple accomplishments to be tied to each activity unit to provide reporting of accomplishments that may apply toward multiple metrics. Because of this, care must be taken in summarizing the data either spatially or tabularly to reduce spatial overlap and to reduce chances for redundancy in reporting. For this assessment, activities were categorized into several distinct types to account for the various ways restoration treatments, or combinations of treatments, can affect restoration outcomes. To report information more concisely, a spatial model was developed to reduce double counting of acres and provide a tool for visually representing treatment types across the landscape through time.

The spatial model was run twice using different starting years to provide two separate, but parallel analyses presented in this report. The first model run is presented in the 4FRI Initiative Summary section. This section provides a broad overview of activities and wildfires from 2010 through 2022 across the entire initiative area. The tables in this section show 4FRI accomplishments for activities tracked in the FACTS database. The second model run is presented in the 4FRI Westside Summary section. This section provides a more in-depth analysis for the westside of 4FRI. The tables in this section show both 4FRI accomplishments and other activities tracked in the FACTS database since 2000, as well as wildfires from the common starting year of 2000. The year 2000 was chosen for this analysis because treatments prior to 2000 were not fully represented spatially in the database and beneficial effects associated with the treatments may no longer be as pronounced.

The FACTS database is a tabular database that can be joined to spatial activity polygons/lines/points to provide the location for activities entered on the tabular side. For this analysis, we are using a region 3 specific feature class (R03_FACT_ACTV160_vw) that is updated weekly through an automated script. Due to the lag between entering the data in FACTS, updates to the spatial data, and running of the

scripts to create this feature class, some updates to the activities or their spatial locations may not be represented in this version of the assessment.

While wildfires can be and are reported in the FACTS database as activities that mitigate fire hazard and/or move the forest toward resource objectives, effects can vary across wildfires or within a single wildfire due to variability in weather, fuels, and management strategies utilized to control and suppress them. This variability in outcomes complicates the reporting and the completeness of the wildfires represented within the FACTS database. Since the wildfire perimeters dataset is more comprehensive and provides a more accurate representation of the areas affected by wildfires over time, the wildfire perimeters are used for this analysis even if the dataset does not address the effects of those wildfires.

This assessment represents the current state of the data and planned activities as of the end of June 2022. This process was intended to be semi-automated and to allow the scripts behind the data to be rerun as new data is entered and older data is updated and/or fixed. An effort was made to identify data gaps and errors in the data for activities in the recent past and update the data to reflect the closeout of the 4FRI Phase 1 contract. Significant data gaps and inconsistencies do still exist for past activities, however, the information summarized here represents the best information available at this time. Additionally, minor updates were manually performed specifically related to the closeout of the 4FRI phase 1 contract to better represent the status of treatments and acres returned to the government at the end of the contract. The spatial data generated through the scripts was summarized and the resulting tables were recalculated to more accurately represent the acres associated with the closeout of the 4FRI phase 1 contract in the tables. The spatial data was not modified, and minor discrepancies may be seen in any direct comparisons between the spatial data and those summaries in this report.

Categories of Activities for Assessment

(Activity code names are located in appendix A)

Commercial Timber Harvest Activities

Completed Commercial Activities – Based on fiscal year the activity was completed.
FACTS Query Used[1]: ACTIVITY_CODE IN (4101,4102,4111,4113,4115,4117,4121,4122,4131,4132,4141,4142,4143,4145,4146,4148,4151, 4152,4162,4175,4177,4183,4192,4193,4194,4196,4210,4211,4220,4131,4232,4241,4242) AND FISCAL_YEAR_COMPLETED >= 2000 AND ORG IN('031204' , '031205', '030701', '030704', '030402', '030406', '030407', '030408', '030101', '030102','030103', '030106', '030107')

Ongoing Commercial Activities – Based on the fiscal year the activity was awarded.
FACTS Query Used[1]: ACTIVITY_CODE IN (4101,4102,4111,4113,4115,4117,4121,4122,4131,4132,4141,4142,4143,4145,4146,4148,4151, 4152,4162,4175,4177,4183,4192,4193,4194,4196,4210,4211,4220,4131,4232,4241,4242) AND FISCAL_YEAR_ACCOMPLISHED >= 2000 AND FISCAL_YEAR_COMPLETED IS NULL AND ORG IN('031204' , '031205', '030701', '030704', '030402', '030406', '030407', '030408', '030101', '030102','030103', '030106', '030107')

Non-Commercial Thinning Activities

FACTS Query Used[1]: (ACTIVITY_CODE IN(1136,1150,1152,1154,1160,1180,3370,4521,4522,4530,6103,6104,6105,6107,6133) OR (ACTIVITY_CODE = '4270' AND ACTIVITY_SUB_UNIT_NAME = 'MOUNTAINAIRE MEADOW 07') OR (ACTIVITY_CODE IN (4511,2340,2341,2360,2400) AND NOT METHOD_CODE IN ('000', '101', '102', '300')) OR (ACTIVITY_CODE IN (4511,2340,2341,2360,2400) AND METHOD_CODE = '000' AND (NOT WORKFORCE_CODE = 'FA' OR WORKFORCE_CODE IS NULL))) AND FISCAL_YEAR_COMPLETED >= 2000 AND ORG IN('031204' , '031205', '030701', '030704', '030402', '030406', '030407', '030408', '030101', '030102','030103', '030106', '030107') AND NOT FACTS_ID = '2013NKRDBS'

Prescribed Fire Activities

FACTS Query Used[1]: ACTIVITY_CODE IN (1111,1112,1113,4491,4492,4541,6101) AND FISCAL_YEAR_COMPLETED >= 2000 AND ORG IN('031204' , '031205', '030701', '030704', '030402', '030406', '030407', '030408', '030101', '030102','030103', '030106', '030107')

Pile Burning Activities

FACTS Query Used[1]: ACTIVITY_CODE IN (1130) AND FISCAL_YEAR_COMPLETED >= 2000 AND ORG IN('031204' , '031205', '030701', '030704', '030402', '030406', '030407', '030408', '030101', '030102','030103', '030106', '030107')

Wildfires

Fire Perimeter – dissolved by year and overlaid by multiple years to get latest wildfire and multiple wildfires on each acre. Different years were used to summarize for the 4FRI Initiative summary (2010-2021) and the 4FRI westside summary (2000-2021) to align with the timeframes used in the activities categories from FACTS specific to each section.

[1]The date used for the FACTS queries is different for the 4FRI initiative summary and the 4FRI westside summary. The year 2010 was used as the cut-off for the 4FRI initiative summary since the initiative began in that year and the year 2000 was used as the cut-off for the 4FRI westside summary to track activities for past and ongoing NEPA projects.

4FRI Initiative Summary

The 4FRI initiative focuses on restoring 2.4 million acres of Ponderosa Pine Ecosystems on four national forests across Northern Arizona. Restoration activities quantified in this report include commercial timber harvest, non-commercial thinning, and prescribed fire activities. Wildfires can also contribute toward restoration goals and are quantified based on wildfire perimeter data. This section of the report summarizes 4FRI accomplishments in these categories as well as wildfire occurrences over the same time period across the entire initiative area.

Commercial Timber Harvest Activities

Since 2010 many timber harvest activities have been completed across the initiative area. On the Apache-Sitgreaves National Forests, industry has maintained a consistent level of timber harvest activities when compared to the west side of the initiative; having treated a total of 76,752 acres. The Coconino National Forest provides the second largest number of commercial timber harvest activities at 24,271 acres. The Tonto has forests with comparatively less acreage of timber within the 4FRI area and correspondingly provides smaller acres of accomplishment for commercial timber harvest activities at 6,177 acres. The acreage of completed commercial timber harvest on the Kaibab (6,127 acres) is less than the actual amount that has occurred on the forest due to activities not being flagged as part of the initiative. Approximately 5,000 acres of commercial treatments on the Kaibab have been completed since 2010 that were not flagged as part of the initiative and do not appear in this table. These acres are accounted for in the 4FRI Westside Summary section later in the document.

Table 1. Commercial Timber Harvest Activities by Forest (4FRI-wide)

Forest	Completed Commercial Timber Harvest[1,2] (Acres) FY 2011 – FY 2022	Ongoing Awarded Commercial Timber Harvest (Acres)	Planned Commercial Timber Harvest Offerings[3] (Acres/Year) FY 2022 – FY 2026
Apache-Sitgreaves	76,792	29,225	14,338
Coconino	24,271	12,801	14,447
Kaibab	6,127	11,253	4,025
Tonto	6,177	374	1,800
Initiative Total	**113,366**	**53,653**	**34,660**

[1]Completed activities from fiscal year 2011 through fiscal year 2022. Fiscal year 2022 is still in progress and these numbers do not represent a full accounting of activities completed to date.

[2]Completed commercial timber harvest activities in this table do not incorporate manual edits applied in tables 2 and 3 to fully account for the closeout of the 4FRI Phase 1 Contract.

[3]Planned commercial timber harvest offerings per year as committed to in the 4FRI restoration strategy. Actual levels of offerings may be more or less than this average.

In addition to commercial treatments that have been completed, many projects have been awarded to contractors and are ongoing and others are in various stages of planning and preparation to be awarded in the next five years. The Apache-Sitgreaves contains the largest proportion of acres under contract with ongoing operations at 29,225 acres. The Coconino and Kaibab National Forests have a similar number of acres under contract at 12,801 acres and 11,253 acres, respectively. Many acres on the Kaibab are near completion and have yet to be reflected as completed in the database.

The five-year plan for commercial timber harvest activities shows a slightly different trend than the completed and ongoing activities. With the 4FRI Restoration Strategy presented in the fall of 2021, a new focus has been put on ramping up restoration activities on the west side of the initiative. This commitment is reflected in the program of work to prep and offer approximately 14,000 acres per year on the Coconino and 4,000 acres per year on the Kaibab over the next five years. The commitment is also reflected in the increase in commercial timber projects planned to be prepped and offered on the Tonto (1,800 acres per year) over the next five years. The commitment on the Tonto to ramp up

restoration and hazardous fuels reduction activities from the 4FRI restoration strategy is also reflected in non-commercial activities to be discussed later in this document.

Table 2 displays commercial timber harvest activities by year awarded and year completed to highlight how projects awarded in one year may be completed over many years. The table is specific to commercial activities tracked in the FACTS database that have been tagged as 4FRI accomplishments and have been completed. It does not represent all acres offered and/or awarded since it does not include acres that have not been completed (see table 3 for a summary of all acres awarded). Since this data is derived from the FACTS database, differences between this information and similar information in the 4FRI monthly updates do exist. It is expected that data in FACTS and in the monthly updates will be updated over time to more accurately reflect the status of restoration activities across the landscape and discrepancies will be reduced.

The 4FRI had relatively fewer acres awarded at the beginning of the initiative in 2010, which could be due to fewer acres in signed NEPA decisions, large disruptive wildfires in 2010 and 2011 on the Coconino and Apache-Sitgreaves, and activities not getting properly attributed as 4FRI accomplishments early in the initiative. Note the increase in acres awarded in 2013 is due to the first task orders for the 4FRI phase 1 contract being awarded in 2013 and a similar increase in acres completed starting in 2015 is likely due to an increase in acres in signed NEPA decisions.

Implementation of timber harvest activities on the west side of the initiative has been frustrated by the lack of established industry prior to 2022 and the current industry's ability to economically remove biomass produced through restoration activities. As seen in table 3, approximately 47,549 acres had been awarded under the 4FRI Phase 1 Contract and have been recently returned to the government at the end of the contract. The majority of those acres are on the Coconino and the Kaibab national forests. The current plan is to reoffer most of the acres that were previously awarded in task orders under the 4FRI Phase 1 Contract.

Table 2. Completed Commercial Timber Harvest Activities by Year Completed and Year Awarded (4FRI-wide)

Fiscal Year Awarded	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022[1]	Grand Total
2005	928		759										**1,687**
2006		304			288								**592**
2007	111		1,262										**1,373**
2008				568									**568**
2009		182											**182**
2010		38		392									**430**
2011	3,737	3,554		267									**7,558**
2012		1,259	741	307									**2,307**
2013			2,061	4,032	3,221	4,714	2,476	29	668		425	2,240	**19,866**
2014				1,257	3,844	2,106	1,050	974	1,039	255	649		**11,174**
2015					4,274	1,808	4,184	1,198	2,072	303	750	1,525	**15,984**
2016						1,717	5,297	2,380	2,342	1,421	1,405	781	**15,268**
2017							1,817	3,399	1,274	2,398	2,934		**11,822**
2018								1,108	3,151	4,210	586	319	**9,374**
2019									797	3,530	3,521	611	**8,459**
2020										510	5,829	1,583	**7,921**
2021											63		**63**
2022[1]													**0**
Grand Total	**4,776**	**5,337**	**4,823**	**6,823**	**11,627**	**10,345**	**14,824**	**9,088**	**11,343**	**12,627**	**16,162**	**7,059**	**114,628**

[1]Fiscal year 2022 is ongoing and not all completed or awarded activities have been entered into the FACTS database.

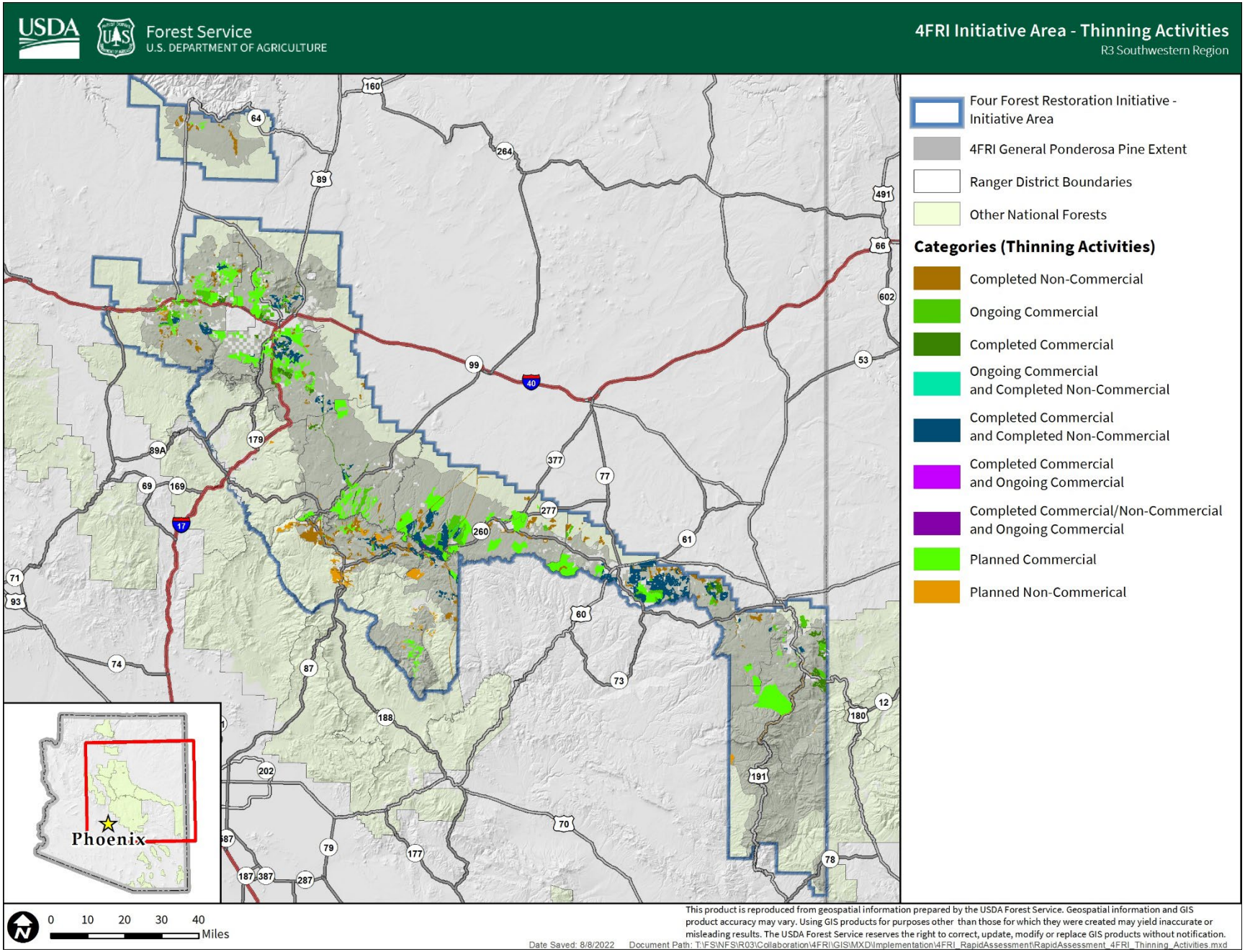
Table 3. Awarded Commercial Timber Harvest Activities by Year (4FRI-wide)

Fiscal Year Awarded	Completed Commercial Timber Harvest (Acres) FY 2011 – FY 2022	Ongoing Commercial Timber Harvest (Acres)	Total Completed or Ongoing Commercial Timber Harvest (Acres)	4FRI Phase 1 Returned at the End of the Contract[2]	Grand Total Completed, Ongoing, and Returned
2005	1,687		1,687		**1,687**
2006	592		592		**592**
2007	1,373		1,373		**1,373**
2008	568		568		**568**
2009	182		182		**182**
2010	430		430		**430**
2011	7,558		7,558		**7,558**
2012	2,307		2,307		**2,307**
2013	19,866		19,866	4,512	**24,378**
2014	11,174		11,174	10,350	**21,524**
2015	15,984	453	16,437	18,119	**34,556**
2016	15,268	1,744	17,012	4,865	**21,877**
2017	11,822	6,998	18,820		**18,820**
2018	9,374	9,672	19,046	1,776	**20,822**
2019	8,459	14,702	23,161	7,927	**31,088**
2020	7,921	7,851	15,772		**15,772**
2021	63	6,781	6,844		**6,844**
2022[1]	0	5,452	5,452		**5,452**
Grand Total	**114,628**	**53,653**	**168,281**	**47,549**	**215,831**

[1]Fiscal year 2022 is ongoing and not all completed or awarded activities have been entered into the FACTS database.

[2]4FRI Phase 1 acres returned to the government represent acres for activities completed in FACTS subtracted from the acres awarded for that year and do not include projects awarded and descoped in previous years.

Figure 1. Completed, Ongoing, and Planned Commercial and Non-commercial Thinning Activities (4FRI-wide)



Non-Commercial Thinning Activities

Non-commercial thinning activities represent many different types of treatment methods. This category combines pre-commercial thinning, hazardous fuels reduction, mastication, and range/wildlife habitat improvement activities. In some cases, these treatments overlap with commercial timber harvest activities and in other cases they are stand-alone. On the Tonto National Forest, most of the thinning accomplishments fall within this category due to a lack of commercial timber, a preponderance of flashy fuels within the wildland-urban interface, and steep terrain. On the other three forests, non-commercial thinning typically entails pre-commercial thinning in conjunction with commercial thinning operations and follows a similar trend seen for completed commercial thinning.

The planned non-commercial thinning described in table 4 below represent the commitments in the 4FRI Restoration Strategy. The Tonto National Forest is placing a high priority on working with partners to confront the wildfire crisis and reduce the risk posed by wildfire in both the forest and woodland types across the Payson and Pleasant Valley districts. That emphasis is reflected in the planned fuels activities for the next five years. It is expected that completed pre-commercial activities connected with ongoing and planned commercial timber harvests will add to the accomplishments in this category over the next five years, but are not represented in the tables for the Coconino, Kaibab, and Tonto national forests to avoid double counting restoration treatments that occur at the same time and location.

Table 4. Non-Commercial Thinning Activities by Forest (4FRI-wide)

Forest	**Forest-wide Completed Non-commercial Thinning[1] (acres) FY 2011 – FY 2022**	**Completed Non-commercial Thinning Within General Ponderosa Pine Extent[1,2] (acres) FY 2011 – FY 2022**	**Planned Non-commercial Thinning[3] (acres/year) FY 2022 – FY 2026**
Apache-Sitgreaves	88,376	79,119	10,000[4]
Coconino	19,460	18,873	1,060
Kaibab	17,590	17,285	2,100
Tonto	35,929	32,178	12,167
Initiative Total	**161,356**	**147,454**	**25,327**

[1]Completed activities from fiscal year 2011 through fiscal year 2022. Fiscal year 2022 is still in progress and these numbers do not represent a full accounting of activities completed to date.

[2]The general ponderosa pine extent footprint was created to encompass the majority of the ponderosa pine. The general ponderosa pine extent closely follows the estimated 2.4 million acres of ponderosa pine across the initiative area historically defined as the 4FRI footprint.

[3]Planned non-commercial thinning activities per year as committed to in the 4FRI restoration strategy. Actual levels of offerings may be more or less than this average.

[4]Represents mechanical treatment acres using whole tree logging that reduces hazardous fuels

Prescribed Fire Activities and Wildfires

Fire is an essential element of restoration for frequent fire forest ecosystems. That said, a single prescribed fire or wildfire by itself may not restore forest structure and may require multiple entries or events to move forests towards desired conditions. Therefore, it is difficult to quantify movement toward restoration when looking at acres of accomplishment alone. However, it is clear that a large percentage of the landscape has been treated with prescribed fire and a larger percentage has sustained wildfire throughout the life of the initiative.

Prescribed Fire Activities – Broadcast Burning and Pile Burning

Prescribed fire is used to manage both natural and activity-generated fuels. Broadcast burning is generally applied across large areas to reintroduce natural processes for a variety of fuels and ecological benefits. Pile burning is applied in more concentrated areas to reduce fuels generated by thinning activities that are not otherwise physically removed from the site. While both are essential to fuels management, pile burning follows thinning activities and cannot be planned in as much detail as broadcast burning activities due to the variability in the timing of thinning activities. Table 5 shows the 4FRI accomplishments for completed broadcast burning and pile burning since the beginning of the initiative as well as the planned yearly accomplishments for both types of prescribed fire activities as described in the 4FRI Restoration Strategy.

Table 5. Prescribed Fire Activities by Forest (4FRI-wide)

Forest	Forest-wide Completed Broadcast Burning (Tabular Acres)[1,2] FY 2011 – FY 2022	Forest-wide Completed Broadcast Burning (Spatial Acres)[2,3] FY 2011 – FY 2022	Completed Broadcast Burning Within General Ponderosa Pine Extent (Spatial Acres)[2,3] FY 2011 – FY 2022	Forest-wide Completed Pile Burning (Spatial Acres)[2] FY 2011 – FY 2022	Planned Prescribed Fire[4] (Acres/Year) FY 2022 – FY 2026
Apache-Sitgreaves	123,172	105,133	98,287	23,933	43,881
Coconino	134,343	122,469	119,598	16,213	35,000
Kaibab	85,351	83,828	83,821	16,393	20,000
Tonto	46,340	27,067	27,067	6,373	17,662
Initiative Total	**389,206**	**338,497**	**328,772**	**62,912**	**116,543**

[1]All completed broadcast burning activities regardless of spatial location. These acres account for broadcast burning activities that have occurred several times on the same piece of ground over time, but subsequently can misrepresent the footprint of the area affected by broadcast burning over time.

[2]Completed activities from fiscal year 2011 through fiscal year 2022. Fiscal year 2022 is still in progress and these numbers do not represent a full accounting of activities completed to date. Despite efforts to update data, spatial data is missing for multiple years for some forests and would potentially increase the footprint of acres that have received broadcast burning treatments.

[3]Data represents unique acres that have had broadcast burning activities completed once or multiple times.

[4]Planned acres for prescribed fire (broadcast burning and pile burning) represent annual estimates based on the 4FRI Restoration Strategy. Due to the way that prescribed burning is planned, more projects are identified each year than can be completed due to capacity and adequate burn windows. The map shows all of the burn blocks being considered for the next five years and represents a larger footprint than the annual estimates expected to be achieved.

Broadcast Burning Activities From Fiscal Year 2011 Through Fiscal Year 2022

Multiple entries with fire will be needed to achieve the goals of restoring frequent fire ecosystems. The spatial model used for this analysis allows for the quantification of acres on the landscape where multiple broadcast burns have occurred on the same place. Table 6 displays the number of times a broadcast burn has been conducted on the areas that have had at least one broadcast burn since fiscal year 2011.

Table 6. Overlap of Broadcast Burning Activities within the General Ponderosa Pine Extent from Fiscal Year 2011 through 2022 (4FRI-wide)

Forest	Prescribed Fire Acres Burned Once FY 2011 – FY 2022	Prescribed Fire Acres Burned Twice[1] FY 2011 – FY 2022	Prescribed Fire Acres Burned 3 or More[1] FY 2011 – FY 2022	Grand Total
Apache-Sitgreaves	**92,267**	**6,019**	**1**	**98,287**
Black Mesa	23,288	623		23,911
Lakeside	17,269	3,273	0	20,542
Alpine	6,746			6,746
Springerville	29,736	1,735	1	31,472
Clifton	15,228	388		15,616
Coconino	**108,955**	**10,202**	**441**	**119,598**
Flagstaff	50,907	4,022	433	55,362
Mogollon Rim	55,445	4,506	8	59,960
Red Rock	2,603	1,673	0	4,276
Kaibab	**82,699**	**1,122**	**0**	**83,821**
Williams	62,484	382		62,866
Tusayan	20,215	740	0	20,955
Tonto	**23,681**	**3,385**	**1**	**27,067**
Payson	14,742	1,280	1	16,022
Pleasant Valley	8,939	2,105		11,044
Grand Total	**307,602**	**20,727**	**443**	**328,772**

[1]Acres that have been affected by two or more prescribed fires between 2010 and 2021

Table 7 shows that acres of broadcast burning per year have been generally increasing since the beginning of the initiative. As part of the 4FRI restoration strategy, approximately 116,543 acres of broadcast burning is planned per year for the next five years across all four forests. To date, Forests have not been able to implement broadcast burning on as many acres as described in the restoration strategy. This shortfall is due to a variety of factors, such as limited burn windows, government shutdowns, restrictions associated with Covid-19, and national moratoriums on broadcast burning. By completing required wildlife and heritage survey work, forests are developing programs that could achieve desired outcomes when conditions are favorable.

Table 7. Completed Broadcast Burning Activities by Year (4FRI-wide)

Forest	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022[1]	Grand Total
Apache-Sitgreaves		11,679	6,221	10,687	3,493	12,523	6,269	14,351	19,081	18,867	5,348	14,653	123,172
Coconino	13,268	8,421	7,939	3,661	12,645	9,827	15,336	21,279	14,047	19,775	5,314	2,832	134,343
Kaibab	734	4,837	2,936	5,911	6,945	6,996	8,306	14,668	14,681	13,504	9	5,824	85,351
Tonto	4,824		2,275	1,359	127	9,415	4,059	5,238	2,690	33	331	15,989	46,340
Initiative Total	**18,826**	**24,937**	**19,371**	**21,618**	**23,210**	**38,761**	**33,970**	**55,536**	**50,499**	**52,179**	**11,002**	**39,298**	**389,206**

[1]Fiscal year 2022 is ongoing and not all completed or awarded activities have been entered into the FACTS database.

Wildfires (2010 through 2021)

As mentioned above, a large proportion of the area has experienced wildfires through the life of the initiative. Many of these wildfires have had beneficial effects and help in the goal of restoring a functioning fire regime across the landscape. However, many of these fires have had detrimental effects on vegetation, fuel loading, and soils. Further exploration into the effects of both wildfire and prescribed fires across the landscape could help quantify where opportunities exist for fire to move the landscape further toward restoration goals and where mechanical treatments are needed to move the landscape toward desired forest structures and spatial patterns.

Table 8. Wildfires 2010 - 2021 (4FRI-wide)

Forest	Wildfire Acres (Forestwide) 2010 - 2021	Wildfire Acres (within General Ponderosa Pine Extent[1]) 2010 - 2021
Apache-Sitgreaves	659,249	641,457
Coconino	358,387	306,919
Kaibab	124,409	116,757
Tonto	78,545	66,962
Initiative Total	**1,220,590**	**1,132,096**

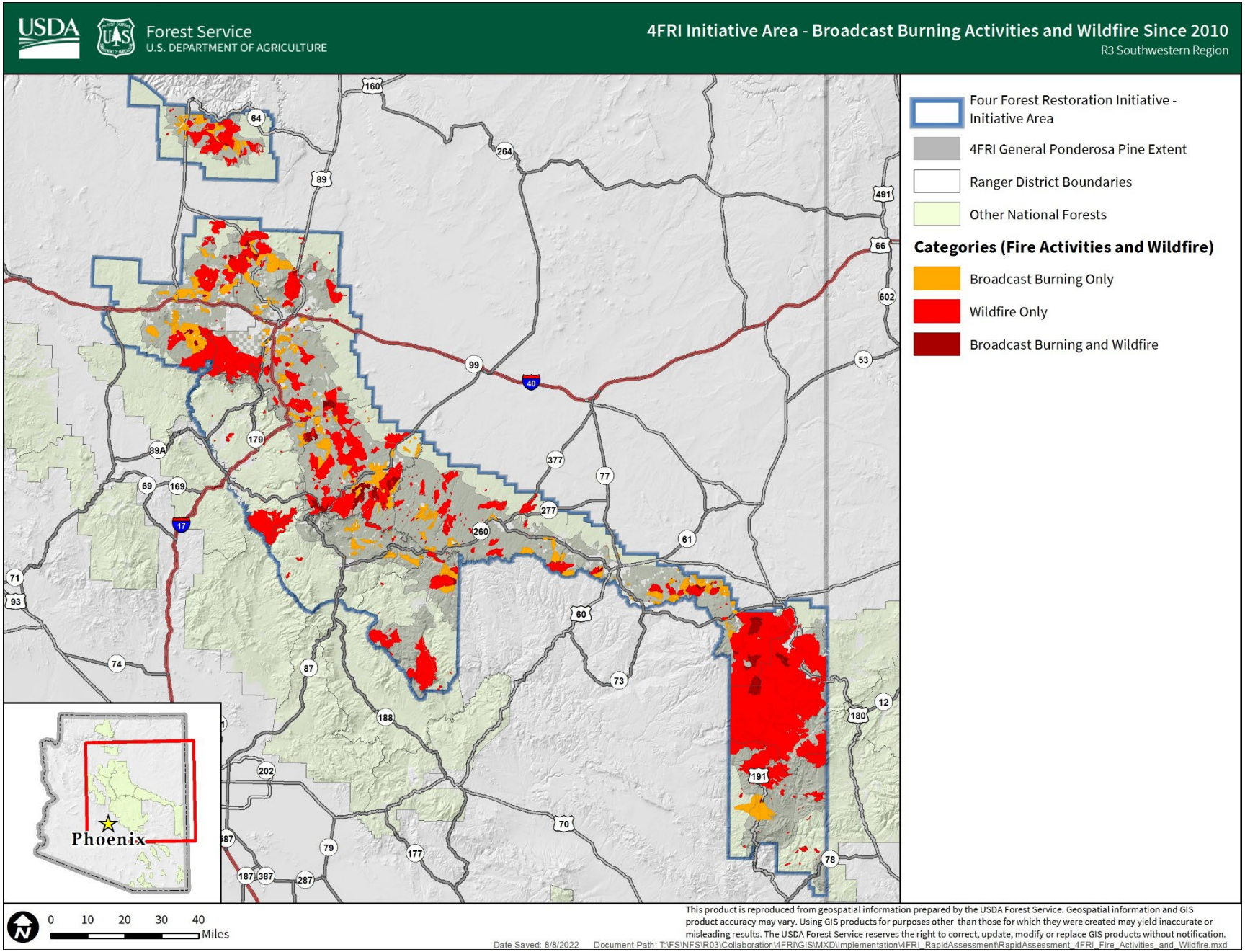
[1]The general ponderosa pine extent footprint was created to encompass the majority of the ponderosa pine. The general ponderosa pine extent closely follows the estimated 2.4 million acres of ponderosa pine across the initiative area historically defined as the 4FRI footprint.

Table 9. Overlap of Wildfires within the General Ponderosa Pine Extent from 2010 to 2021 (4FRI-wide)

Forest	Wildfire Acres Burned Once 2010 - 2121	Wildfire Acres Burned Twice[1] 2010 - 2121	Wildfire Acres Burned 3 or More[1] 2010 - 2021	Grand Total
Apache-Sitgreaves	**587,891**	**53,527**	**40**	**641,457**
Black Mesa	39,050	377		39,427
Lakeside	18,495	11		18,507
Springerville	138,215	199		138,414
Alpine	319,785	47,245	26	367,056
Clifton	72,346	5,694	14	78,053
Coconino	**297,536**	**9,217**	**166**	**306,919**
Flagstaff	143,315	2,755		146,070
Mogollon Rim	144,993	6,461	166	151,621
Red Rock	9,229			9,229
Kaibab	**115,996**	**761**		**116,757**
Williams	71,986	530		72,517
Tusayan	44,010	231		44,241
Tonto	**61,011**	**5,940**	**10**	**66,962**
Payson	4,978			4,978
Pleasant Valley	56,034	5,940	10	61,984
Grand Total	**1,062,434**	**69,445**	**217**	**1,132,096**

[1]Acres that have been affected by two or more wildfires between 2010 and 2021

Figure 2. Broadcast Burning Activities - Fiscal Year 2011 through 2022 and Wildfires - 2010 through 2021 (4FRI-wide)



4FRI Westside Summary (Coconino/Kaibab)

The focus of the 4FRI rapid assessment is to provide detailed status of activities across the Coconino and south zone of the Kaibab. The Kaibab National Forest is effectively broken out into two zones based on geography and logistical constraints due to the Grand Canyon being located between the North Kaibab Ranger District on the north side of the forest and the Williams and Tusayan ranger districts on the south side of the forest. The south zone of the Kaibab is comprised the Williams and Tusayan Ranger Districts. The following summary and tables display activities reported in the FACTS database and wildfire perimeters stored in official Forest Service spatial databases. The data provided below represents activities over a longer time period than those in the 4FRI Initiative Summary section above to include activities that have been awarded or completed between 2000 and 2022 and wildfires that have occurred between 2000 and 2021. This data includes activities that represent accomplishments as a part of the initiative and activities that occurred prior to the start of the initiative in 2010. This longer timeframe was chosen for this section to provide a more encompassing analysis of past activities and wildfires and a more inclusive representation of the status of restoration across the westside of the 4FRI landscape.

Commercial Timber Harvest Activities

Table 10. Commercial Timber Harvest Activities by Forest (4FRI Westside)

Forest	Completed Commercial Timber Harvest[1] (Acres) FY 2000 – FY 2022	Ongoing Awarded Commercial Timber Harvest[2] (Acres) FY 2000 – FY 2022	Planned Commercial Timber Harvest[3] (Acres/Year) FY 2022 – FY 2026
Coconino	40,417	12,548	14,447
Kaibab	15,557	11,775	4,025
Total	**55,974**	**24,323**	**18,472**

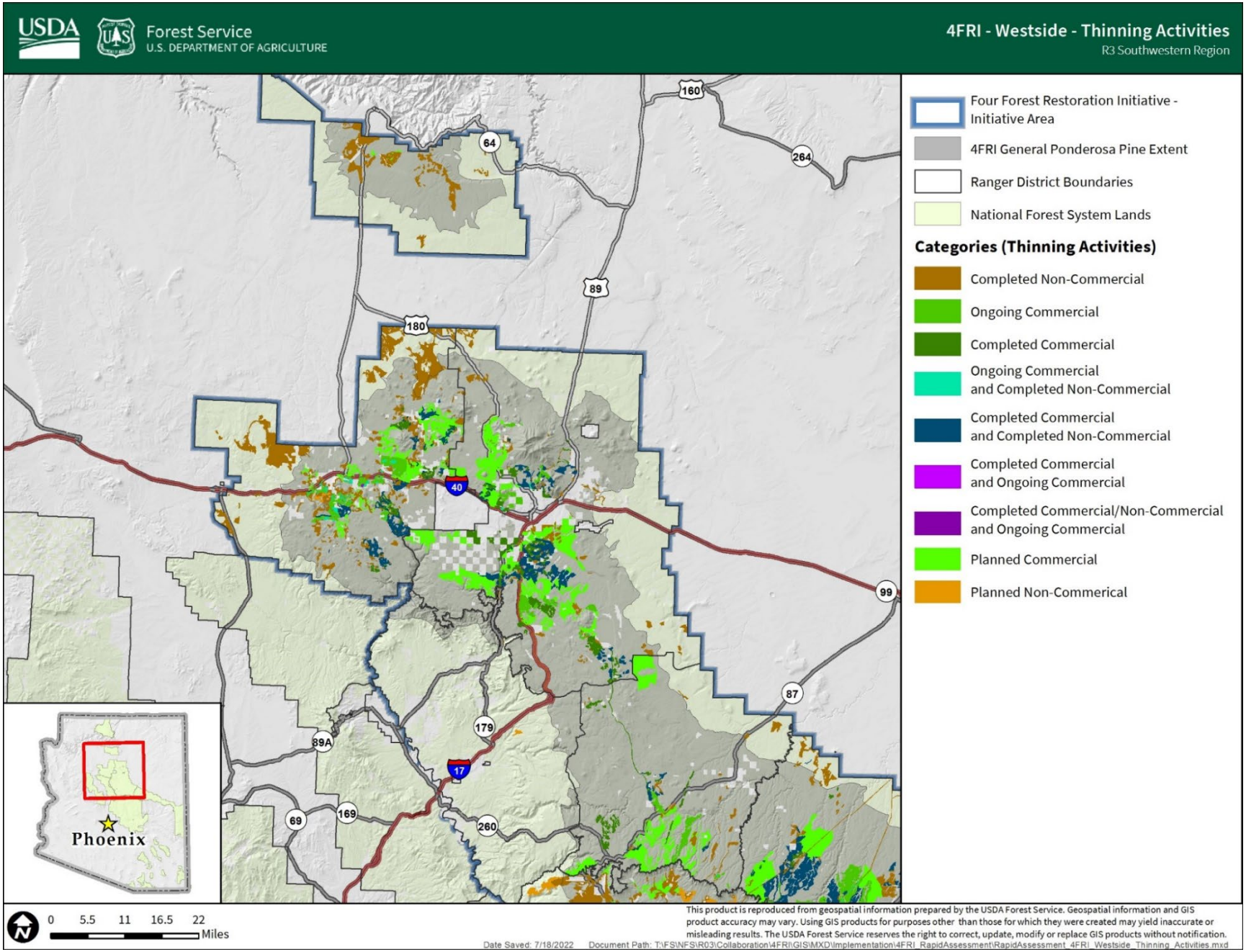
[1]Commercial thinning activities completed between fiscal years 2000 and 2022

[2]Commercial thinning activities awarded between fiscal years 2000 and 2022

[3]Planned commercial timber harvest offerings per year as committed to in the 4FRI restoration strategy. Actual levels of offerings may be more or less than this average.

Commercial activities have occurred on at least 55,974 acres across the Coconino and south zone of the Kaibab since 2000. This number likely represents an underestimate of the actual acres thinned in commercial timber harvests due to data gaps in tracking treatments spatially as far back as 2000, however the data represents the best information available. More accurate records are available for ongoing activities compared to older activities that may not have been entered as completely as more recent activities. Still, inconsistent reporting requirements, lumping units into sales to save time rather than provide finer details, and time lags in reporting do still represent a challenge for providing ongoing estimates of treatments prior to end of year reporting. As discussed earlier, when comparing the scale of past commercial thinning activities to the 5-year plan, the current 4FRI restoration strategy represents an increase in the scale of restoration across the westside of the 4FRI area. This commitment is reflected in the plan to prepare and offer contracts on approximately 14,447 acres per year on the Coconino and 4,025 acres per year on the Kaibab over the next five years.

Figure 3. Completed, Ongoing, and Planned Commercial and Non-commercial Thinning Activities (4FRI Westside)



NEPA Project Summaries – Status of Current and Past Commercial Activities

Table 11 shows a detailed summary of proposed commercial thinning activities within current and upcoming NEPA projects on the Coconino and south zone of the Kaibab National Forests. The first two columns represent all thinning activities proposed in each project compared to the subset of those proposed treatments that could be achieved through commercial timber harvest activities. This subset is used to provide an estimate of the remaining treatment opportunities after taking out complete, ongoing, and planned/prepped projects. While these estimates are useful for identifying opportunities for implementation in the future, unknowns such as potential changed conditions due to future wildfires, reductions in acres during layout due to operational feasibility, potential issues with access, and other site-specific limitations could reduce the acres treated using commercial thinning. For example, on the Tusayan ranger district, the 4FRI 1st Environmental Impact Statement (EIS) allowed up to 29,974 of mechanical thinning (table 11), but due to a variety of factors these acres are likely to be treated using non-commercial methods.

Generally, table 11 shows a transition from past NEPA decisions covering smaller footprints toward implementation of the larger landscape scale NEPA decisions collaboratively developed with the 4FRI stakeholder group. Since the 4FRI 1st EIS was signed in 2015, some restoration activities from that project have been completed and are awarded in ongoing projects. Additionally, most timber harvest activities planned for the next five years on the Williams Ranger District on the Kaibab and the Flagstaff Ranger District on the Coconino are authorized in this project. Beyond what is completed, ongoing, and planned in the next five years, approximately 109,000 acres on the Williams Ranger District and approximately 166,000 acres on the Flagstaff Ranger District are remaining and available for timber harvest from the 4FRI 1st EIS decision. On the Mogollon Rim Ranger District on the Coconino, ongoing and planned timber harvest activities in the next five years will be primarily focused on the CC Cragin watersheds. As timber harvest activities from the Cragin Watershed Protection Project are completed, focus will turn toward the approximately 185,000 acres that are available for timber harvest from the Rim Country project.

Table 12 is provided to complement the information in table 11. The table shows completed commercial activities in past projects adjacent to but not overlapping ongoing projects on the landscape listed in table 11. Many of these project areas, especially those where activities occurred in the early 2000s, will need to be reevaluated for restoration needs in the future. In addition to the past projects listed in table 12, the environmental analysis for the Turkey Butte-Barney Pasture project on the Mogollon Rim north of the Red Rock/Secret Mountain Wilderness is currently on hold. This area represents another 17,000 acres with similar needs for restoration as adjacent areas on the Flagstaff Ranger District.

By looking closely at the current 5-year plan for the Coconino and south zone of the Kaibab, several priorities become apparent across the landscape. Priorities for commercial thinning on the Kaibab are mostly centered around the communities and infrastructure near Interstate 40. Further out in time, priorities shift to restoration in the forests on the southwest sides of Kendrick and Sitgreaves Mountains. On the Flagstaff Ranger District on the Coconino, a similar pattern to the Kaibab is apparent in the focus on commercial thinning projects adjacent to communities and infrastructure. Restoration activities in and around these areas will help to mitigate some of the risk associated with uncharacteristic wildfire effects in the wildland-urban interface. In addition, several projects are identified in the forests west and southwest of the San Francisco Peaks and the forests surrounding Mormon Mountain. On the Mogollon Rim Ranger District on the Coconino, priorities are within the watersheds flowing into the C.C. Cragin reservoir.

As discussed earlier, around 47,000 acres have been returned to the government following the ending of the 4FRI Phase 1 Contract. Many of these projects are planned to be repackaged into stand-alone timber sales and stewardship projects, but some have not been reprioritized for the next five years. Previous investments in wildlife and heritage surveys, timber measurement and marking, layout, and contract packages elevate the need to expeditiously incorporate these sales into outyear plans.

Table 11. NEPA Project Summaries for Ongoing and Planned Commercial Activities (4FRI Westside)

Forest/District/NEPA Project Name	NEPA Planned All Thinning Treatments	Subset of Thinning Treatments Available for Timber Harvest Activities	Completed Commercial Timber Harvest[1] FY 2000 – FY 2022	Ongoing Commercial Timber Harvest FY 2000 – FY 2022	Future/ Upcoming Commercial Timber Harvest (FY22-FY26)[2]	Prepped[2] (Not in 5-Year Plan)	Remaining Planned Treatments Available for Timber Harvest[3]
Coconino	**616,869**	**517,187**	**16,695**	**12,921**	**82,162**	**16,037**	**389,372**
Flagstaff RD	**291,853**	**258,512**	**14,719**	**7,659**	**51,411**	**4,750**	**179,973**
4FRI 1st EIS	234,221	212,364	4,493	5,498	33,495	2,733	166,145
Eastside Fuels Reduction and Forest Health Project	7,841	3,928	536		905		2,487
Elk Park Fuels Reduction and Forest Health Project	4,700	4,659	2,865		1,738		56
Flagstaff Watershed Protection Project	6,792	6,792	1,858	1,574	363		2,997
Hart Prairie Fuels Reduction and Forest Health Restoration	7,440	7,272	71	467	5,171		1,563
Marshall Fuel Reduction and Forest Restoration	10,800	4,875			2,271		2,604
Munds Park Fuel Reduction Project	990	650	530	120			0
Wing Mtn. Fuels Reduction and Forest Health Restoration	10,470	9,565			7,468		2,097
Woody Ridge Forest Health	8,599	8,407	4,366			2,017	2,024
Mogollon Rim RD/Red Rock RD	**325,016**	**258,675**	**1,976**	**5,262**	**30,751**	**11,287**	**209,399**
4FRI 1st EIS	11,299	11,086			5,700		5,386
Clints Well Forest Restoration Project	16,444	12,715	1,369	1,679		5,271	4,396
Cragin Watershed Protection Project	37,766	35,976		3,583	21,251		11,142
Rim Country	243,700	185,192			3,800		181,392
Upper Beaver Creek Watershed Fuel Reduction Project	15,807	13,706	607			6,016	7,083
Kaibab	**240,671**	**193,522**	**7,065**	**11,772**	**28,621**	**6,919**	**139,145**
Williams RD	**210,070**	**163,548**	**7,065**	**11,772**	**28,621**	**6,919**	**109,171**
4FRI 1st EIS	153,825	127,792	1,032	8,920	24,068	2,894	90,878
Bill Williams Mountain Restoration Project	15,200	12,317	204	916			11,197
City Project	8,667	4,024			1,365	454	2,205
Dogtown Fuels Reduction Project	7,797	4,150			1,638		2,512
Frenchy Vegetation/Fuels Management Project	9,319	7,694	4,721	594			2,379
McCracken Project	15,262	7,571	1,108	1,342	1,550	3,571	0
Tusayan RD	**30,601**	**29,974**					**29,974**
4FRI 1st EIS	30,601	29,974					29,974
Grand Total	**857,540**	**710,709**	**23,760**	**24,693**	**110,783**	**22,956**	**528,517**

[1]Commercial thinning activities completed between fiscal year 2000 through fiscal year 2022. Fiscal year 2022 is still in progress and may not represent all activities that have been completed to date.

[2]Future and upcoming commercial activities represent the projects identified in the current version of the five-year plan.

[3]Acres do not account for layout loss due to accessibility and operability issues, updated information from ongoing wildlife and heritage surveys, or changed conditions due to future disturbances.

Table 12. NEPA Project Summaries for Completed Commercial Activities (4FRI Westside)

Forest/District/NEPA Project Name	Total Project Area	Estimate for Timber Forest Types	Completed Commercial Thinning[1] FY 2000 – FY 2022
Coconino - Flagstaff RD	**29,316**	**27,512**	**12,880**
Jack Smith/Schultz	10,036	9,816[2]	644
Mormon Lake Basin Fuel Reduction Project	2,833	2,818	2,033
Mountainaire HFRA Project	15,814	14,878	9,954
Railroad Forest Health and Fuel Reduction Project	633		249
Kaibab - Williams RD	**18,069**	**16,238**	**5,202**
Elk-Lee Project	8,140	6,677	2,658
Community Tank Grassland Restoration Project	1,050	1,050	1,039
Spring Valley	8,879	8,511	1,505
Grand Total	**47,385**	**43,750**	**18,082**

[1]Commercial thinning activities completed between fiscal year 2000 through fiscal year 2022. Fiscal year 2022 is still in progress and may not represent all activities that have been completed to date.

[2]Approximately 5,800 acres were highly impacted by wildfire prior to the 2022 fire season. An evaluation of vegetation effects from the Tunnel and Pipeline fires may add to these acres impacted by wildfires within this area.

Figure 4. NEPA Project Areas (4FRI Westside)

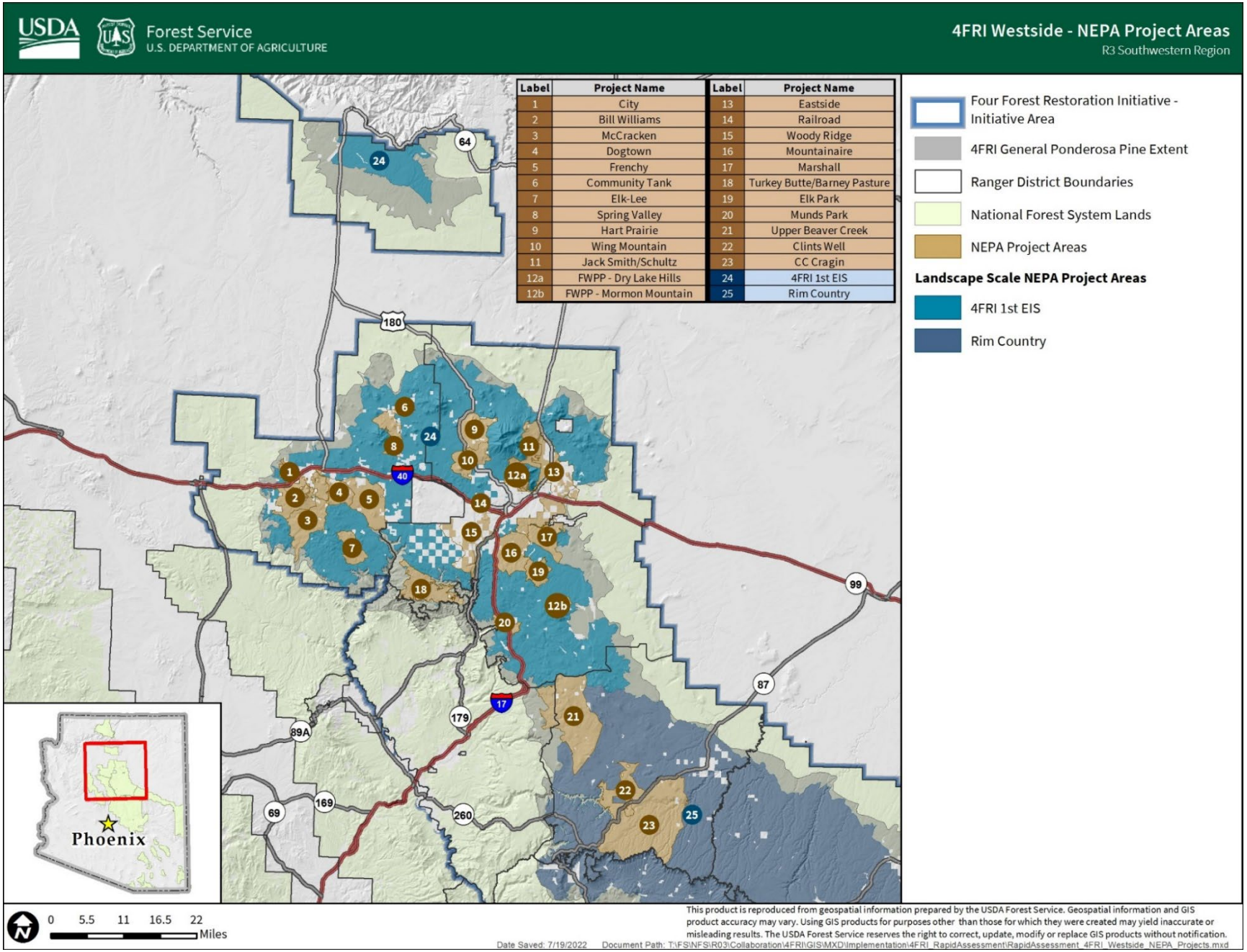
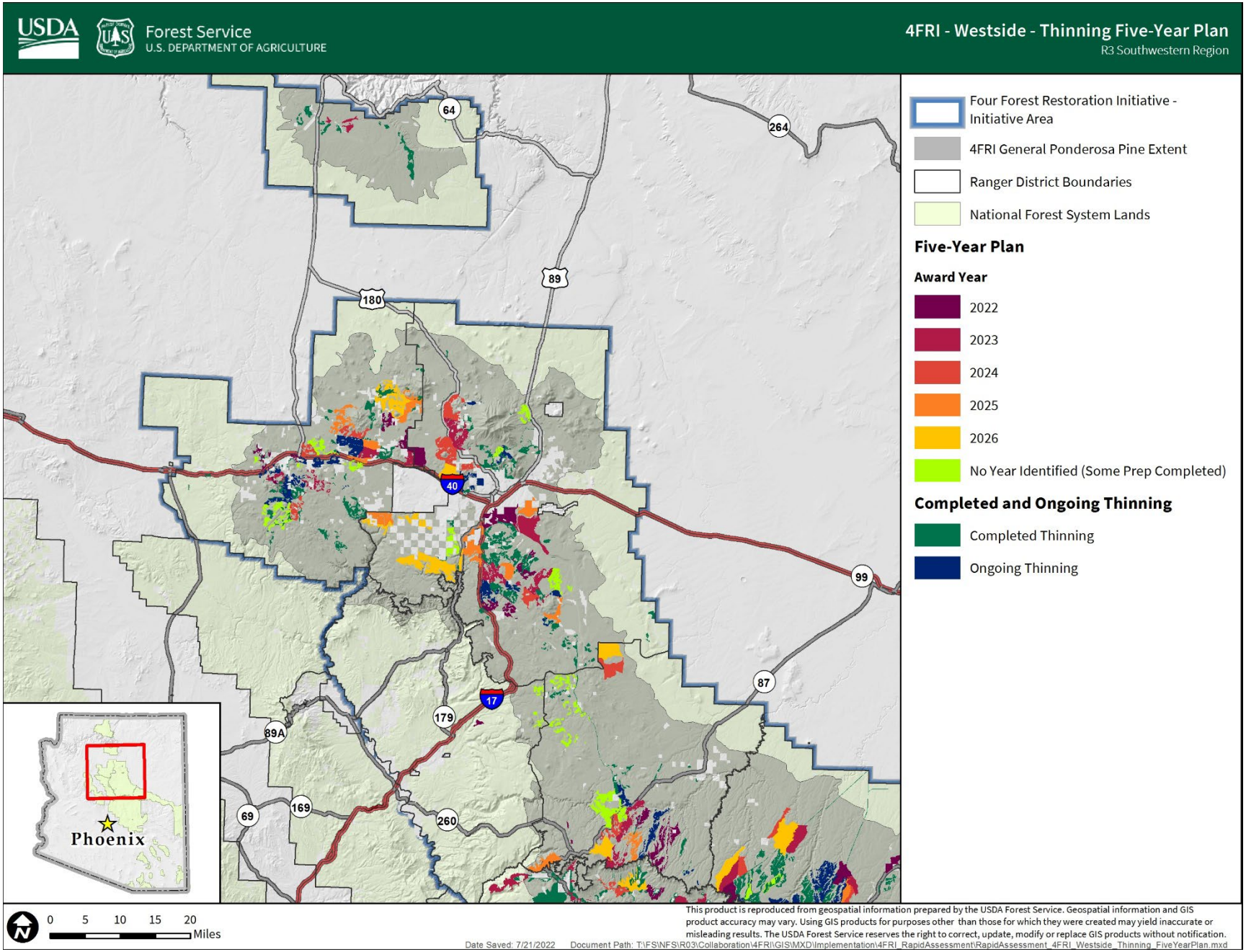


Figure 5. Commercial and Non-Commercial Thinning Five Year Plan (4FRI Westside)



Non-Commercial Thinning Activities

As described earlier, non-commercial thinning activities represent many different types of treatment methods. This category combines pre-commercial thinning, hazardous fuels reduction, mastication, and range/wildlife habitat improvement activities. On the Coconino and Kaibab National Forests, priorities for non-commercial activities are mainly identified for high priority partner projects. These projects include critical thinning to reduce fuels and mitigate the risk of high severity fire on Bill Williams Mountain southwest of Williams. Since the majority of completed non-commercial thinning activities have occurred in conjunction with commercial thinning activities in the past, it is expected that a significant proportion of acres in ongoing and planned commercial thinning projects would also have non-commercial thinning completed as well. Non-commercial thinning activities occurring in conjunction with commercial thinning activities are not represented as planned in this table because thinning small diameter and larger diameter trees during the same entry would be considered one treatment for planning purposes, although they represent two separate reporting accomplishments.

Table 13. Non-Commercial Thinning Activities (4FRI Westside)

Forest	Forest-wide Completed Non-commercial Thinning[1] (Acres) FY 2000 – FY 2022	Completed Non-commercial Thinning Within General Ponderosa Pine Extent (Acres) FY 2000 – FY 2022	Planned Non-commercial Thinning[2] (Acres/Year) FY 2022 - 2026
Coconino	35,366	31,779	1,060
Kaibab	86,933	50,016	2,100
Total	**122,299**	**81,795**	**3,160**

[1]Commercial thinning activities completed between fiscal year 2000 through fiscal year 2022. Fiscal year 2022 is still in progress and may not represent all activities that have been completed to date.

[2]Planned non-commercial thinning activities per year as committed to in the 4FRI restoration strategy. Actual levels of offerings may be more or less than this average.

Prescribed Fire Activities and Wildfires

As discussed earlier, fires are an essential element of restoration of frequent fire forest ecosystems. Because restoration in frequent fire forests involves reestablishing a functioning fire regime with multiple entries over time, it is more difficult to measure movement toward restoration when looking at acres of accomplishment alone. However, assessing the footprint acres of prescribed fire and wildfire can provide information about how much of the landscape has moved toward a functioning fire regime by at least initiating a first cycle of fire.

Prescribed Fire Activities – Broadcast Burning and Pile Burning

Table 14 below provides a summary of prescribed fire activities since 2000 as well as the planned acres for the next five years as described in the 4FRI restoration strategy. Activities have been summarized using both tabular and spatial information to provide details about the scope of broadcast burning and pile burning across the landscape. The tabular summary shows that approximately 436,779 acres have seen prescribed fire once or multiple times over the past 20 years. The spatial acres provide a baseline for assessing where those prescribed fires have been located over that time and attempts to prevent double counting activity units that have been treated multiple times. Figure 6 (page 25) provides additional details on the acres treated with broadcast burning by year and shows an increase in burning since the early 2000s.

A relatively new metric that has been tracked for hazardous fuels treatments since 2016 allows for tracking fuels treatments as “initial or interim”, “maintenance”, or “final” fuels treatments. This provides another mechanism to assessing the status of fuels treatments for each activity polygon. Almost 25,000 acres (about 23%) of the broadcast

burning acres on the Coconino since that time have been identified as maintenance fuels treatments compared to the remainder being identified as initial or interim fuels treatments.

In addition to broadcast burning, pile burning is another tool used to remove fuels from the landscape. Since 2000, pile burning has been completed on 53,865 acres on the Coconino and south zone of the Kaibab national forests. Pile burning is utilized when activity fuels have been created through thinning activities and not otherwise removed from the site. Due to the lack of industry infrastructure to handle biomass, pile burning has been used to remove activity fuels generated from thinning activities and likewise follows the general pattern of thinning in the wildland-urban interface surrounding communities and critical infrastructure over the past 20 years.

Figure 7 provides a map of the broadcast burning planned in the five-year plan for the Coconino and south zone of the Kaibab. It is important to note that plans for broadcast burns are necessarily more flexible than outyear planning for thinning projects due to broadcast burn window unknowns tied to fuel moisture, weather, and ventilation affecting both burning objectives and smoke impacts to communities downwind of planned burn blocks. Plans for each year generally include more acres than can be completed in any one year to allow for flexibility in burn windows across the landscape, and the map shows a footprint of planned projects greater than the acres shown in table 14.

Broadcast burns typically aren't conducted immediately before mechanical thinning operations. Since ongoing thinning is focused in the wildland-urban interface, broadcast burning opportunities in these areas are limited in the near-term. However, several areas surrounding Flagstaff are planned to be burned following thinning operations and in areas with thinning projects planned further out into the future. The remainder of planned broadcast burn projects on the Coconino focus on areas not planned for thinning projects in the next five years. Likewise, on the Williams Ranger District on the Kaibab, projects in the next five years will precede thinning projects farther out in the five-year plan or are in areas outside of the projects planned in the next five years. On the Tusayan Ranger District, the 4FRI restoration strategy focuses on using a combination of broadcast burning and non-commercial thinning to accomplish restoration goals. The five-year plan shows that the focus will be on broadcast burn projects on the south and southeast portion of the ponderosa pine on the district.

Table 14. Prescribed Fire Activities (4FRI Westside)

Forest	Forest-wide Completed Broadcast Burning (Tabular Acres)[1,2] FY 2000 – FY 2022	Forest-wide Completed Broadcast Burning (Spatial Acres)[2,3] FY 2000 – FY 2022	Completed Broadcast Burning Within General Ponderosa Pine Extent (Spatial Acres)[2,3] FY 2000 – FY 2022	Forest-wide Completed Pile Burning (Spatial Acres)[2] FY 2000 – FY 2022	Planned Prescribed Fire[4] (Acres/Year) FY 2022 – FY 2026
Coconino	285,558	167,022	157,563	27,939	35,000
Kaibab	151,221	123,036	116,113	25,926	20,000
Total	**436,779**	**290,058**	**273,676**	**53,865**	**55,000**

[1]All completed broadcast burning activities regardless of spatial location. These acres double count where broadcast burning activities have occurred on the same piece of ground over time. Since this data is not spatial, it represents completed treatments across the entirety of the forest and will include activities occurring outside of the ponderosa pine.

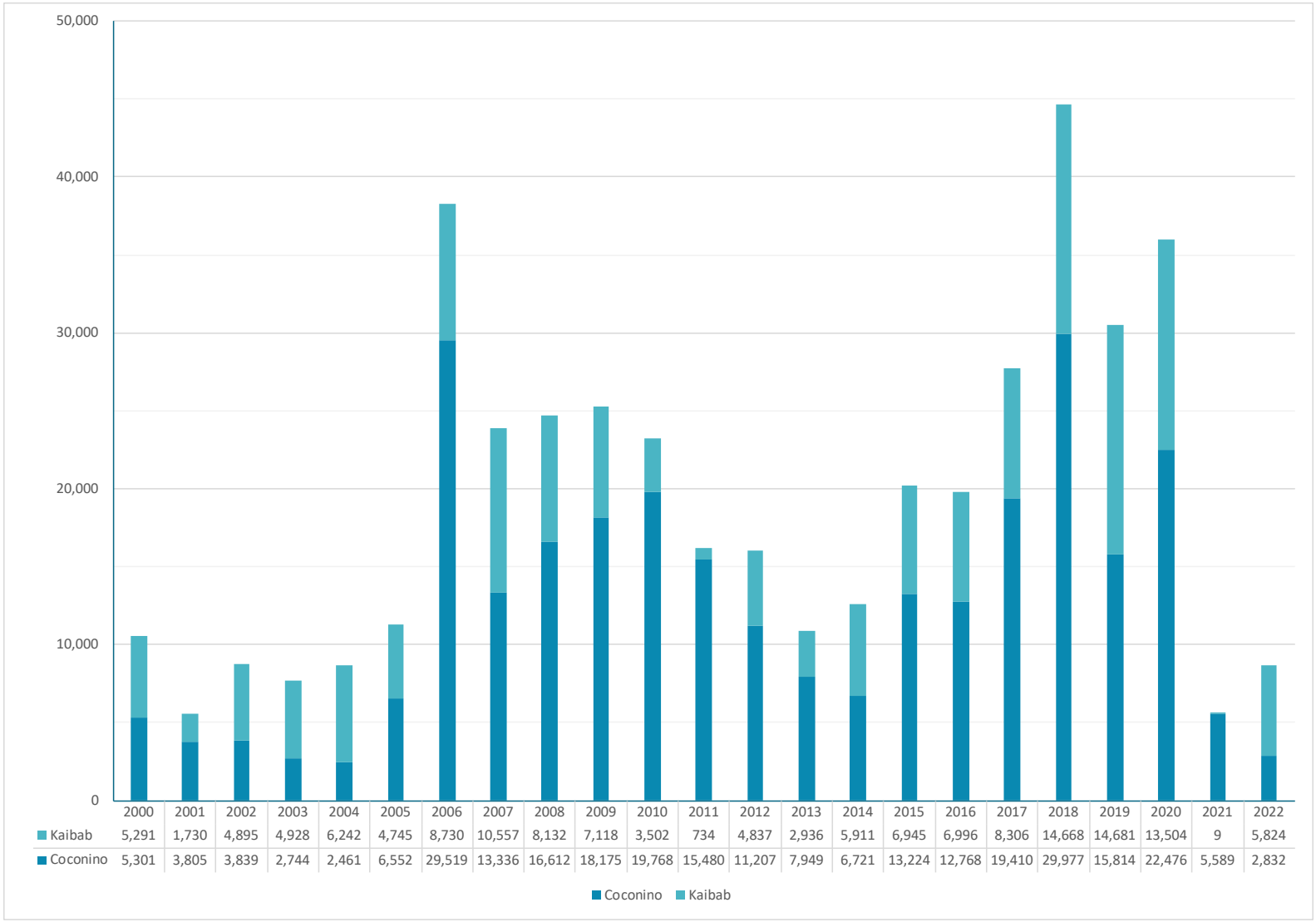
[2]Despite efforts to update data, spatial data is missing for multiple years for some forests and would potentially increase the footprint of acres that have received broadcast burning treatments.

[3]Data represents unique acres that have had broadcast burning activities completed once or multiple times.

[4]Planned acres for prescribed fire (broadcast burning and pile burning) represent annual estimates based on the 4FRI Restoration Strategy. Due to the way that prescribed burning is planned, more projects are identified each year than can be completed due to capacity and adequate burn windows. The map shows all of the burn blocks being considered for the next five years and represents a larger footprint than the annual estimates expected to be achieved.

Prescribed Fire Activities (Fiscal Years 2000 Through 2022)

Figure 6. Prescribed Fire Activities by Fiscal Year (4FRI Westside)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Kaibab	5,291	1,730	4,895	4,928	6,242	4,745	8,730	10,557	8,132	7,118	3,502	734	4,837	2,936	5,911	6,945	6,996	8,306	14,668	14,681	13,504	9	5,824
Coconino	5,301	3,805	3,839	2,744	2,461	6,552	29,519	13,336	16,612	18,175	19,768	15,480	11,207	7,949	6,721	13,224	12,768	19,410	29,977	15,814	22,476	5,589	2,832

Note: Fiscal year 2022 is ongoing and not all completed or awarded activities have been entered into the FACTS database.

Figure 7. Completed and Planned Broadcast Burning Activities (4FRI Westside)

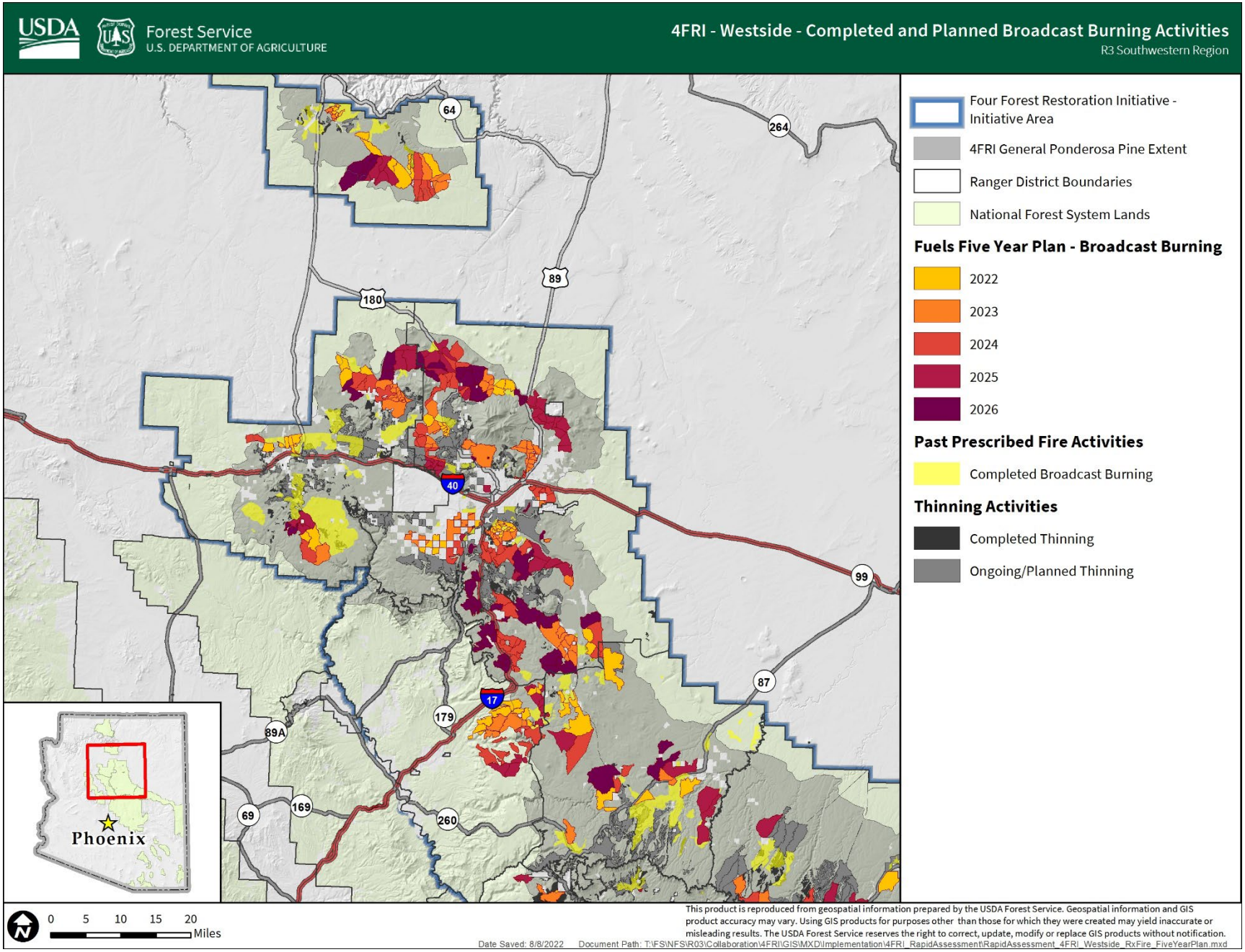
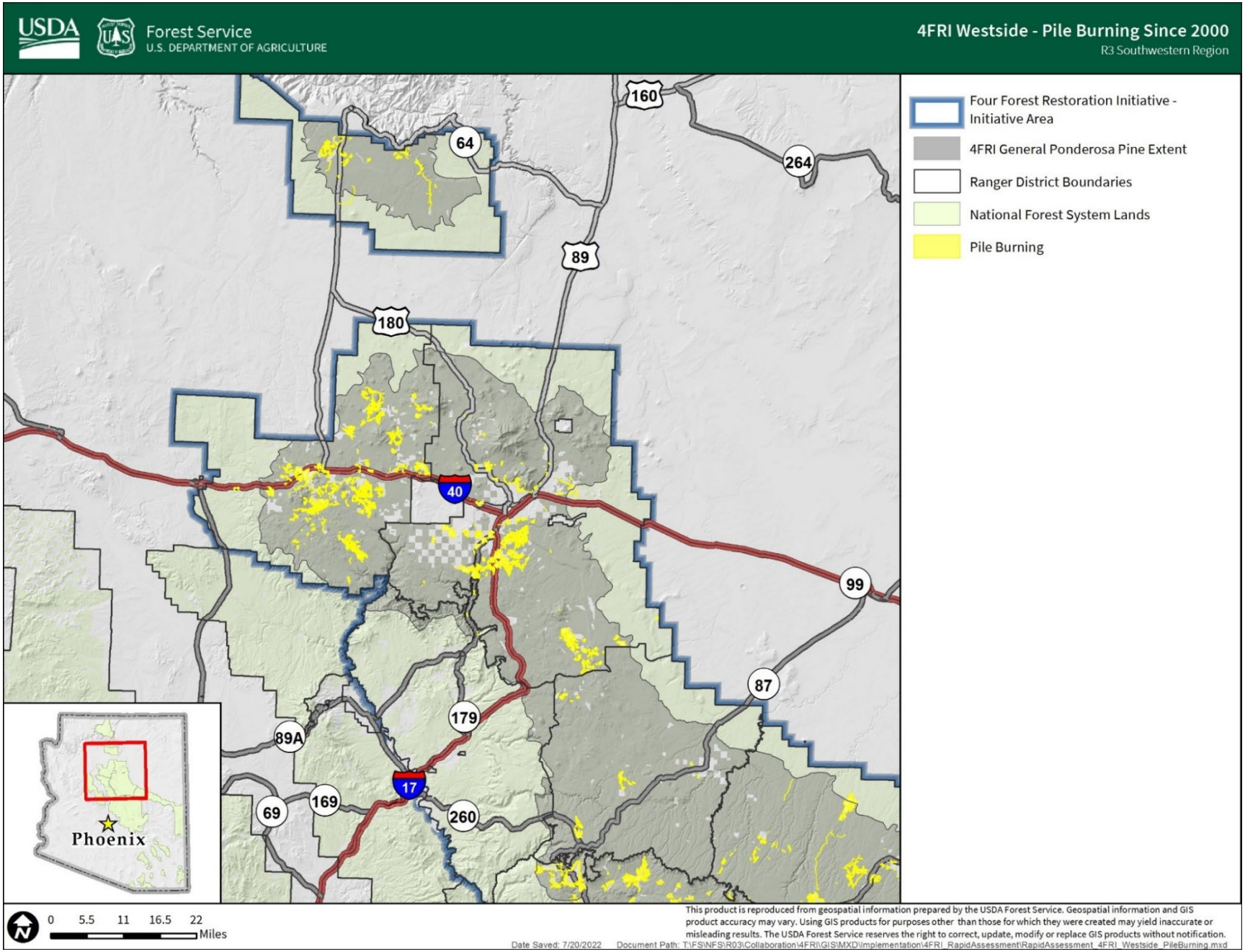


Figure 8. Pile Burning Activities (4FRI Westside)



Wildfires (From 2000 Through 2021)

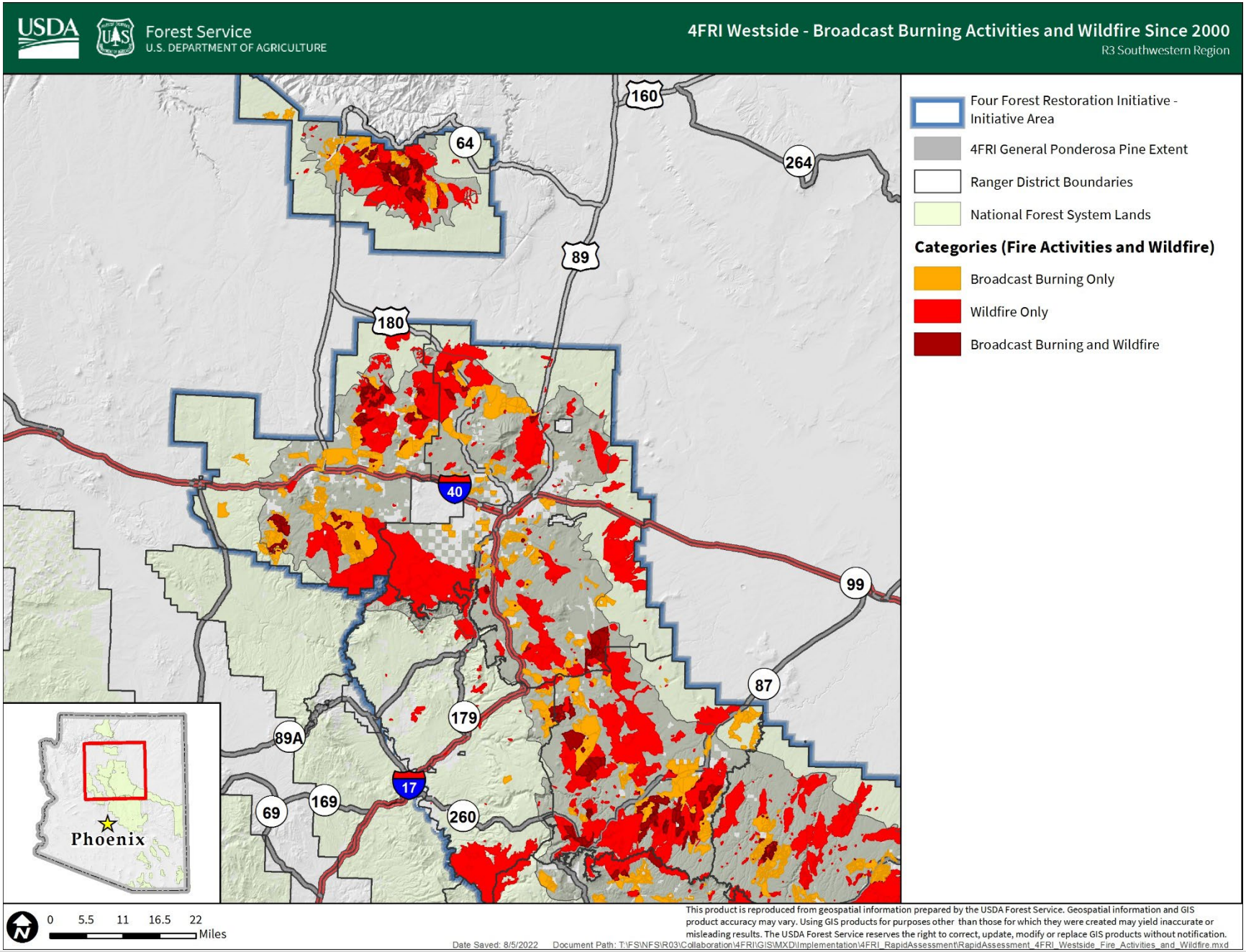
Table 15. Wildfires From 2000 Through 2021 (4FRI Westside)

Forest	Wildfire (Forest-wide) 2000 - 2021	Wildfire (within General Ponderosa Pine Extent) 2000 - 2021
Coconino	423,517	344,126
Kaibab	174,224	165,818
Total	**597,742**	**509,945**

Similar to the discussion above in the 4FRI initiative summary, wildfires have impacted a large percentage of the landscape across the Coconino and south zone of the Kaibab over the past 20 years. When comparing the forest-wide acres to those within the ponderosa pine extent, most wildfires have occurred in and around the ponderosa pine. Figure 9 shows the location of where wildfires have occurred in relation to both the general ponderosa pine extent and mapped broadcasting burning activities over the same period. Additional information about the overlap of broadcast burning activities and wildfires is in the "Broadcast Burning Activities and Wildfires Combined" section below dedicated to quantifying the number of times each acre has burned since 2000.

As discussed earlier in the document, wildfires can have both beneficial and detrimental effects on vegetation, fuel loading, and soils. To provide additional information about the effects that fires have had on the landscape since 2000, monitoring trends in burn severity data has been summarized in the next section. While this data provides some information about how wildfires have affected the forest, additional details are needed to measure and quantify how these fires have affected fuels structures and changes in needs for restoration of these ecosystems at the local, midscale, and landscape scales. Effects to soils are not included in this report.

Figure 9. Broadcast Burning Activities and Wildfires Since 2000 (4FRI Westside)



Monitoring Trends in Burn Severity

Monitoring Trends in Burn Severity (MTBS) is an interagency program whose goal is to consistently map the burn severity and extent of large fires across all lands of the United States from 1984 to present. This includes all fires 1000 acres or greater in the western United States and 500 acres or greater in the eastern Unites States. MTBS data products provide a unique historical record of high spatial and thematic resolution data consistently characterizing post-fire effects for documented and mappable large fires in the US from 1984 to the present. Due to the fact that MTBS data involves comparing burn severity prior to and one year post fire, the data in this report represent fires from 2000 through 2020.

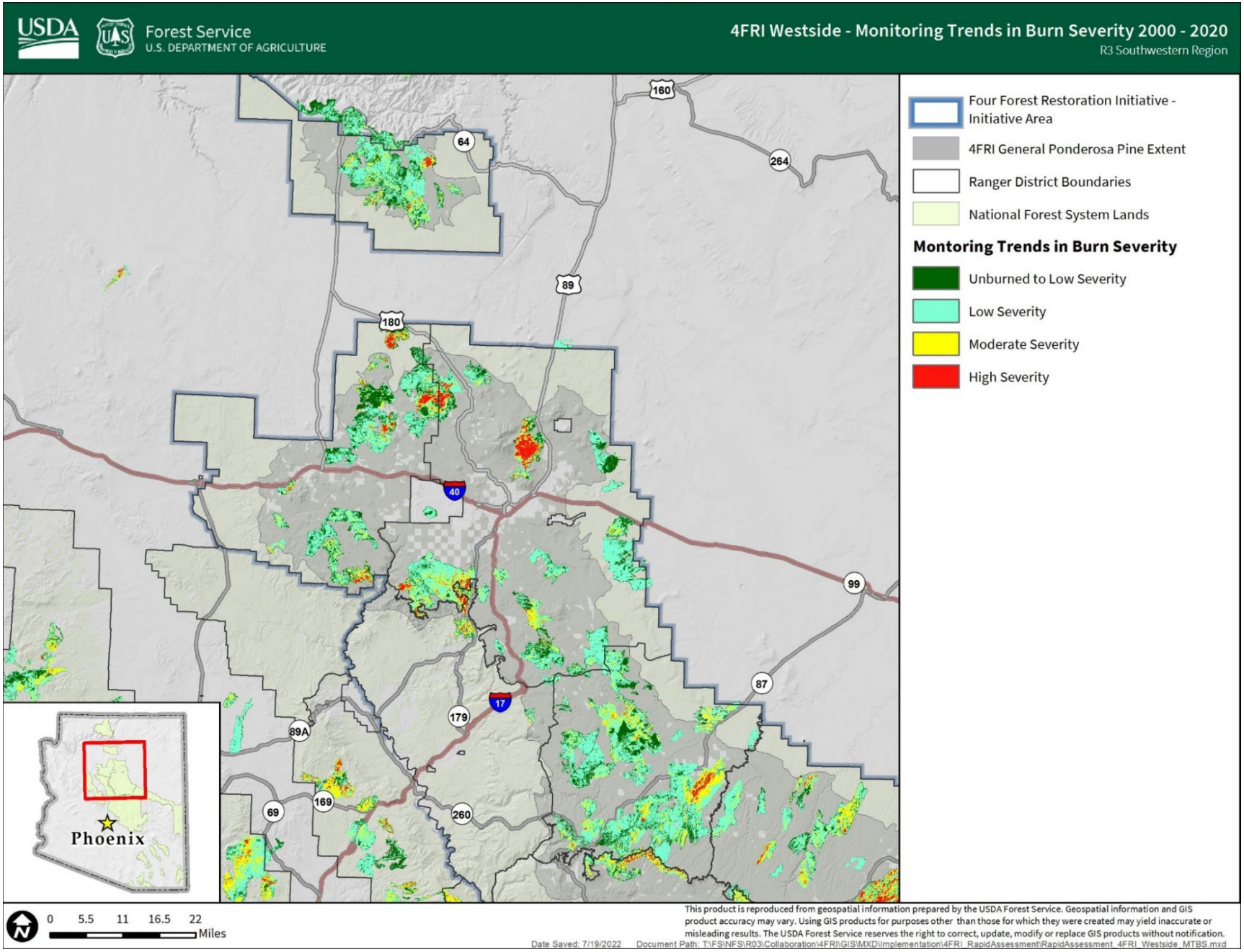
The data presented in the table and map below represent the fires mapped on the Coconino and south zone of Kaibab from 2000 through 2020 within the general 4FRI ponderosa pine extent displayed on the map below. In areas where multiple fires have impacted any acre, the highest severity fire effects are reflected to provide the most extreme disturbance that has occurred over time. Categorical values for increased greenness and clouds/shadows/waterbodies are not represented in the tables below due to being represented by higher absolute values than the value used for the high severity fire category and difficulties in processing multiple overlapping fires over 20 years.

The data shows that at least 21,488 acres have burned with high severity and almost 80,000 acres have burned with moderate or high severity across the landscape between 2000 and 2020. Approximately 5,000 acres proposed for thinning treatments within the Jacksmith/Schultz project on the Flagstaff Ranger District were burned severely after the record of decision was signed. Additional significant fires occurring on this landscape in 2021 and 2022 are not included in this assessment as the data is not yet available. Other acres on both the Kaibab and the Coconino have been burned prior to NEPA decisions. The Rim Country project on the Mogollon Rim and parts of the Red Rock ranger districts on the Coconino incorporated treatments designed to move these acres toward desired conditions for fire adapted ecosystems following high severity disturbances such as wildfires.

Table 16. Monitoring Trends in Burn Severity (4FRI Westside)

District	Unburned to Low Severity	Low Severity	Moderate Severity	High Severity	Total Moderate or High Severity
Kaibab National Forest	**57,005**	**85,700**	**15,626**	**5,758**	**21,384**
Tusayan Ranger District	20,025	36,333	6,447	1,524	7,971
Williams Ranger District	36,980	49,367	9,179	4,234	13,413
Coconino National Forest	**79,183**	**179,427**	**42,457**	**15,730**	**58,187**
Flagstaff Ranger District	29,331	64,798	16,522	10,991	27,513
Mogollon Rim Ranger District	48,048	111,202	23,828	3,803	27,631
Red Rock Ranger District	1,804	3,427	2,107	936	3,043
Grand Total	**136,188**	**265,127**	**58,083**	**21,488**	**79,571**

Figure 10. Monitoring Trends in Burn Severity 2000-2020 (4FRI Westside)



Broadcast Burning Activities and Wildfires Combined

The tables and map below provide context for fire as a whole across the landscape. Broadcast burning activities and wildfires together have burned over 700,000 acres within the general ponderosa pine extent on the Coconino and south zone of the Kaibab. To restore a functioning fire regime within frequent fire ecosystems, the goal is to return fire to the landscape where these forests are burning on a repeated cycle. Since 2000, prescribed fires and wildfires have combined to burn over 130,000 acres two times, and over 30,000 acres three or more times across this landscape. Taken alone, these acres are moving toward that goal for establishing a functioning fire regime.

Table 17. Broadcast Burning Activities - Fiscal Years 2000 Through 2022 (4FRI Westside)

Forest	Broadcast Burning Acres Burned Once FY 2000 – FY 2022	Broadcast Burning Acres Burned Twice FY 2000 – FY 2022	Broadcast Burning Acres Burned 3 or More FY 2000 – FY 2022	Grand Total
Coconino	**119,355**	**30,327**	**7,881**	**157,563**
Flagstaff	57,680	9,721	1,749	69,150
Mogollon Rim	57,807	17,607	5,733	81,147
Red Rock	3,868	2,998	400	7,266
Kaibab	**94,267**	**19,766**	**2,080**	**116,113**
Williams	65,745	15,398	1,792	82,935
Tusayan	28,522	4,368	289	33,178
Grand Total	**213,622**	**50,092**	**9,961**	**273,676**

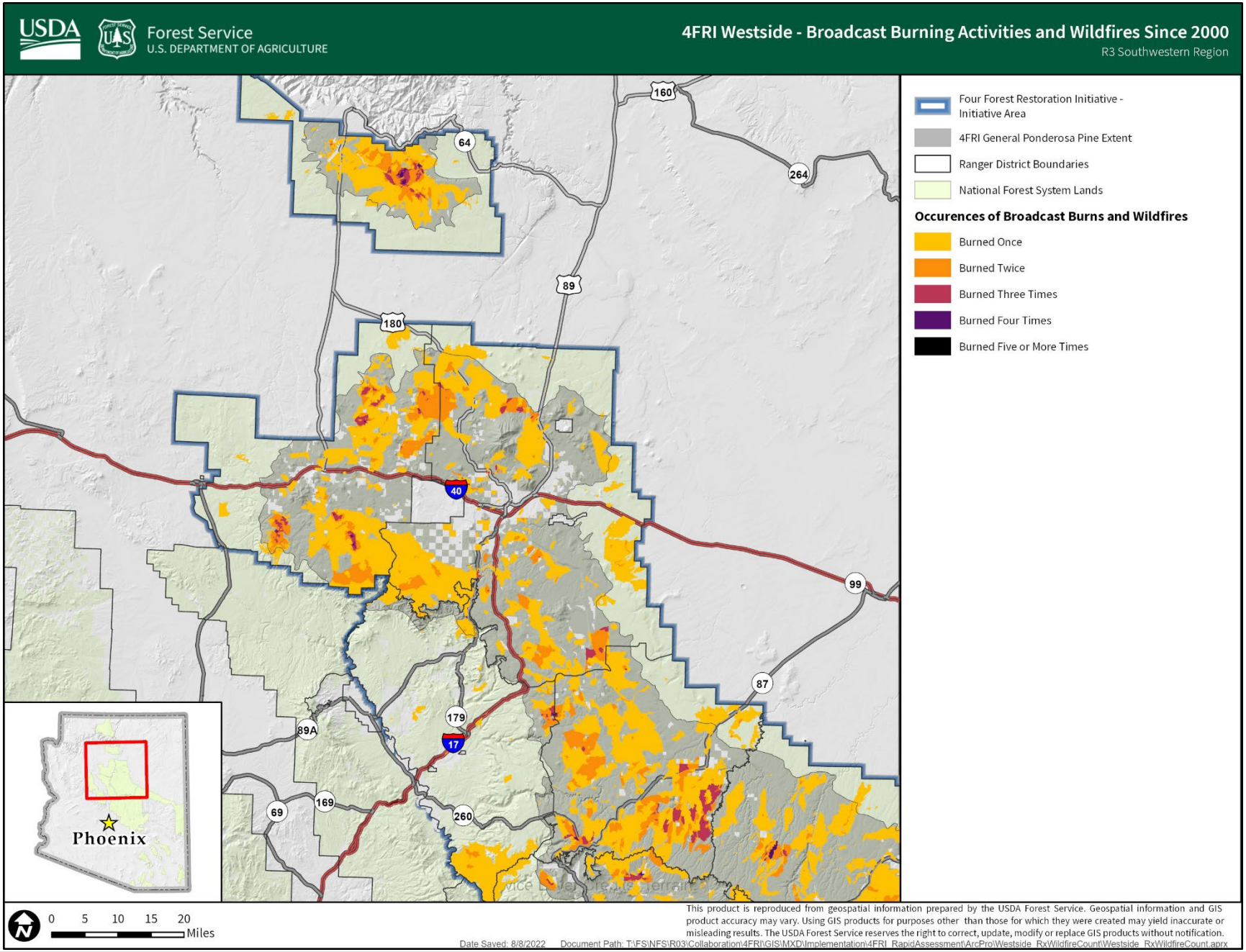
Table 18. Wildfires - 2000 Through 2021 (4FRI Westside)

Forest	Wildfire Acres Burned Once 2000 - 2021	Wildfire Acres Burned Twice 2000 - 2021	Wildfire Acres Burned 3 or More 2000 - 2021	Grand Total
Coconino	**317,261**	**26,486**	**379**	**344,126**
Flagstaff	142,819	15,039	150	158,009
Mogollon Rim	161,959	11,303	229	173,491
Red Rock	12,482	144		12,626
Kaibab	**139,400**	**26,214**	**204**	**165,818**
Williams	83,171	17,416	163	100,750
Tusayan	56,229	8,798	41	65,068
Grand Total	**456,661**	**52,700**	**583**	**509,945**

Table 19. Broadcast Burning Activities - Fiscal Years 2000 Through 2022 and Wildfires - 2000 Through 2021 (4FRI Westside)

Forest	Wildfire or Broadcast Burn Acres Burned Once	Wildfire or Broadcast Burn Acres Burned Twice	Wildfire or Broadcast Burn Acres Burned 3 Times	Wildfire or Broadcast Burn Acres Burned 4 Times	Wildfire or Broadcast Burn Acres Burned 5 Times	Grand Total
Coconino	**360,130**	**77,914**	**19,110**	**428**	**8**	**457,589**
Flagstaff	180,294	31,690	4,002	3	8	215,997
Mogollon Rim	164,295	43,561	14,435	187		222,479
Red Rock	15,541	2,662	672	237	0	19,114
Kaibab	**188,413**	**52,678**	**10,963**	**1,509**	**24**	**253,588**
Williams	123,144	37,769	6,759	432	4	168,108
Tusayan	65,269	14,909	4,204	1,077	20	85,480
Grand Total	**548,543**	**130,592**	**30,073**	**1,938**	**32**	**711,177**

Figure 11. Broadcast Burning Activities and Wildfires Since 2000 (4FRI Westside)



Broadcast Burning, Wildfire, and Thinning Activities Combined

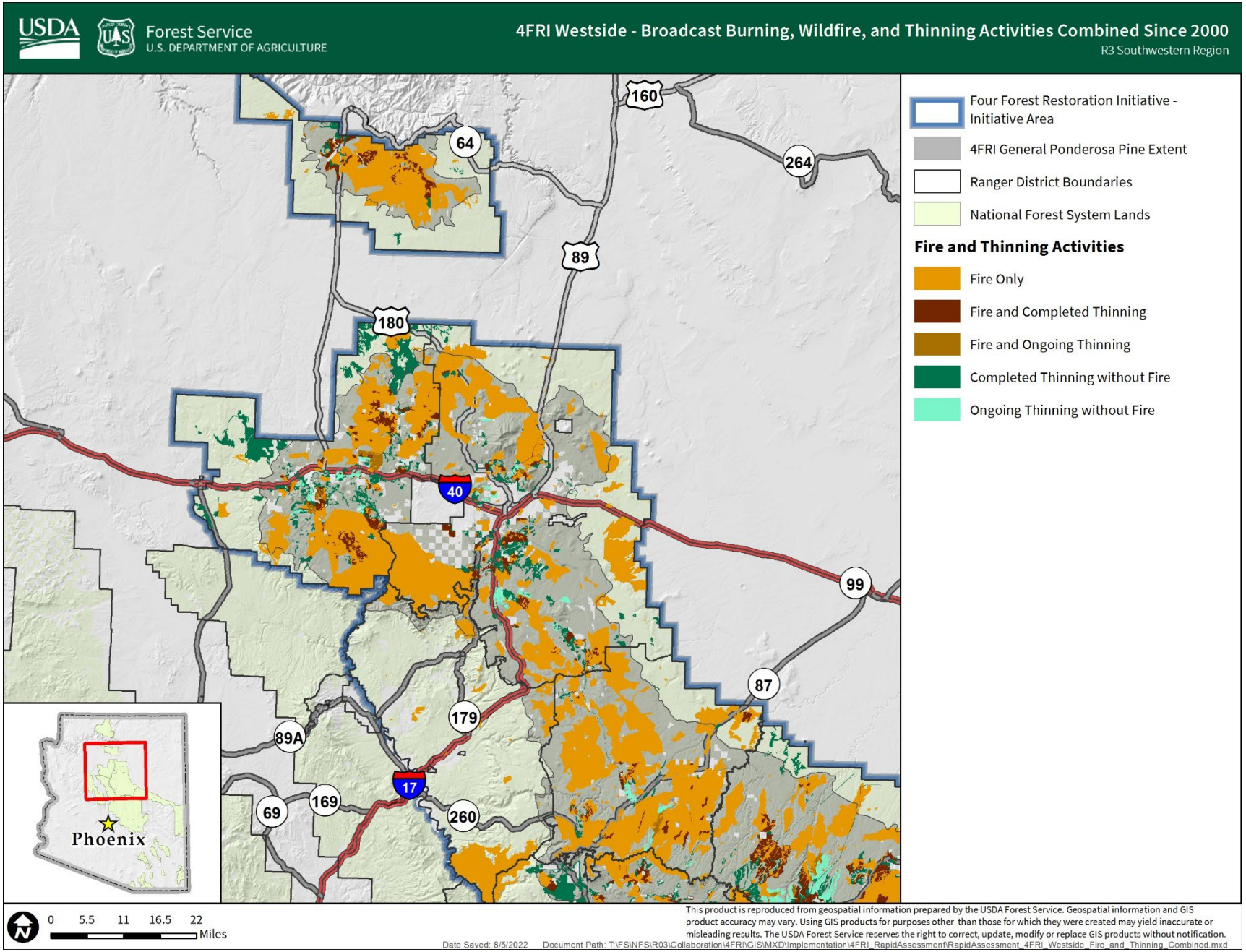
Since many areas will require both thinning and fire to achieve restoration outcomes, it can be useful to look at the overlap of those activities to assess movement toward restoration goals across the landscape. The spatial model used for this report allows for the display of areas that have been thinned (commercial and/or non-commercial thinning) and burned (broadcast burning and/or wildfire). Table 21 quantifies how those activities overlap within the general ponderosa pine extent between 2000 and 2022. A large portion of the landscape has been treated with broadcast burning and/or affected by wildfires, and most of those (653,264 acres) have only been affected by fire alone. Approximately half of the area (49,122 acres) that have had completed thinning have also been burned. Similarly, approximately one third of the area (8,791 acres) that are currently being thinned have also been burned prior to that thinning.

Table 20. Broadcast Burning, Wildfire, and Thinning Activities Combined Since 2000

Forest	Fire Only[1] (Acres) 2000 - 2022	Fire and Completed Thinning[1] (Acres) 2000 - 2022	Fire and Ongoing Thinning[1] (Acres) 2000 - 2022	Thinning Complete without Fire[1] (Acres) 2000 - 2022	Ongoing Thinning without Fire[1] (Acres) 2000 - 2022
Coconino	433,692	21,040	2,858	31,611	9,690
Kaibab	219,572	28,082	5,933	25,211	5,841
Grand Total	**653,264**	**49,122**	**8,791**	**56,821**	**15,531**

[1]Broadcast burning and thinning activities are derived from the FACTS database and cover fiscal years 2000 through 2022. Fiscal year 2022 is still in progress and may not represent all activities that have been completed to date. Wildfire acres are derived from the wildfire perimeter data and cover calendar years 2000 through 2021.

Figure 12. Broadcast Burning, Wildfire, and Thinning Activities Combined Since 2000 (4FRI Westside)



Conclusions and Next Steps

This report was designed to provide information on the status of restoration activities across 4FRI with a specific emphasis on the west side of the initiative on the Coconino and south zone of the Kaibab national forests. Information was summarized by activity type and described for completed, ongoing, and planned thinning and prescribed fire activities for the next five years. The hope is that this information will provide a baseline for collaborative discussions surrounding priorities and opportunities for restoration in the near future as well as for long-term strategies for achieving restoration goals across the landscape.

To that end, data generated as part of this report will be made available for those discussions and any potential future prioritization exercises and optimization modeling. This assessment and corresponding data sources are not meant to be all inclusive for future needs. Data describing and quantifying values at risk, both internally developed by the forest service and from external collaborators, will be crucial to a proper understanding of restoration needs, strategies to meet those needs, and risks across the landscape from wildfire, forest health, and climate change now and into the future. Additionally, fire models will need to be developed and/or updated to quantify potential fire behavior and wildfire risk.

Appendix A – Activities by Category

Commercial timber harvest activities

Appendix A Table 1. Activity Codes for Commercial Timber Harvest Activities

Code	Activity
4101	Coppice Cut (EA/RH/FH)
4102	Coppice Cut (w/leave trees) (EA/RH/FH)
4110	Clearcutting
4111	Patch Clearcut (EA/RH/FH)
4112	Strip clearcutting (EA/RH/FH)
4113	Stand Clearcut (EA/RH/FH)
4114	Stand clearcutting - Salvage Mortality
4115	Patch Clearcut (w/ leave trees) (EA/RH/FH)
4116	Strip clearcutting (w/res) (EA/RH/FH)
4117	Stand Clearcut (w/ leave trees) (EA/RH/FH)
4120	Preparation Cut
4121	Shelterwood Preparatory Cut (EA/NRH/NFH)
4122	Seed-tree Preparatory Cut (EA/NRH/NFH)
4123	Shelterwood seed cut (w/res) (EA/NR/FH)
4131	Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)
4132	Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)
4133	Shelterwood cut (w/res) (EA/RN/NFH)
4134	Seed-tree cut (w/res) (EA/RN/NFH)
4140	Removal cut
4141	Shelterwood Removal Cut (EA/NRH/FH)
4142	Seed-tree Final Cut (EA/NRH/FH)
4143	Overstory Removal Cut (from advanced regeneration) (EA/RH/FH)
4144	Final Overstory Removal Cut (EA/NRN/FH)
4145	Shelterwood Removal Cut (w/ leave trees) (EA/NRH/FH)
4146	Seed-tree Removal Cut (w/ leave trees) (EA/NRH/FH)
4147	Overstory removal cut (w/res) (EA/RN/FH)
4148	Shelterwood Staged Removal Cut (EA/NRH/NFH)
4150	Selection cut
4151	Single-tree Selection Cut (UA/RH/FH)
4152	Group Selection Cut (UA/RH/FH)
4154	Single-tree selection cut (UA/NRN/NFH)
4160	Partial removal
4162	Two-aged Coppice Cut (w/res) (2A/RH/FH)
4175	Two-aged Patch Clearcut (w/res) (2A/RH/FH)
4176	Strip clearcutting (w/res) (2A/RH/FH)
4177	Two-aged Stand Clearcut (w/res) (2A/RH/FH)
4183	Two-aged Seed-tree Seed and Removal Cut (w/res) (2A/RH/FH)
4186	Seed-tree final removal cut (w/res) (2A/NRN/FH)
4192	Two-aged Preparatory Cut (w/res) (2A/NRH/NFH)
4193	Two-aged Shelterwood Establishment and Removal Cut (w/ res) (2A/RH/FH)
4194	Two-aged Shelterwood Establishment Cut (w/res) (2A/RH/NFH)
4195	Shelterwood Removal Cut (w/res) (2A/NRN/NFH)
4196	Two-aged Shelterwood Final Removal Cut (w/res) (2A/NRH/FH)

Code	Activity
4200	Intermediate harvest methods
4210	Improvement Cut
4211	Liberation Cut
4220	Commercial Thin
4230	Sanitation (salvage)
4231	Salvage Cut (intermediate treatment, not regeneration)
4232	Sanitation Cut
4233	Cull
4240	Special Cut
4241	Special Products Removal
4242	Harvest Without Restocking

Non-commercial thinning activities – Hazardous fuels thinning, precommercial thinning, range and wildlife habitat improvement

Appendix A Table 2. Activity Codes for Non-commercial Thinning Activities

Code	Activity	Category	KP6	Hazardous Fuels Thinning	Precommercial Thinning
1136	Pruning to Raise Canopy Height and Discourage Crown Fire	Mechanical	Yes	1136	
1150	Rearrangement of Fuels	Mechanical	Yes	1150	
1152	Compacting/Crushing of Fuels	Mechanical	Yes	1152	
1154	Chipping of Fuels	Mechanical	Yes	1154	
1160	Thinning for Hazardous Fuels Reduction	Mechanical	Yes	1160	
1180	Fuel Break	Mechanical	Yes	1180	
2340	Range Cover Conversion		No	2340	
2341	Range Cover Manipulation	Mechanical	Yes	2341	
2360	Range Control Vegetation	Mechanical	Yes	2360	
2400	Tree Encroachment Control		No	2400	
3370	Precommercial thinning for visual	Mechanical	Yes		3370
4270	Permanent Land Clearing	Mechanical	Yes	4270*	
4511	Tree Release and Weed	Mechanical	Yes	4511*	
4521	Precommercial Thin	Mechanical	Yes		4521
4522	Precommercial thinning - strip	Mechanical	Yes		4522
4530	Prune	Mechanical	Yes	4530	
6103	Wildlife Habitat Precommercial thinning	Mechanical	Yes		6103
6104	Wildlife Habitat Regeneration cut	Mechanical	Yes	6104	
6105	Wildlife Habitat Intermediate cut	Mechanical	Yes	6105	
6107	Wildlife Habitat Mechanical treatment	Mechanical	Yes	6107	
6133	Wildlife Habitat Slash treatment	Mechanical	Yes	6133	

*Specific activities were queried for these activity codes to focus on restoration treatments for activities coded as 4270 and mechanical treatments for activities coded as 4511

Broadcast burning activities

Appendix A Table 3. Activity Codes for Broadcast Burning Activities

Code	Activity
1111	Broadcast Burning - Covers a majority of the unit
1112	Jackpot Burning - Scattered concentrations
1113	Underburn - Low Intensity (Majority of Unit)
4491	Site Preparation for Natural Regeneration - Burning
4492	Site Preparation for Natural Regeneration - Chemical
4541	Control of Understory Vegetation- Burning
6101	Wildlife Habitat Prescribed fire

Pile burning activity

Appendix A Table 4. Activity Codes for Pile Burning Activities

Code	Activity
1130	Burning of Piled Material