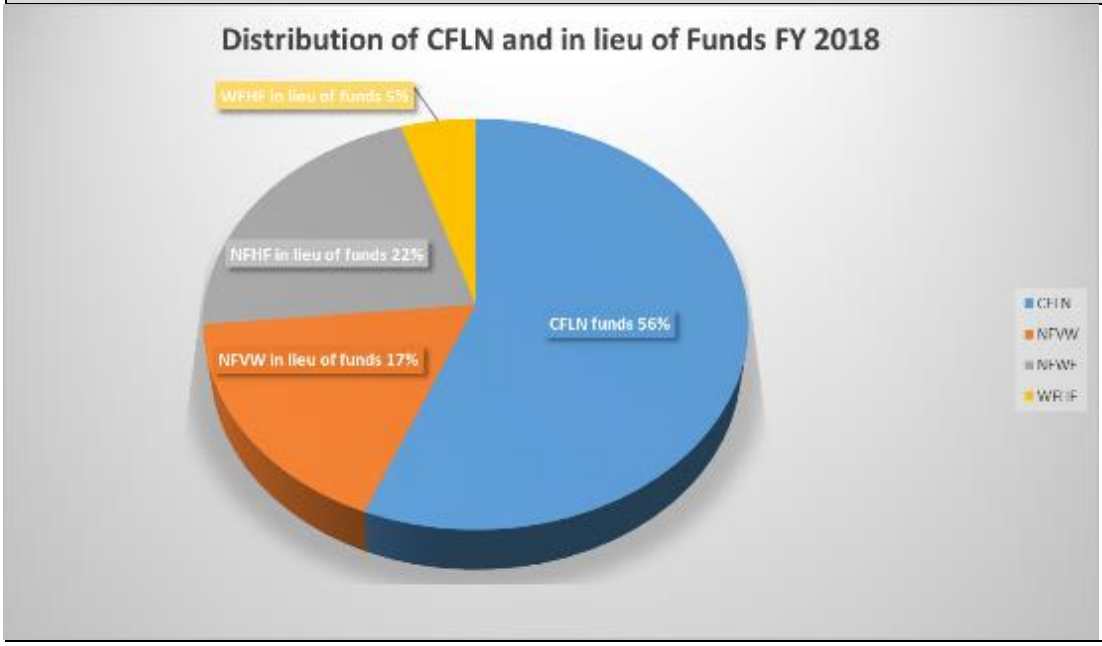
CFLR Project (Name/Number): Four Forest Restoration Initiative CFLR005

National Forest(s): Apache-Sitgreaves, Coconino, Kaibab and Tonto National Forests

1. Match and Leveraged Funds:

a. FY18 Matching Funds Documentation

Fund Source – (CFLN/CFLR Funds Expended)	Total Funds Expended in Fiscal Year 2018
	**CFLN18 $2,141,655**

This amount should match the amount of CFLR/CFLN dollars obligated in the FMMI CFLRP expenditure report. Include prior year CFLN dollars expended in this Fiscal Year.

Fund Source – (Funds expended from Washington Office funds (in addition to CFLR/CFLN) (please include a new row for each BLI))	Total Funds Expended in Fiscal Year 2018
TOTAL In Lieu of CFLN FUNDS	NFVW $186,106[1] NFWF $662,508[2] WFHF $827,043[3] **TOTAL $1,675,657**

This value (aka carryover funds or WO unobligated funds) should reflect the amount expended of the allocated funds as indicated in the program direction, but does not necessarily need to be in the same BLIs or budget fiscal year as indicated in the program direction.

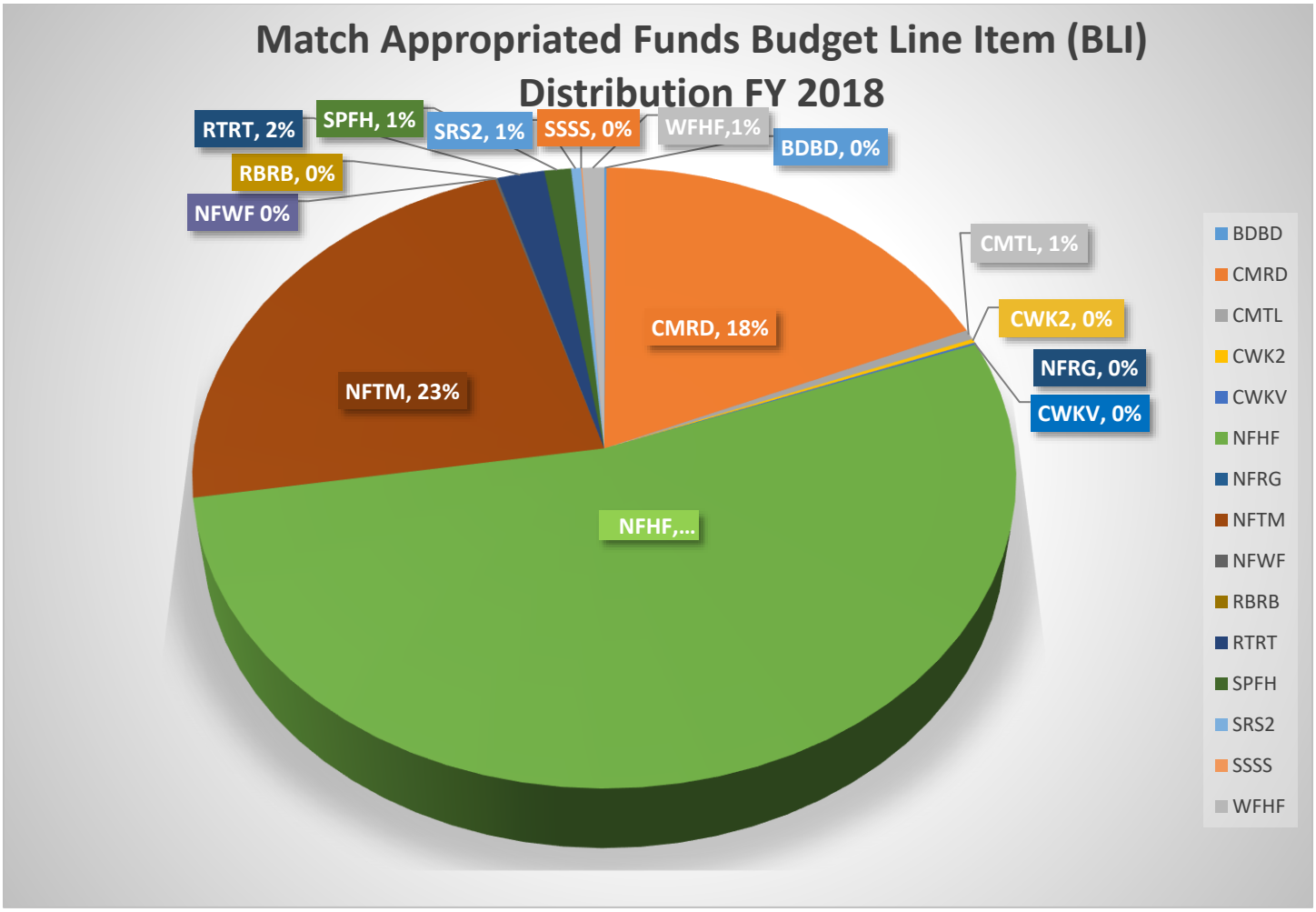
Fund Source – (FS Matching Funds (please include a new row for each BLI)	Total Funds Expended in Fiscal Year 2018
BDBD	$30,952

[1] Note---this is the total amount of NFVW in the gPAS expenditure report

[2] Note---the total amount for NFWF in the gPAS expenditure report is this amount, plus the $35,227 that is displayed in the appropriated funds section below for a total of $697,735

[3] Note---The total amount for WFHF in the gPAS expenditure report is this amount, plus the $306,798 that is displayed in the appropriated funds section below for a total of $1,133,841

Fund Source – (FS Matching Funds (please include a new row for each BLI)	Total Funds Expended in Fiscal Year 2018
CMRD	$6,032,878
CMTL	$169,753
CWK2	$68,433
CWKV	$33,435
NFHF	$17,431,565
NFRG	$510
NFTM	$7,479,666
NFWF	$35,227[4]
RBRB	$928
RTRT	$668,032
SPFH	$377,792
SRS2	$140,207
SSSS	$16,964
WFHF	$306,798[5]
	TOTAL $32,793,141



[4] See footnote #2 above for full expenditure of NFWF funds as reported in gPAS
[5] See footnote #3 above for full expenditure of WFHF funds as reported in gPAS

This amount should match the amount of matching funds obligated in the FMMI CFLRP expenditure report, minus the Washington Office funds listed in the box above and any partner funds contributed through agreements (such as NFEX, SPEX, WFEX, CMEX, and CWFS) listed in the box below.

Fund Source – (Funds contributed through agreements)	Total Funds Expended in Fiscal Year 2018
CWFS (Rocky Mountain Elk Society and Arizona Elk Society)	$50,443
NFXN (National Forest Foundation and Arizona Game and Fish Department)	$175,615
TOTAL AGREEMENTS	**$226,058**

Please document any partner contributions to implementation and monitoring of the CFLR project through an income funds agreement (**this should include partner funds captured through the FMMI CFLRP reports such as NFEX, SPEX, WFEX, CMEX, and CWFS**). Please list the partner organizations involved in the agreement. Partner contributions for Fish, Wildlife, Watershed work can be found in WIT database.

Fund Source – (Partner In-Kind Contributions)	Total Funds Expended in Fiscal Year 2018
American Conservation Experience	$214,405
Arizona Elk Society	$68,000
City of Flagstaff	$500,000
Coconino County	$85,631
Ecological Restoration Institute	$57,660
Friends of Northern Arizona Forests	$60,148
Mottek Consulting	$9,442
National Forest Foundation	$509,250
The Nature Conservancy	$191,985
Trout Unlimited	$51,638
TOTAL	**$1,748,159**

Total partner in-kind contributions for implementation and monitoring of a CFLR project on NFS lands. Please list the partner organizations that provided in-kind contributions.

Service work accomplishment through goods-for services funding within a stewardship contract (for contracts awarded in FY18)	Totals
Total revised non-monetary credit limit for contracts awarded in FY18	**$648,382.13**

Revised non-monetary credit limits for contracts awarded prior to FY18 were captured in previous reports (FY16 and FY15). This should be the amount in contract's "Progress Report for Stewardship Credits, Integrated Resources Contracts or Agreements" in cell J46, the "Revised Non-Monetary Credit Limit," as of September 30. Additional information on the Progress Reports is available in CFLR Annual Report Instructions document.

b. Please fill in the table describing leveraged funds in your landscape in FY2018. Leveraged funds refer to funds or in-kind services that help the project achieve proposed objectives but do not meet match qualifications.

WHO	Item Description	Description on where treatment/activity was carried out	total estimated amount	Source of funds
US Forest Service	NEPA planning	across portions of all 4 forests within Rim Country, CC Cragin, Park Day, Hannigan Meadow area, and reforestation areas.	$2,075,471	appropriated funds

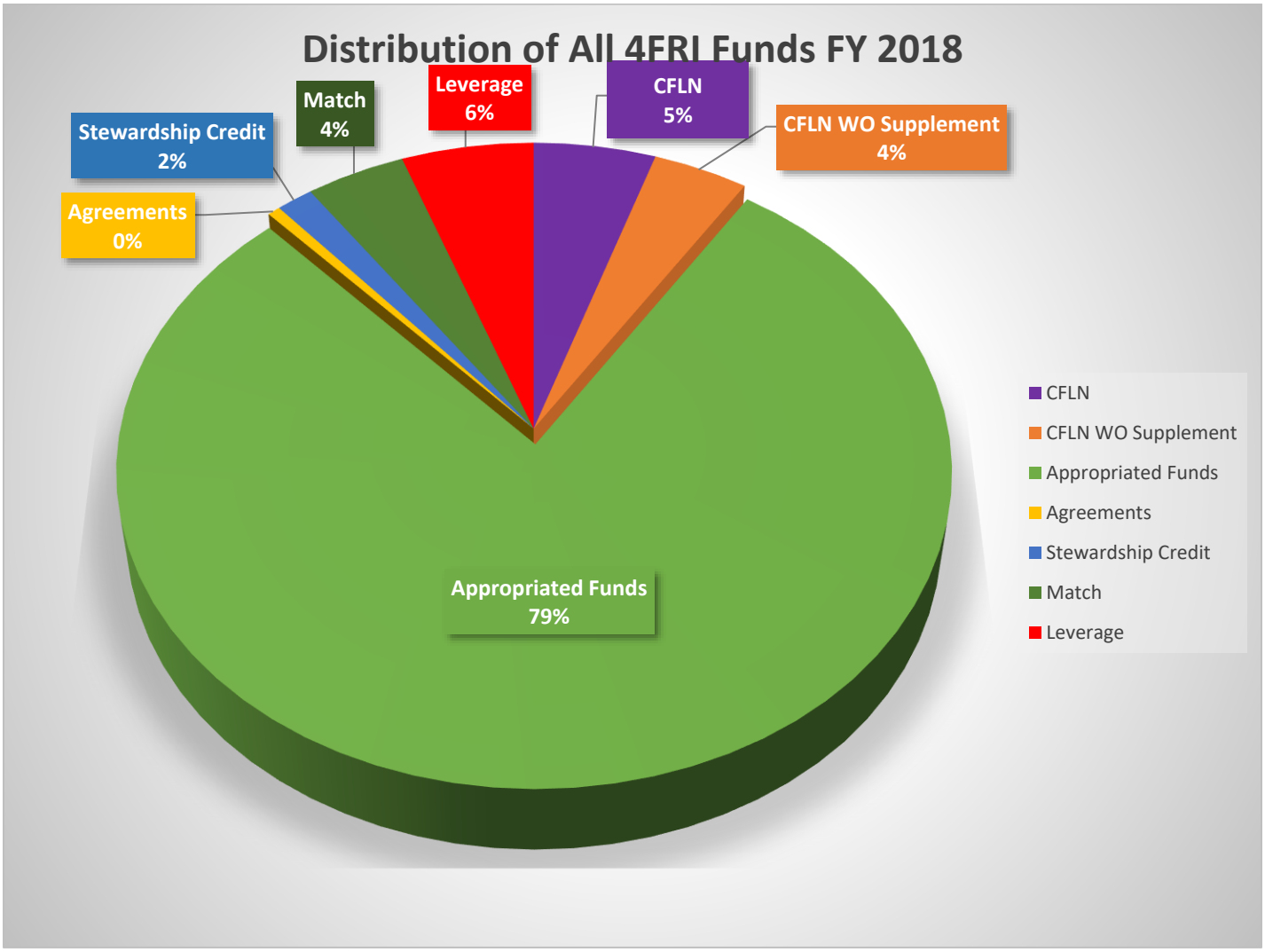
WHO	Item Description	Description on where treatment/activity was carried out	total estimated amount	Source of funds
GFFP	WUI Summit sponsor	Flagstaff	$489	GFFP
GFFP	4FRI Brochure printing	Flagstaff	$241	GFFP
GFFP	Greater Flagstaff CWPP revision	Flagstaff	$4,000	GFFP
GFFP	Prescribed Fire Smoke Newspaper Insert	Flagstaff, Sedona, Verde Valley, Cottonwood	$6,719	GFFP
GFFP	Prescribed Fire Smoke Newspaper Insert	Flagstaff, Sedona, Verde Valley, Cottonwood	$1,222	GFFP
GFFP	Ft Tuthill Kiosk	Flagstaff	$4,761	GFFP
GFFP	Ft Tuthill Kiosk	Flagstaff	$2,195	ERI/County
GFFP	Ft Tuthill Kiosk	Flagstaff	$865	GFFP
GFFP	Ashland Fire & Rescue Learning Exchange	Ashland, OR	$4,120	GFFP
GFFP	Ashland Fire & Rescue Learning Exchange	Ashland, OR	$749	GFFP
GFFP	Lead Wood Utilization Community of Practice	Flagstaff	$825	GFFP
GFFP	Lead Wood Utilization Community of Practice	Flagstaff	$150	GFFP
GFFP	AZ Fire Adapted Communities Initiation	Statewide	$9,981	GFFP
GFFP	AZ Fire Adapted Communities Initiation	Statewide	$1,815	GFFP
GFFP	Museum of Northern AZ "Fire & Water" film screening	Flagstaff	$2,500	GFFP
Ecological Restoration Institute	ERI Administrative and Program Support	SC/CWG/Stakeholder meetings	$38,440	Federal
University of Arizona	Industry Development	Flagstaff and Williams	$939	State of Arizona
University of Arizona	Industry Development	Flagstaff and Williams	$626	State of Arizona

WHO	Item Description	Description on where treatment/activity was carried out	total estimated amount	Source of funds
Trout Unlimited	monitoring plan-EIS	TU has brought attention to and successfully advocated for the subjects of Stream Temperature Monitoring and Macro-Invertebrate Monitoring to the MPMB and then on to the Full SHG, as part of advanced Monitoring Planning for the RC EIS. We have interfaced with A - S NF, Tonto NF, and other IDT staff on that approach, as well as with the AZGFD. We have helped form the Water Resources Sub Work Group and organized and made presentations to it.	$4,461	Trout Unlimited
Trout Unlimited	planning support	TU has and continues to work collaboratively with 4FRI IDT fishery biologists and others on the Aquatics Flexible Toolbox. This is a comprehensive toolbox of effective management tools to restore streams, meadows, springs, and seeps throughout Arizona.	$2,941	Trout Unlimited
Trout Unlimited	planning support	Volunteers and TU staff have maintained an active role as 4FRI Stakeholder representatives, attending almost all SHG meetings and many Working Group meetings and SHG SC meetings.	$4,902	Trout Unlimited
Trout Unlimited	planning support	TU has had a stakeholder representative on the CC Cragin CWPP SHG during 2016-2018 dialogs and continues that involvement.	$2,451	Trout Unlimited
Trout Unlimited	outreach	-TU representatives have participated in the 4FRI SHG Communications WG for the development of SHG Newsletters, Forest Treatment Brochures, and Communications publicizing Public meetings related to the 4FRI.	$2,451	Trout Unlimited

WHO	Item Description	Description on where treatment/activity was carried out	total estimated amount	Source of funds
Trout Unlimited	planning support	AZTU and its affiliates have developed and submitted extensive comments on the Rim Country EIS preliminary documents, addressing broad water issues, including stream, riparian, and watershed restoration and reconnection, and including useful monitoring proposals for stream conditions and aquatic wildlife profiles. Interfaced with AZGFD on those comments and recruited other NGOs to provide comments.	$1,961	Trout Unlimited
Trout Unlimited	outreach	Trout Unlimited Volunteers and staff advocated for and helped organize the Haigler creek Aquatics Field Trip in May 2018, for development of the Tonto National Forest Management Plan, with attendance of almost 50 people. This trip grew out of necessity to educate people on stream restoration techniques and the development of the Aquatics Resources Flexible Toolbox. TU is a strong advocate for the use and implementation of the Aquatic Flexible Toolbox throughout the Four Forest Restoration Initiative.	$3,922	Trout Unlimited
Trout Unlimited	planning and future implementation support	Trout Unlimited has continued its major initiative the Southwest Native Trout Strategy and that expressly includes, integrates and depends on the Arizona 4FRI activities as a key enabler of that strategy. That strategy addresses recovery of the Gila and Apache Trout, both ESA "Threatened" species, with original ranges falling within the 4FRI Footprint. That strategy is expected to contribute some $5 million primarily in National Forest areas in Arizona and New Mexico over 5 years continuing through 2020. FY2018: 220 hours and - Meetings related to that SWNTS team in FY2018 included many 4FRI SHG members and USFS personnel.	$6,863	Trout Unlimited
The Nature Conservancy	Hart Prairie Preserve	Coconino National Forest, Flagstaff Ranger District	$130,000	Private donors

DISTRIBUTION OF ALL FUNDS FOUR FOREST RESTORATION INITIATIVE

FUND SOURCE	AMOUNT	% of funds
CFLN	$2,141,655	5%
CFLN WO Supplement	$1,675,657	4%
Appropriated Funds	$32,793,141	79%
Agreements	$226,058	1%
Stewardship Credit	$648,382	2%
Match	$1,748,159	4%
Leverage	$2,316,059	6%
TOTAL	**$41,549,111**	**100%**



2. **Please tell us about the CFLR project's progress to date in restoring a more fire-adapted ecosystem as described in the project proposal**, and **how it has contributed to the wildland fire goals in the *10-Year Comprehensive Strategy Implementation Plan***.

FY2018 Overview

FY18 Activity Description (Agency performance measures)	**Acres**
Number of acres treated by prescribed fire	59,074[6]
Number of acres treated by mechanical thinning	7,992[7]
Number of acres of natural ignitions that are allowed to burn under strategies that result in desired conditions	20,799[8]
Number of Acres treated by fuel rearrangement, pruning, crushing, piling, and chipping	8,603[9]
Number of acres treated to restore fire-adapted ecosystems which are maintained in desired condition	21,170[10]
Number of acres mitigated to reduce fire risk	35,047[11]

Expenditures

Category	**$**
FY2018 Wildfire Preparedness[12]	$3,805,810
FY2018 Wildfire Suppression[13]	$18,435,141
The cost of managing fires for resource benefit if appropriate (i.e. full suppression versus managing)	No data
FY2018 Hazardous Fuels Treatment Costs (CFLN)	No direct CFLN, $400,000 in in lieu of WFHF funds
FY2018 Hazardous Fuels Treatment Costs (other BLIs)	$6,731,925

The 4FRI project has prioritized mechanical and fuels treatments across the landscape utilizing 5 year plans that have used the following criteria for implementation: 1) areas within the wildland urban interface, areas of high crown fire potential, and watersheds of concern. These priorities were a combination of candidate areas outlined by the 4FRI stakeholders group in the 2010 Landscape Restoration Strategy and refined by the 4FRI Forest Supervisors in 2012. Because a vast majority of the ponderosa pine type within the 4FRI landscape is within the very high or high fire hazard type as defined by the Firelab classified data, most all treatments will be in areas where treatments will reduce fire hazard by reducing fuels---either through mechanical harvest removal, or fuels reduction and change in crown base height through fire activities. Please see the maps below for locations of treatments within the project area in relation to Fire Hazard Potential. For FY 18, 84% of both the fire fuels treatments (Rx burn, wildfire, non-commercial thinning, piling of material, chipping—49% in very high and 35% in high hazard areas) and commercial mechanical harvest (52% in very high and 32% in high fire hazard) were accomplished in areas that had either very high or high fire hazard potential. Fuels treatments were primarily located in Wildland Urban Interface areas—69% of the FP-FUELS treatments in 2018.

[6] From FACTS FP-FUELS-WUI and FP-FUELS-NON-WUI report ran November 10, 2018 for activity codes 111, 1112 and 1130

[7] Data from gPAS initative accomplishment report date ran November 8, 2018

[8] From FACTS FP-FUELS-WUI and FP-FUELS-NON-WUI report ran November 10, 2018 for activity codes 1117 and 1119

[9] From FACTS FP-FUELS-WUI and FP-FUELS-NON-WUI report ran November 10, 2018 for activity codes 1136, 1150, 1152, 1153, 1154,

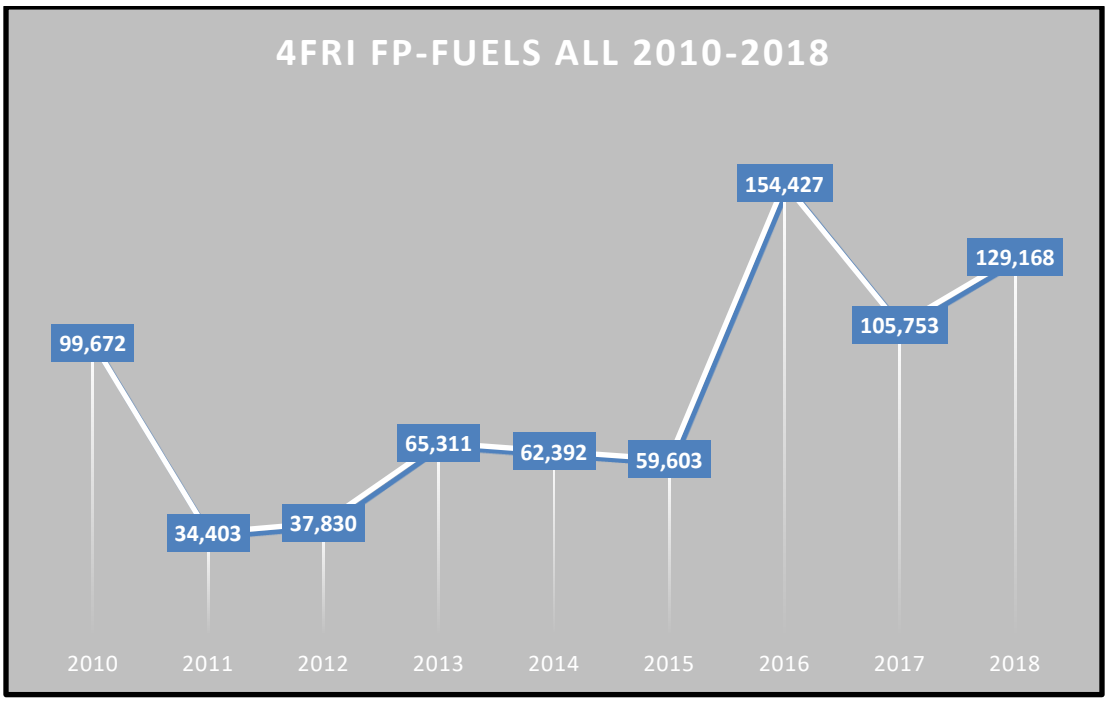
[10] FY 18 footprint acres that were previously treated.

[11] From FACTS FP_FUELS_ALL_MIT_NFS report run November 10, 2018

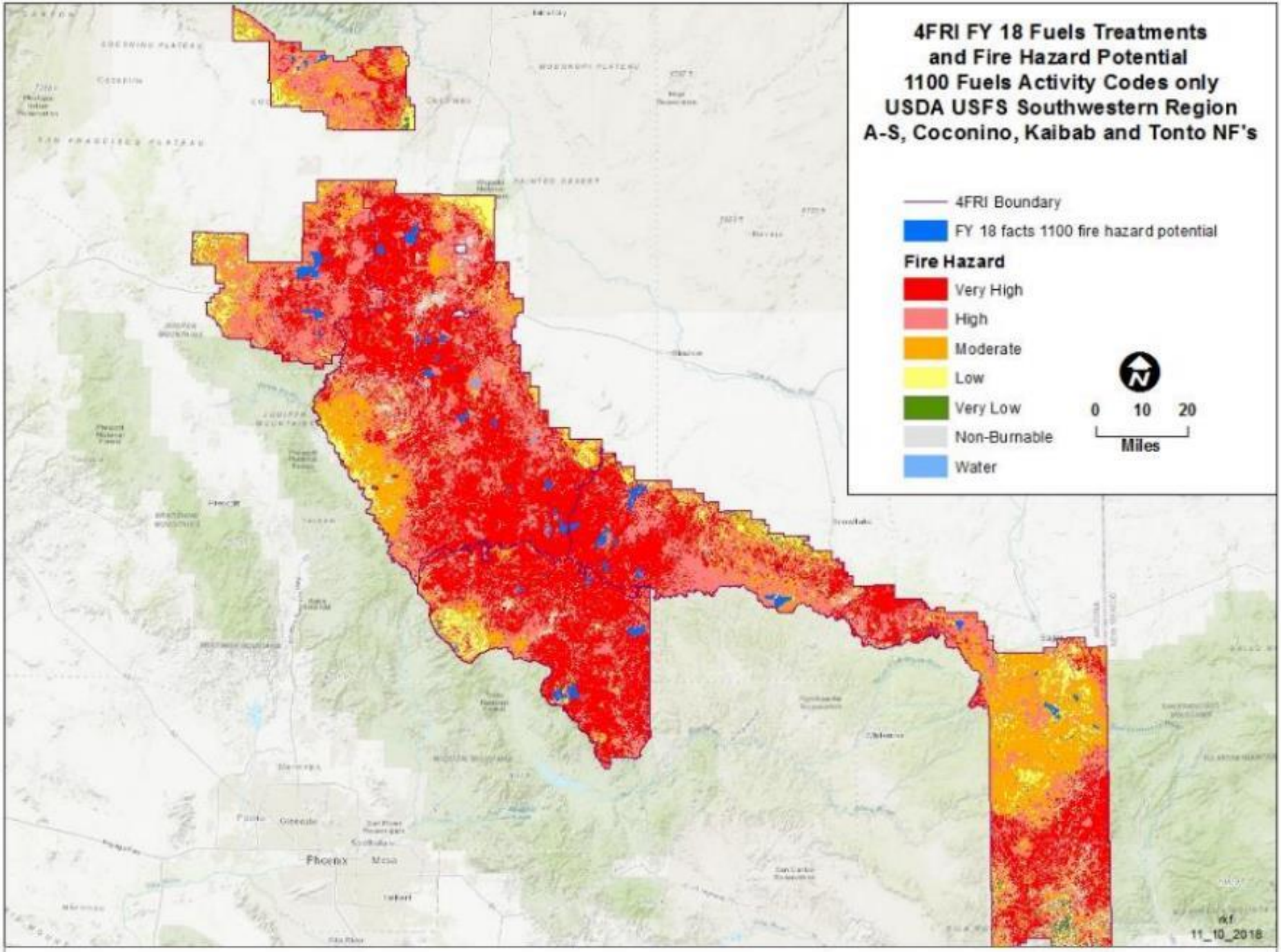
[12] Include base salaries, training, and resource costs borne by the unit(s) that sponsors the CFLRP project. If costs are directly applicable to the project landscape, describe full costs. If costs are borne at the unit level(s), describe what proportions of the costs apply to the project landscape. This may be as simple as Total Costs X (Landscape Acres/Unit Acres).

[13] Include emergency fire suppression and BAER within the project landscape. Describe acres of fires contained and not contained by initial attack. Describe acres of resource benefits achieved by unplanned ignitions within the landscape. Where existing fuel treatments within the landscape are tested by wildfire, summary and reference the fuel treatment effectiveness report.

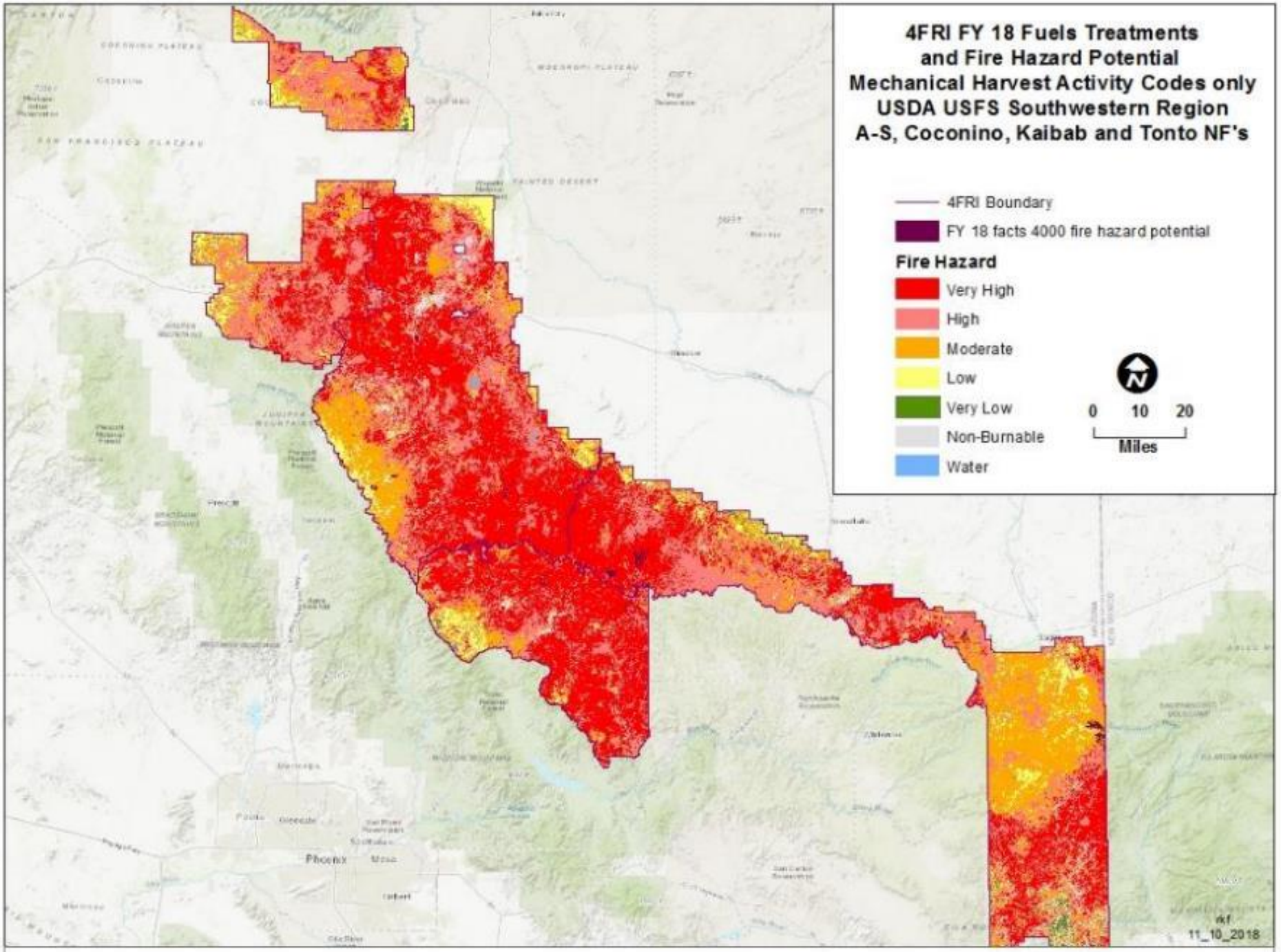
The amount of fire treatments greatly accelerated in FY 2018 over 2017. There were several causal factors for this. One, the Forests were burning larger burn blocks and utilizing more aerial ignition than in previous years. Second, over the last three years, there has been extensive use of shared resources across forests. In addition, State and local fire



department resources have also been utilized to increase the workforce to be able to accomplish prescribed burns. Second, the lack of fall moisture made for an extended prescribe fire season. However, because of the lack of moisture, the amount of acres that were accomplished using wildfire were less than FY 2016 and 2017. Third, additional funding from the Washington Office enabled extension of tours for fire fighters that were able to take advantage of the fall prescribe fire burn season, as well as complete pre-fire resource survey requirements. Fourth, large scale completed NEPA acreage exists across much of the 4FRI project area. All of these actions has created the ability to accelerate the pace and scale of fire operations.



Spatial Data from Forest Service Enterprise Data Warehouse Fuels accomplishments and Initiative accomplishments and Firelab classified hazard potential data.



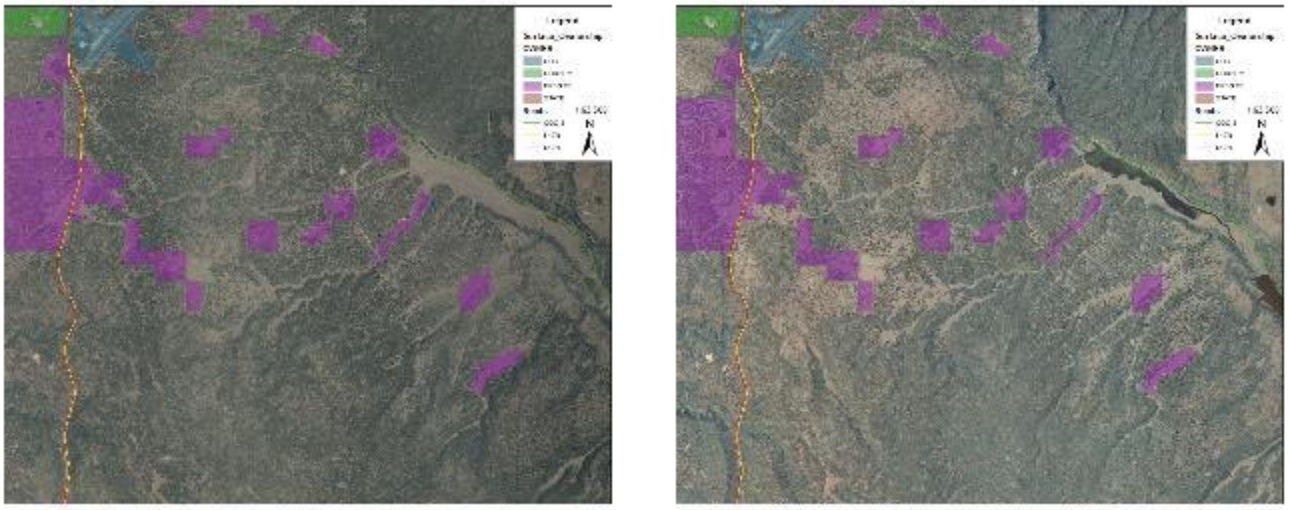
Spatial Data from Forest Service Enterprise Data Warehouse Fuels accomplishments and Initiative accomplishments and Firelab classified hazard potential data.

Through the life of the 4FRI project, there has been large-scale implementation of mechanical harvest. The table below displays the acres of mechanical harvest issued in contracts and the acres harvested since 2010. This combined effort to implement mechanical thinning treatments is moving these portions of the landscape toward desired conditions and the goals outlined in the 10-year strategy. However, the lack of existing industry is creating an issue with acres that will be available for prescribe fire in the future because sales under contract cannot be utilized for prescribe fire due to the potential for claim with lost volume and the loss of butt marks in painted units. This will move prescribe fire away from urban interface areas where there are sales that are awarded but not harvested.

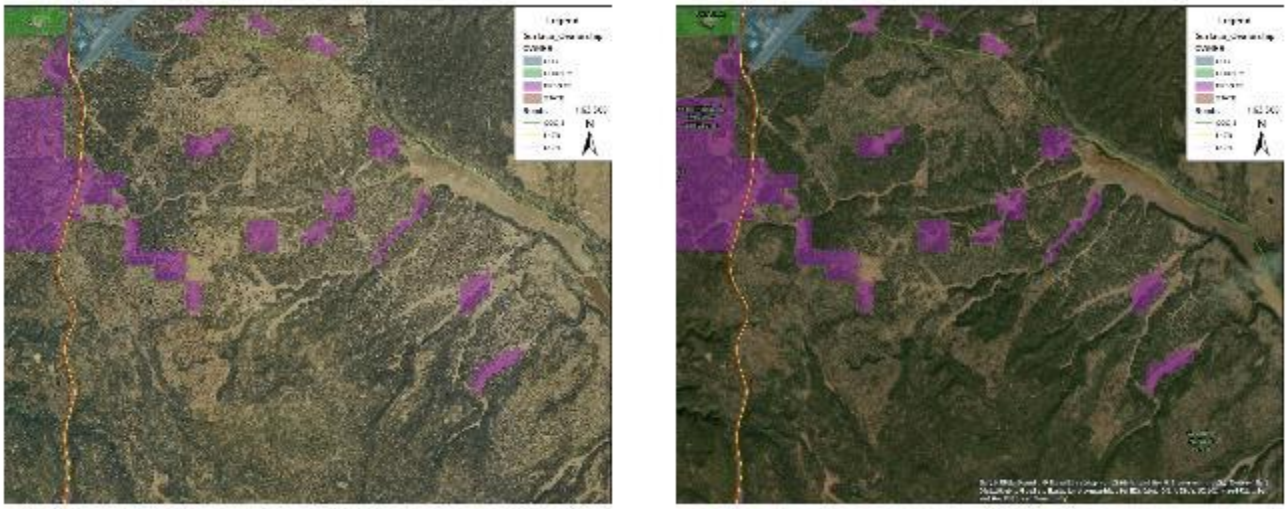
Summary by Fiscal Year	Acres awarded in all contracts	Acres completed in all contracts
Fiscal Year 2010	10,882	13,265
Fiscal Year 2011	17,638	16,034
Fiscal Year 2012	10,063	8,653
Fiscal Year 2013	25,479	15,469
Fiscal Year 2014	22,069	13,585
Fiscal Year 2015	38,819	14,550
Fiscal Year 2016	22,137	11,569
Fiscal Year 2017	32,514	13,108
Fiscal Year 2018	21,983	12,731
Total	**201,584**	**118,964**

With the caveat of impacts to future prescribe fire acres, mechanical treatments meet the 10-year comprehensive strategy by achieving these objectives:

- Treatments meet the goal of reducing fire intensities and conform to the National Fire Management Plan by reducing hazardous fuels.
- Treatments are designed to restore fire-adapted ecosystems by restoring the structure, pattern, and composition of ponderosa pine forests.



2007 / 2010



2013 / 2017

The photos above display the before and after aerial photos of mechanical harvest on multiple sale areas, just south of Flagstaff, Arizona and the Flagstaff District Coconino National Forest. The first photo is 2007, prior to 4FRI. 2010 is the first year of the initiative, 2013 is the fourth year of the initiative and 2017 is the eighth year of the initiative. The photos displays the change in structure pattern and composition that will change fire behavior on the landscape within the Wildland Urban Interface. Additional treatment have taken place in 2018 within this landscape but aerial photos are not available to display the change. Including the specific projects discussed above, other treatments implemented in Fiscal Year 2018 within the 4FRI area that address the 10-year strategy include:

- Fuels reduction treatments with prescribed burning, wildfires managed for resource benefits and mechanical thinning on approximately 129,168 acres, of which approximately 88,926 acres are in Wildland Urban Interface.
- Of the fuels treatments completed, 35,407 acres are Forest Service acres where fuels have effectively been mitigated to reduce wildfire risk. Of the 35,407 acres, 29,327 acres were in the Wildland Urban Interface.
- Prescribed fire and wildfires managed for resource benefits treatments designed to reduce fire intensities conform to the National Fire Management Plan by reducing hazardous fuels.

How may the treatments that were implemented contribute to reducing fire costs? If you have seen a reduction in fire suppression costs over time, please include that here. ? The Hub Point Fire noted a cost of $50/acre that is much lower per acre costs than prescribed fire.

Have there been any assessments or reports conducted within your CFLRP landscape that provide information on cost reduction, cost avoidance, and/or other cost related data as it relates to fuels treatment and fires? If so, please summarize or provide links here:
Wayne Fox, Director, Arizona Rural Policy Institute; Assistant Dean, W.A. Franke College of Business at Northern Arizona University completed a cost avoidance study for the Flagstaff Watershed Protection Project. The link is attached. Link;

Changes in potential wildland fire suppression costs due to restoration treatments in Northern Arizona Ponderosa pine forests. Forest Policy and Economics Volume 87, February 2018, Pages 101-114. Link; Fitch, R., & Kim, Y. S. (2015).

Expected wildfire suppression costs for proposed 4fri treatment areas. In The Colorado Plateau VI: Science and Management at the Landscape Scale (pp. 331-338). University of Arizona Press. Link

When a wildfire interacts with a previously treated area within the CFLR boundary:

If additional assessments have been completed since the FY2017 CFLRP annual report on fires within the CFLRP area, please note that and provide responses to the questions below.

Each unit is required to complete and submit a standard fuels treatment effectiveness monitoring (FTEM) entry in the FTEM database (see FSM 5140) when a wildfire occurs within or enters into a fuel treatment area. **For fuel treatment areas within the CFLR boundary, please copy/paste that entry here and respond to the following supplemental questions. Note that the intent of these questions is to understand progress as well as identify challenges and what didn't work as expected to promote learning and adaptation.**

Fire Suppression (WFSU)

The 4FRI project area had an active wildland fire year in 2018. The table below summarizes fire activity over 100 acres in the 4FRI area as reported in the Wildland Fire Decision Support System (WFDSS). There were 59,221 acres of wildfires over 100 acres in size within the 4FRI footprint. There were a mixture of suppression activities that are displayed in the table below.

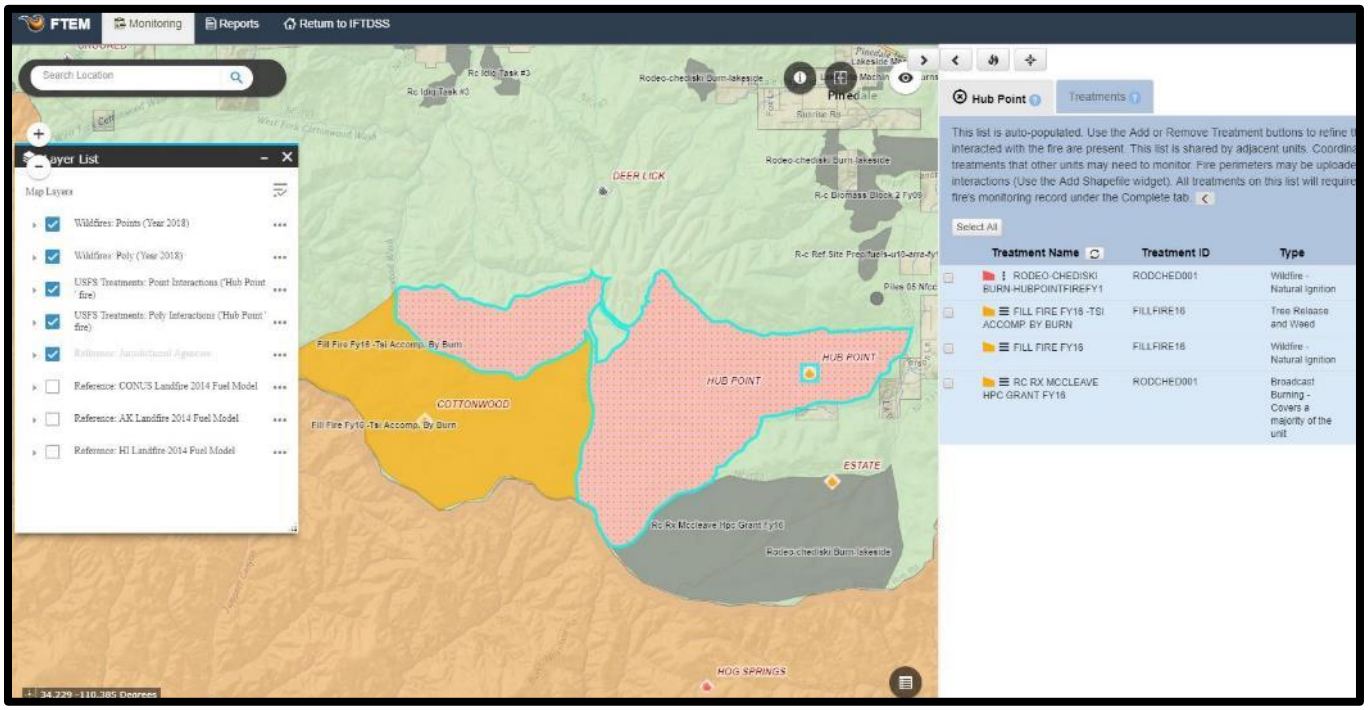
Incident Name	Unique Fire Identifier	Jurisdiction(s)	Size	Strategy	Forest	Treatment Interaction
33 Springs	2017-AZASF-001091	USFS, Other	1,703	Resource Benefit	Apache-Sitgreaves	No
377	2018-AZASF-000484	BLM, USFS, State	4,833	Full Suppression	Apache-Sitgreaves	No
CINDER	2018-AZASF-001344	USFS	500	Full Suppression	Apache-Sitgreaves	No
Grama	2018-AZASF-000879	USFS	2,153	Resource Benefit	Apache-Sitgreaves	No
Hub Point	2018-AZASF-000996	BIA/Tribal, USFS	5,056	Resource Benefit	Apache-Sitgreaves	Yes-FTEM report
Ranch	2018-AZASF-000963	USFS	5,491	Full Suppression	Apache-Sitgreaves	No
Woods	2018-AZASF-000309	USFS	102	Full Suppression	Apache-Sitgreaves	No
Bristow	2018-AZCOF-001237	USFS	2,812	Resource Benefit	Coconino	Yes, no report
Chimney	2018-AZCOF-001093	USFS	208	Resource Benefit	Coconino	No
Deer	2018-AZCOF-001122	USFS	800	Resource Benefit	Coconino	No
Platypus	2018-AZCOF-001336	USFS	4,889	Full Suppression	Coconino	No
Rhino	2018-AZCOF-001338	USFS	897	Full Suppression	Coconino	No
Seep	2018-AZCOF-001188	USFS	4,400	Resource Benefit	Coconino	No
Tinder	2018-AZCOF-000285	USFS	16,309	Full Suppression	Coconino	Yes-FTEM report
BALD	2018-AZKNF-000776	USFS	340	Resource Benefit	Kaibab	Yes, no report
PERKINS	2018-AZKNF-000990	USFS	565	Resource Benefit	Kaibab	Yes, no report
RAIN	2018-AZKNF-000758	USFS	604	Resource Benefit	Kaibab	No
Bears	2018-AZTNF-001470	USFS	7,559	Resource Benefit	Tonto	No

Six fires interacted with areas that were recently treated, each will be discussed separately.

Hub Point

The Hub Point Fire was reported to Show Low Dispatch Center as a lightning fire by Juniper Ridge look out on Friday July 27th at around 1800. Management objectives of the Hub Point Fire included the protection of values at risk while allowing this lightning caused fire to mimic historic conditions with low to moderate fire intensity. No previous treatments had occurred directly within the fire perimeter, however, the fire has been surrounded by previous treatments. The entire area is covered by the Rodeo-Chediski Prescribed Fire EA and was planned to be prescribe

burned in the future. The cost of the Hob Point Fire was approximately $50/acre, considerably less than a prescribed fire.



- *Please describe if/how partners or community members engaged in the planning or implementation of the relevant fuels treatment.* No treatments occurred within the fire, but the planned Rx burns were covered in the Rodeo-Chediski Prescribed Burn EA with a signed decision February 22, 2012 and was scoped with local community members and partners.
- *Did treatments include coordinated efforts on other federal, tribal, state, private, etc. lands within or adjacent to the CFLR landscape?* No
- *What resource values were you and your partners concerned with protecting or enhancing? Did the treatments help to address these value concerns?* Resource concerns within the Hub Point Fire area:

Resource	Concern	Mitigation
Timber	Certified Ponderosa pine regeneration and a Ponderosa pine plantation within the old Rodeo-Chedeski burn	Use minimal personal and fire to minimize mortality in the Ponderosa pine regeneration
Wildlife	Northern Goshawk nesting site within planning area	Use minimal personnel and equipment to limit disturbance, take appropriate action to protect nesting trees and fledgling area from high intensity fire
Recreation	Busy weekends due to upcoming elk hunting season and the end of summer	Manage smoke appropriately and keep public updated with current information
Range	Grazing allotment within planning area	Coordinate with permittee to avoid conflicts with cattle and protect pasture fences
Archaeology	High density of sites within the area including railroad beds with fire sensitive features	Use a para-arch to identify fire sensitive sites. Prep fire sensitive sites to avoid impact. Avoid mechanical disturbance of sites

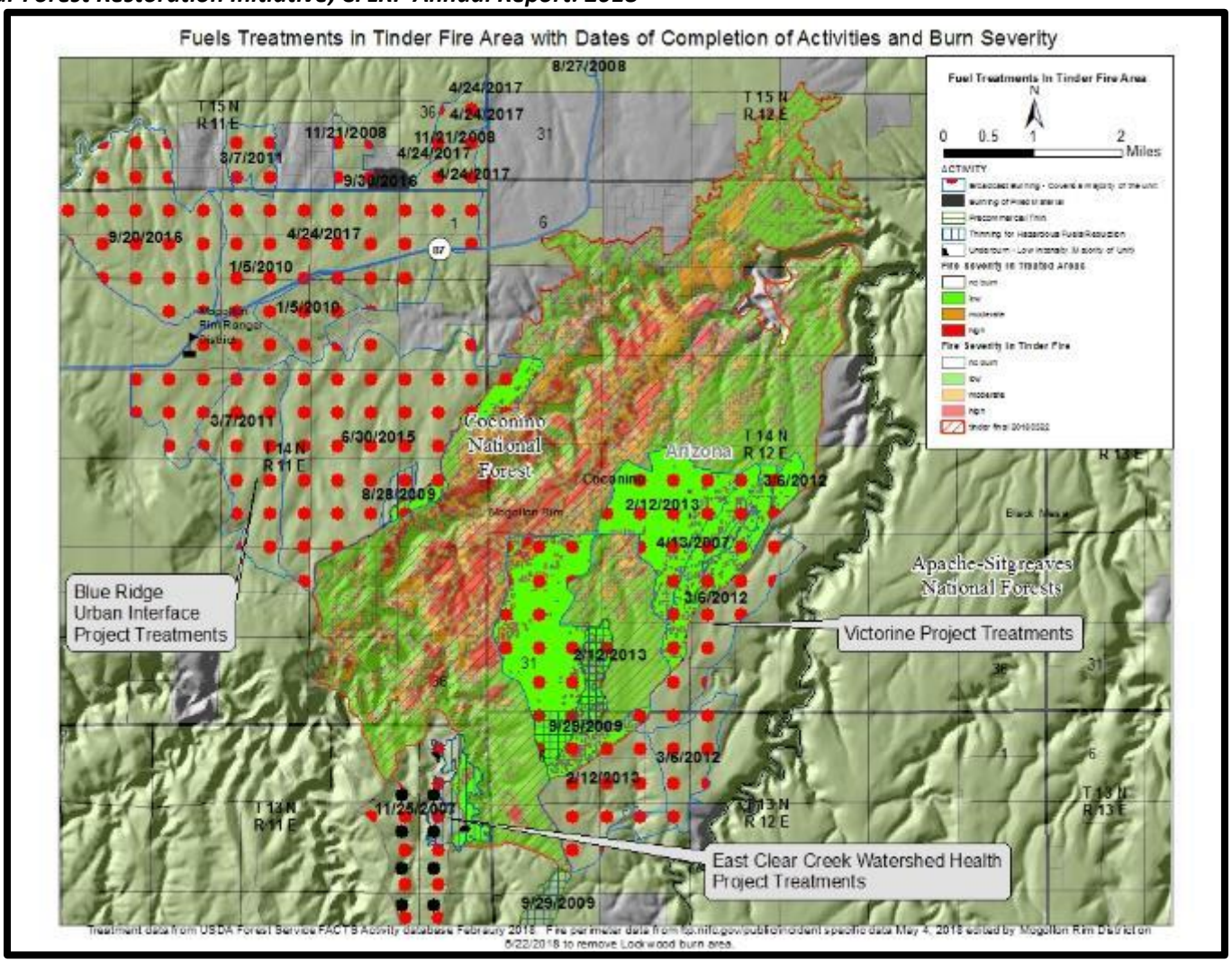
- *Did the treatments do what you expected them to do? Did they have the intended effect on fire behavior or outcomes? Please include a brief description.* Yes, Fire effects across the Hub Point were primarily low severity (see phots below) that were consistent with the values at risk.

- *What is your key takeaway from this event – what would you have done differently? What elements will you continue to apply in the future?* There are a few key successes that should be noted. All of the resource concerns were successfully mitigated. The fire was implemented during a time of year that has some of the highest visitor use for the surrounding area, which translates to great importance for the local economy. This was accomplished without significant impact to local communities.
- *What didn't work as expected, and why? What was learned?* Suggestions From After Action Review are as follows:
  - Order PIO when decision to monitor occurs (Include a public information incident objective)
  - Order Archaeologist when decision to monitor occurs
  - Develop 72 hour plan early on (efficiency)
  - Develop monitor fire planning checklist

Please include the costs of the treatments listed in the fuels treatment effectiveness report: how much CFLR/CFLN was spent? How much in other BLI's were spent? If cost estimates are not available, please note and briefly explain. No pre-fire treatments occurred within the Hub Point fire area, so no data on treatment costs. The FETM noted the cost per acre was $50---this is less than the proposed prescribed fires that were planned for the area.

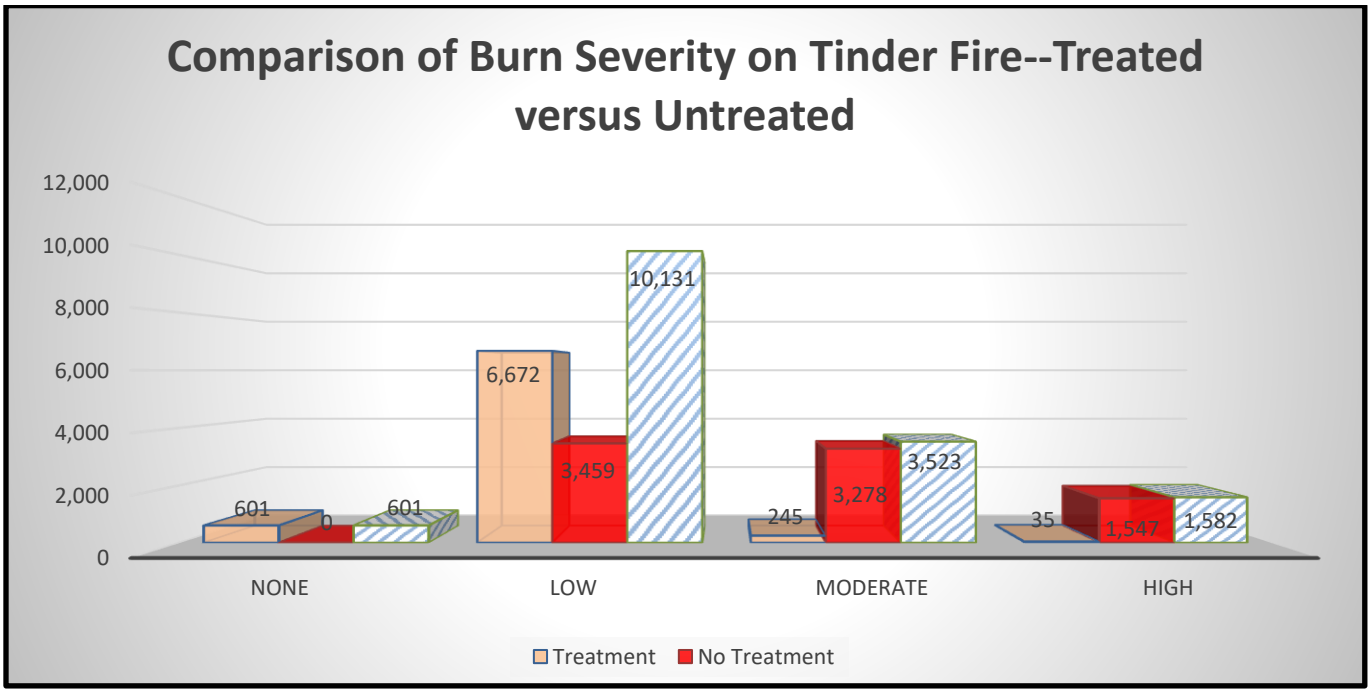
Tinder Fire

The Tinder Fire on the Coconino National Forests was started by humans on April 27, 2018 in the mid-slope of the East Clear Creek drainage near the Kinder Crossing trail. The winter of 2017 and 2018 was abnormally dry and fuel conditions were similar to June fire conditions. The fire was also located due south of two subdivisions, Clear Creek Pines Units 8 and 9. For these reasons, the Tinder Fire had a full suppression strategy. The fire burn very rapidly and with severe fire effects on untreated areas and burned into Clear Creek Pines Units 8 and 9 and destroyed 33 primary residences and 54 minor structures. The Tinder Fire contained 7, 567 acres of fire that burned within three different implementation projects, Blue Ridge Urban Interface project, Victorine 10K Project Area, and small portion of the East Clear Creek Watershed Health Project (See map below for treatment areas and relative fire severity).



- *Please describe if/how partners or community members engaged in the planning or implementation of the relevant fuels treatment.* Yes, partners and local community members were involved in the planning of the fuels treatment projects and were scoped during the NEPA process for the Blue Ridge Urban Interface project (Decision, June 2002) and the Victorine 10K analysis area (Decision July 2005). Each prescribed burn that was implemented had press releases and emails sent to the local community email list.
- *Did treatments include coordinated efforts on other federal, tribal, state, private, etc. lands within or adjacent to the CFLR landscape?* No
- *What resource values were you and your partners concerned with protecting or enhancing? Did the treatments help to address these value concerns? Did the treatments do what you expected them to do? Did they have the intended effect on fire behavior or outcomes? Please include a brief description.* The primary reason for the fuels treatments in the Blue Ridge Urban Interface (BRUI) project was fuels reduction for the communities in and around the BRUI project area. The Victorine project was fuels reduction as well as forest health related. The treatments did address these concerns as documented in the FETM for the Tinder Fire. Fire behavior was moderated by previous fuel treatments in comparison to untreated acres (See table and bar graph below), however, there is a caveat to this fact. Many of the high severity burn acres were on steep slopes that affected fire behavior. However, even with this caveat, reviewing the map above displays there were still large pockets of moderate and high severity fire effects on flat slopes outside of the treatment area and the size and extent of patches of moderate and severe fire behavior are much smaller within previously treated areas.

Fire Severity	Treatment	% of fire	No Treatment	% of fire	Fire total	% of fire
None	601	4%	0	0%	601	4%
Low	6,672	42%	3,459	22%	10,131	64%
Moderate	245	2%	3,278	21%	3,523	22%
High	35	0%	1,547	10%	1,582	10%
TOTAL	**7,553**	**48%**	**8,284**	**52%**	**15,837**	**100%**



- *What is your key takeaway from this event – what would you have done differently? What elements will you continue to apply in the future?* Part of the Victorine Project was not treated because of a Northern Goshawk Post Fledgling Area. Photos 8 and9 show the difference in effects from just prescribed fire. The lack of treatment lead to higher severity fire effects. The surrounding area was treated (prescribe burned). The treated area shows effects that are more consistent with the evolutionary history of Southwestern Ponderosa Pine forest. These no treatment areas (e.g., Post-Fledgling Areas, wildlife thermal/hiding cover, visual screens, etc.) lead to increased fire severity, higher rates of spread and resistance to control and can greatly reduce treatment effectiveness. In the future, planning needs to include treatment within habitats to protect the habitat so it is not lost during a wildfire.
- *What <u>didn't</u> work as expected, and why? What was learned?* All treated areas moderated fire behavior.
- *Please include the costs of the treatments listed in the fuels treatment effectiveness report: how much CFLR/CFLN was spent? How much in other BLI's were spent? If cost estimates are not available, please note and briefly explain.* No CFLR funds were utilized (several of the projects were implemented pre-CFLR program. Treatments since 2010 were all treated with WFHF bli. Cost varied from between $75/ acre to $200/acre (source FACTS activity 160 report).

Bears Fire

The Bears Fire (7,559 acres) was detected on the Tonto NF on July 27th, 2018 at about 1350. The initial size up reported the fire was about 2 acres, creeping in ponderosa pine litter in Bear Head Canyon, southwest of the J Slash X Ranch, about 20 miles southeast of Payson (see map below).

- *Acres impacted and severity of impact:* Please see below

- *Brief description of the planned treatment for the area:* Planned treatment for the area is prescribed burning.

- *Summary of next steps – will the project implement treatments elsewhere? Will they complete an assessment?* Spring CE is approximately 207,000 acres and has 29 other prescribed fire units identified. An assessment will be completed on broadcast burns greater than 1,000 acres in size.

- *Description of collaborative involvement in determining next steps.* Burn plan for Spring CE is still in development and has multiple individuals involved from the WO, RMRS, RO, Forest, and District. District staff (ranger, wildlife, timber, recreation) and local ranchers will be involved in discussions before treating areas. Public will be notified before implementation.

Incident objectives and fire effects

Resource objectives from WFDSS that indicate if acres have moved towards desired condition for fire and fuels are listed below with brief descriptions of if/how the objectives were met.

1. Provide a mosaic of age classes within each cover type which will provide for a mix of successional stages, and to allow fire to resume its natural ecological role within ecosystems.

This objective was met for over 90% of the ponderosa pine / evergreen oak in the Bears Fire. In some areas, fire severity was higher than desired because:
1) Unexpected wind shifts that pushed fire uphill when ignition tactics had counted on a wind direction as forecast. That produced the largest patches of high severity in ponderosa pine / evergreen oak, near Lookout Point.

2) High severity edge effects were created when shrubs downslope from ponderosa pine stands torched (Figure 2). Prior to 2003, the shrubby area downslope from the pines shown in Figure 2 was forested, but the Picture Fire created large areas of high severity that are now mostly shrub fields. When the shrubs downslope burned, the heat killed the pines on the edge of the stands uphill.

High severity on the edge of a ponderosa pine stand produced by the fire behavior in the shrubs downslope from the pine.

2. Minimize negative habitat and disturbance effects from fire and suppression activities to individual spotted owls and their habitats (PACs, Recovery Habitat, and Critical Habitat).

This objective was met. Tactics and strategies were developed and implemented to minimize fire severity and disturbances in the PAC areas within the OPA. The patch size for Ponderosa Pine / Evergreen oak in the Tonto Assessment is 0.1 – 50 acres. However, discussions with FWS in previous fires have indicated that patches of high severity should not exceed 4 acres in PACs, and 2.5 acres in MSO core areas. RAVG data indicate only one area larger than 4 acres within a PAC, though there are multiple smaller areas.

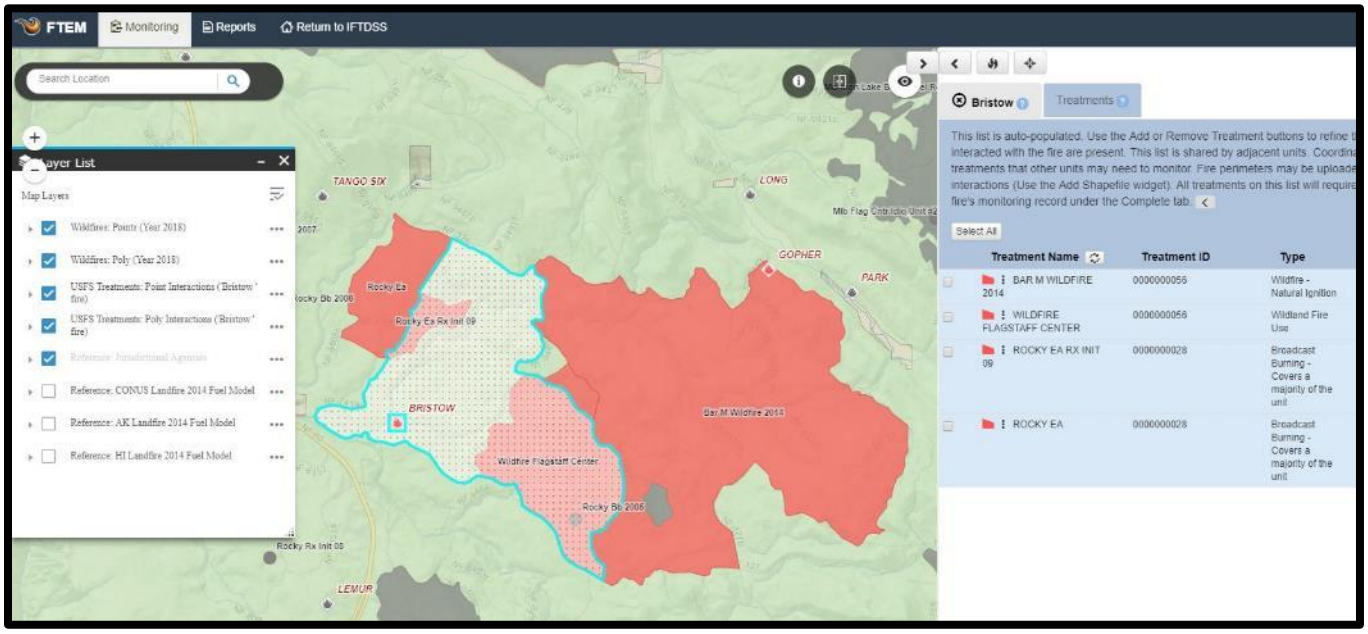
Other relevant fire effects

With the exception of about 350 acres in the ponderosa pine / evergreen oak (<5% of the burned area), fire effects were within the fire regimes for the vegetation types (Table 1) in the 7,559 acres that burned in the Bears Fire.

Table 1. Vegetation types within the Bears Fire perimeter and their fire regimes. *Vegetation type*	**acres**	**Fire Return Interval**	**Fire Severity**
Interior Chaparral	27	30 - 100, 50	mixed to high
Madrean Encinal Woodland	21	10 - 100, 25	low to mixed
Madrean Pinyon-Oak Woodland	114	10 - 200, 35	low to mixed
PJ Evergreen Shrub	419	35 - 200, 35	low to high
PJ Grass	13	1 - 35, 20	low to mixed
Ponderosa Pine - Evergreen Oak	6,335	1 - 60, 5	low to mixed
Fremont Cottonwood - Conifer	17	infrequent	low, variable
Sycamore - Fremont Cottonwood	4	infrequent	low, variable

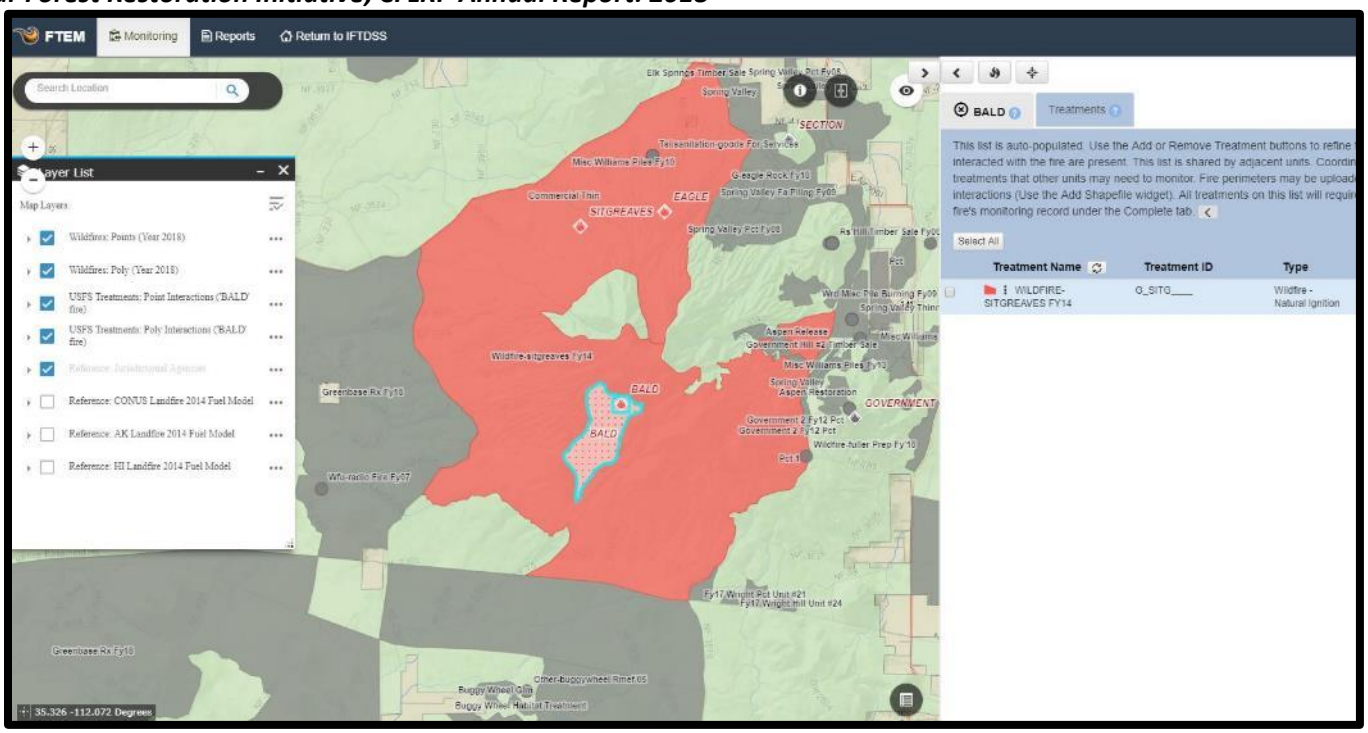
Bristow Fire

The Bristow Fire was started by lightning on July 21, 2018 on the Flagstaff Ranger District of the Coconino National Forest. No FTEM report has been completed for the Bristow Fire to date. The FTEM database displays multiple interactions with previous fires within the fire boundary (see map below).



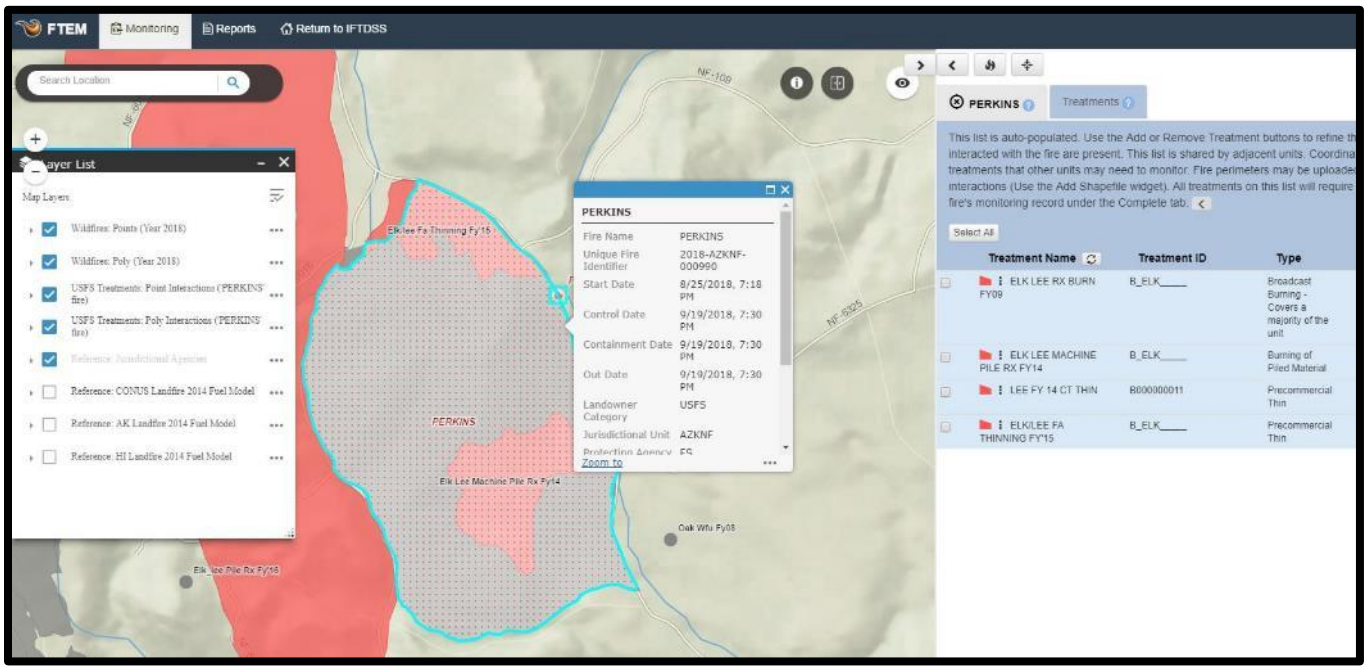
Bald Fire

The Bald Fire was started by lightning on July 22, 2018 on the Williams District of the Kaibab National Forest. No FTEM report has been completed for the Bald Fire to date. The FTEM database displays the entire fire burned within the Sitgreaves wildfire form 2014 (see map below).



Perkins Fire

The Perkins Fire was started by lightning on August 25, 2018 on the Williams District of the Kaibab National Forest. No FTEM report has been completed for the Perkins Fire to date. The FTEM database displays that there were several interactions with previously treated areas within the fire perimeter (see map below).



Additional information regarding 4FRI's progress to date in restoring a more fire-adapted ecosystem and how it has contributed to the wildland fire goals in the 10-Year Comprehensive Strategy Implementation Plan includes the following.

Fire Preparedness (WFPR)

The following table summarizes the costs for wildfire preparedness in the 4FRI project area. The total expenditures in WFPR were prorated by the relative area of the 4FRI project in relationship to the total forest acreage. The table displays, by forest, the total expenditures in WFPR for FY 2018, the percent of the forest covered by these expenditures, and the 4FRI expenditures allocated to WFPR. Approximately $3.8 million of wildfire preparedness funds were spent in FY 2018 in the 4FRI footprint.

FOREST	WFPR total	% of Forest	4FRI expenditures WFPR
Apache-Sitgreaves	$1,600,280	0.8	$1,280,224
Coconino	$1,562,093	0.8	$1,249,674
Kaibab	$1,367,389	0.5	$683,695
Tonto	$2,368,867	0.25	$592,217
TOTAL	**$6,898,629**		**$3,805,810**

3. **What assumptions were used in generating the numbers and/or percentages you plugged into the TREAT tool**? Information about Treatment for Restoration Economic Analysis Tool inputs and assumptions available here.

CFLN

1) Total CFLR funding in Table 1 includes appropriated CFLN plus carryover from final expenditure report.
2) % contract in Table 1 is 26% from contracts let using CFLN and CFLN carryover--$3.8 million. % of contracts derived from Work Plan contract values.
3) % of contracting split in Table 2 in CFLR is based on the percentage of contracts derived from Work Plan contract values.
4) Volume in Table 3 is from Timber Information Manager (TIM) database cut and sold report.
5) % manufacturing in Table 4 is from values produced by Arizona Department of Forestry and Fire Management Wood Utilization & Marketing Specialist and validated with a product mix census conducted by the US Forest Service. In this project, energy is comprised of cogeneration as well as wood pellets. Some biomass is going to soil amendments, decorative bark, horse bedding etc that is not categorized and is actually manufactured outside of the project area in Maricopa County so the percentage is less than 100%.

FULL PROJECT

1) Total project funding in Table 1 from final funding report and does not include CFLN plus carryover.
2) % of contracting in Table 1 is the 25% that went to contracts. % of contracts derived from Work Plan contract values.
3) % of split in Table 2 is based on the percentage of the actual cost by bli, assigned to the categories in the table.
4) Volume in Table 3 is from Timber Information Manager (TIM) database cut and sold report.
5) % manufacturing in Table 4 is from values produced by Arizona Department of Forestry and Fire Management Wood Utilization & Marketing Specialist and validated with a product mix census conducted by the US Forest Service. In this project, energy is comprised of cogeneration as well as wood pellets. Some biomass is going to soil amendments, decorative bark, horse bedding etc that is not categorized and is actually manufactured outside of the project area in Maricopa County so the percentage is less than 100%.

FY 2018 Jobs Supported/Maintained (FY18 CFLR/CFLN/ WO carryover funding):

FY 2018 Jobs Supported/Maintained	Jobs (Full and Part-Time) (Direct)	Jobs (Full and Part-Time) (Total)	Labor Income (Direct)	Labor Income (Total)
Timber harvesting component	34	48	$1,525,266	$1,846,845
Forest and watershed restoration component	7	9	$69,663	$130,721
Mill processing component	13	27	$442,736	$807,262
Implementation and monitoring	33	45	$2,246,713	$2,654,201
Other Project Activities	1	2	$24,074	$33,560
TOTALS:	**88**	**130**	**$4,308,452**	**$5,472,589**

FY 2018 Jobs Supported/Maintained (FY18 CFLR/CFLN/ WO carryover and matching funding):

FY 2018 Jobs Supported/Maintained	Jobs (Full and Part-Time) (Direct)	Jobs (Full and Part-Time) (Total)	Labor Income (Direct)	Labor Income (Total)
Timber harvesting component	303	429	$13,727,395	$16,621,606
Forest and watershed restoration component	41	60	$524,756	$1,086,416
Mill processing component	116	245	$3,984,621	$7,265,360
Implementation and monitoring	458	559	$18,908,508	$22,337,953
Other Project Activities	9	12	$156,969	$225,806
TOTALS:	**929**	**1,304**	**$37,302,249**	**$47,537,140**

4. **Describe other community benefits achieved and the methods used to gather information about these benefits**. **How has CFLR and related activities benefitted your community from a social and/or economic standpoint?** (Please limit answer to two pages).

The Four Forest Restoration Initiative (4FRI) achieved a number of community benefits over the last year. The table below highlights four areas.

Indicator	Brief Description of Impacts, Successes, and Challenges	Links to reports or other published materials (if available)
Volunteer/outreach participation	Multiple partners continue to provide extensive amounts of volunteer hours performing monitoring and restoration work across the 4FRI landscape. Major partners that solicit for and provide volunteers include the Trout Unlimited (3,618 hours), Friends of Northern Arizona Forests (2,455 hours) Grand Canyon Trust (208 hours) and the Arizona Elk Society (350 hours). The Arizona Elk Society was awarded the Forest Service Rise to the Future Partnership Award for their work in	Arizona Elk Society Long Valley Draw Restoration

Indicator	Brief Description of Impacts, Successes, and Challenges	Links to reports or other published materials (if available)
	2017 in Long Valley Draw Meadow---the attached video link highlights this work.	
Economic dependency/sectors impacted/expanding market development	The US Forest Service, University of Arizona, Ecological Restoration Institute at Northern Arizona University, Campbell Global, and Apache County have had preliminary meetings with Mr. Ahn Jong Hyeun of JA International concerning development of wood export to South Korea.	
Economic dependency/sectors impacted/expanding market development and Responses to surveys about collaboration conducted locally	Socioeconomic info concerning the impacts of the economic impact of the logging industry on local economies were collected by Evan Hjerpe of Conservation Economics Institute for use in a study of the socioeconomic effects of the logging industry that is being conducted as part of the socioeconomic component of the 4FRI Multi-Party Monitoring Board. The final report for the study is expected in early FY 2019 and will be available in next year's CFLR report.	
Tribal Connections	The FS received a $25k grant through the Forest Service Citizen Science Competitive Funding Program to collaborate with NAU and southwestern tribes on the identification, documentation, and future management of culturally important plants within the 4FRI footprint. The intent of this project is to develop tools, and management recommendations that can be applied across the 4FRI project area. As this is the first year for the CFP program, this project will be highlighted as a pilot project to develop best management practices for future citizen science projects. The Forest Service and the San Carlos Apache, Tonto Apache, White Mountain Apache and Zuni tribes have signed a Master Participating Agreement to partner on a wide range of restoration activities within the 4FRI footprint. Staff on all four forests have been discussing potential projects with tribes for some time, so implementation of the MPA will allow each unit to move forward on developing forest-level SPA's to implement these projects.	More information on the program and our proposal can be found here…. Link
Economic dependency/sectors impacted/expanding market development	Key recommendations resulting from the assessment of the 10-year White Mountain Stewardship Project (WMSP) focus on contracting processes, industry capacity, and partnerships. Cohesive agency, industry, and stakeholder partnerships are critical to the success of forest restoration initiatives. Some project challenges detailed in the report include: Stewardship contracting barriers; the single contractor model; A limited supply of raw material; The economic downturn of	The Social and Economic Contributions of the White Mountain Stewardship Project: Final 10-Year Assessment—Lessons Learned and Implications for Future Forest Management Initiatives Link

Indicator	Brief Description of Impacts, Successes, and Challenges	Links to reports or other published materials (if available)
	the Great Recession; and Wallow Fire impacts. Many project successes are also captured, such as: Revitalized forest products industry in the White Mountains; Generational family businesses maintained; Benefits to forest health and ecosystem services; Meaningful collaboration among U.S. Forest Service, stakeholders, and citizens; wildfire risk reduction and increased community protection and paved the way for the nation's next largest collaborative restoration project, the Four Forest Restoration Initiative, or 4FRI.	White Mountain Stewardship Project Final 10-year Socioeconomic Assessment Link
Community support for relevant initiatives	The paper outline the community partnerships that were created or were in place to create the Flagstaff Watershed Protection Project> lessons learned include: Manage expectations regarding NEPA requirements and timelines; Be prepared to show immediate on-the-ground progress; Assure quality internal communication within the USFS; Convey project as an investment, not a cost and Keep the management structure simple.	Flagstaff Watershed Protection Project: Creating Solutions through Community Partnerships Link
Public input in political processes	The White Paper provides collaborative organizations or groups with information about the Forest Service's administrative review process, as well as the judicial review process, and opportunities for engagement at both levels. The White Paper is a resource for collaborative groups to educate themselves on the laws and procedures surrounding administrative and judicial reviews of Forest Service projects.	Administrative and Legal Review Opportunities for Collaborative Groups Link
Job training opportunities/ per capita normalize	Job gap analysis for private sector logging/field jobs completed in 2015 with ERI, TNC and FS. The paper outlined 9 different positions form mill worker to truck driver, the desired education outcome for each of the positions, and the training opportunities	4FRI share point site Job gap analysis

The forest products industry within the 4FRI project area continues to provide employment opportunities and community benefits across the 4FRI landscape. One new mill has opened on the west side of the project area near Williams, Arizona, James Perkins Lumber, however, one mill also closed on the west side of the project area near Williams, Arizona as well (Grand Canyon Forest Products).

4FRI has also provided numerous public education/outreach opportunities, including the following:
1) The 4FRI stakeholders created a restoration brochure 4FRI brochure that outlines the basic concepts around restoration that are available for all stakeholders to distribute. Examples of how these were used include Suarez Logging handing copies out to interested publics within their sale areas, the Forest Service distributing copies to local homeowner's near the Chimney Springs harvesting project.
2) 4FRI stakeholders sponsored a viewing of the video Fire and Water-Restoring Arizona's Forest at the Museum of Northern Arizona on May 17, 2018.
3) The Grand Canyon Forest Partnership provided funding for a prescribed fire smoke newspaper insert in Flagstaff, Sedona, Verde valley and Cottonwood.
3) The Federal Timber Purchaser's Committee national meeting was held in the first week of May with 4Fri as a featured portion of the conference.
3) The FS created and distributed a monthly 4FRI update summarizing progress on planning and implementation (on 4FRI website at 4FRI monthly updates);

4) The 4FRI Stakeholder Group held monthly stakeholders meetings open to the and publishes a monthly new letter (the most recent copy of the newsletter can be found on the home page of the 4FRI stakeholders at 4FRI home page 4FRI.org).

5. Based on your project monitoring plan, **describe the multiparty monitoring process.**

The Multiparty Monitoring Board (MPMB) has collaborated with the Forest Service to design and implement data collection activities based on high priority stakeholder monitoring questions. Meetings are held on a monthly basis and more frequently in topic-based subgroups to develop study designs, review ongoing data collection efforts, and assess information needs. The MPMB developed a plan that will implement a long term strategic approach to data collection that will answer ecological and socioeconomic questions at landscape scales. They have also engaged a pool of subject matter experts who are available to review and consult on monitoring design and data analysis. A variety of stakeholders are active participants in the MPMB particularly in the development of monitoring question and study design. These include the Ecological Restoration Institute at Northern Arizona University, The Nature Conservancy, Arizona Department of Game and Fish, Campbell Global, Mottek Consulting, The Center for Biological Diversity, the Salt River Project, the Greater Flagstaff Forest Partnership, the Grand Canyon Trust, Beale Mountain Forestry, Trout Unlimited, the Rocky Mountain Research Station, and others listed below.

Ongoing Monitoring:

Data collection has continues on a number of fronts. The following monitoring projects will provide information on the short term and long term effects of some restoration activities.

Songbird occupancy bird data has continued to expand and continues to be collected in partnership with the Bird Conservancy of the Rockies across the treatment landscape. When complete, it will help identify the effects of landscape restoration on bird communities. This data will also leverage existing regional and national songbird data to separate treatment effects from climate driven changes to bird populations. Additional information is coming in the form of a local species colonization/extinction analysis to identify key bird species expected to be sensitive to the forest changes created by restoration treatments.

Mexican Spotted Owl occupancy and reproduction monitoring is occurring as part of a broader region-wide effort lead by U.S. Fish and Wildlife Service. Initial baseline occupancy monitoring of protected activity centers continues annually. The study design will explore the differences between paired mechanical and prescribed fire treatments and treatments that only use prescribed fire. This data will be aggregated with identical studies that are occurring throughout the state to increase the size of the dataset and the predictive power. This will ultimately improve our understanding of the effects of restoration on MSO populations. The initial fire treatments were implemented in select PACs in 2018. Occupancy monitoring will continue and vegetation will be re-surveyed in 2019 to document changes.

Landscape pattern analysis of remote sensing imagery continues to be an area of active monitoring and stakeholder engagement. LiDAR data was collected across the entire southern zone of the Kaibab National Forest and portions of the Coconino National Forest scheduled for restoration with the next 5 years. This data will be essential to the evaluation of the spatial pattern created in restoration treatments. We have also partnered with Northern Arizona University and the Nature Conservancy to develop models that will individually segment trees from within the LiDAR data to create a forest stem map that will be helpful in treatment preparation and effects analysis.

In cooperation with Northern Arizona University, permanent vegetation plots were established across the ponderosa pine belt of the Coconino National Forest. These plots were established using a multi-scale sample design that will allow data collected at fine scales to support broader scale analyses. The sample design also dovetails with the permanent plots established on both the Kaibab and Coconino National Forests, allowing cross-boundary trend analysis. These

plots will evaluate changes in vegetation composition and structure that occur as a result of restoration treatments. Tree structure, surface vegetation cover, and fuel components are quantified to not only describe residual vegetation structure, but also to model the effects of fire on the landscape. The effect will be to create a dataset that is more cost efficient and capable of answering questions that go beyond the scope of this restoration project. A power analysis for all metrics have been conducted and we expect to have post treatment data collected in FY19 to analyze changes.

We are actively engaged in developing a landscape scale sample design and protocol to test the effects of restoration treatments on groundwater recharge/availability as expressed through spring flow. The design is being developed in collaboration with the Springs Stewardship Institute at the Museum of Northern Arizona. Efforts are also already underway with the 2018 installation of piezometers at multiple spring sites.

In response to requests from industry partners, we have initiated a monitoring program with Forest Health Protection and Northern Arizona University to evaluate the drying rate of logs left in the forest and the risk of insect outbreaks. This program will allow us to open the door to improving the economics of hauling low value wood to local mills while managing the risk to residual stands from wood beetle populations that can grow in drying logs. In the second year of monitoring, we began tracking the drying rates earlier in the year to capture pre-monsoonal effects. A risk assessment and recommendations for best management practices are currently being developed.

In collaboration with The Nature Conservancy and AmeriCorps, the MPMB surveyed post treatment areas to identify evaluate the establishment and spread of noxious weeds. This project helps evaluate the success of not only the site specific weed treatments, but also the FS best management practices used to mitigate noxious weed outbreaks.

As 4FRI approaches the publishing the DEIS for a second large scale analysis covering the east side of the project area, the MPMB completed developing a new set of monitoring questions related to aquatic habitat quality as well as other related to water quantity and quality. These questions are being integrated into the monitoring plan and will become part of the Rim Country FEIS.

Preliminary Data:

The vast majority of the monitoring information collected at this point describes the current condition. As the first restoration treatments designed in the first landscape scale EIS come to completion in 2019, we will return to describe and document the changed condition. Some of the monitoring data will reveal important short-term changes in components such as tree structure, forest composition, diameter distribution, and canopy cover. Some of this data may be available as soon as next summer.

We will be flying over treated areas with unmanned aerial systems (UAS) to calculate canopy cover and spatial pattern using structure from motion modeling. Other components of the monitoring data will require time to mature and provide relevant information such as the response of the herbaceous layer in restored forests and the effect of changes in forest structure on MSO reproduction.

Our preliminary data on forest vegetation supports our understanding that mid-sized trees are overrepresented across the landscape while large trees and small trees are generally underrepresented. Forest canopy is far more continuous than historically occurred and forest pattern is less aggregated and heterogeneous than desired. In MSO protected activity centers designated for restoration, initial surveys indicate that occupancy is inconsistent. This is likely a reflection of the quality of the habitat. We hope that after restoration treatments are complete, the quality of the habitat will improve and the protected activity center will be more consistently occupied. Initial Rx burn treatments have

been completed in the MSO PACs and mechanical treatments are occurring in surveyed stands. Post treatment analysis will begin this next year.

Weaknesses:
Our monitoring process is vibrant and provides additional confidence to a highly engaged stakeholder group. However, the greatest shortcoming of this process is that it takes time to collect and properly interpret the data. There is a genuine and reasonable desire to swiftly integrate new information into an adaptive management framework, but the most important questions are frequently those that cannot be quickly answered. So we collect both short-term and longer term-data and combine it with the best available science to inform our decisions and adapt our approaches to management.

Monitoring Plan: Multi-Party Monitoring Plan

6. FY 2018 Agency performance measure accomplishments:

Performance Measure	Unit of measure	Total Units Accomplished	Total Treatment Cost ($) *(Contract Costs)*
Acres of forest vegetation established FOR-VEG-EST *Costs are total costs per bli based on locally derived average cost per acre of $55.00/acre across all bli's*	Acres	7,745	BLI ACRES COSTS CFLN 175 $9,625 NFMP 23 $1,265 NFTM 518 $28,490 NFXN 286 $15,737 RTRT 6,742 $370,836
Acres of forest vegetation improved FOR-VEG-IMP *Costs are total costs per bli based on locally derived average cost per acre of $75.00/acre across all bli's*	Acres	14,434	BLI ACRES COSTS BDBD 77 $5,775 CFLN 165 $12,353 CWKV 281 $21,075 NFHF 4,894 $367,013 NFTM 4,882 $366,150 NFXN 320 $23,963 NONE 1,024 $76,800 PTNR 5 $375 RTRT 5 $383 SPFH 27 $2,025 SRS2 140 $10,523 SSCC 1,100 $82,500 WFSU 1,515 $113,625
Manage noxious weeds and invasive plants INVPLT-NXWD-FED-AC *Costs are total costs per bli based on locally derived average cost per acre of $230.00/acre across all bli's*	Acre	1,343	BLI ACRES COSTS CFLN 831 $191,084 NFVW 513 $117,898
Highest priority acres treated for invasive terrestrial and aquatic species on NFS lands INVSPE-TERR-FED-AC	Acres	No data	No data

Performance Measure	Unit of measure	Total Units Accomplished	Total Treatment Cost ($) *(Contract Costs)*
Acres of water or soil resources protected, maintained or improved to achieve desired watershed conditions. S&W-RSRC-IMP *Costs are total costs per bli based on locally derived average cost per acre of $120.12/acre across all bli's*	Acres	50,121	BLI ACRES COSTS CFLN 4,807 $577,417 CWFS 722 $86,751 CWKV 139 $16,697 NFHF 30,762 $3,695,131 NFTM 5,270 $633,032 NFXN 2,150 $258,258 NONE 60 $7,207 RTRT 597 $71,712 WFHF 5,614 $674,329
Acres of lake habitat restored or enhanced HBT-ENH-LAK	Acres	No data	No data
Miles of stream habitat restored or enhanced HBT-ENH-STRM *Costs are total costs per bli based on locally derived average cost per acre of $130.76/mile across all bli's*	Miles	8.5	BLI MILES COSTS NFRG 0.7 $86 PTNR 7.3 $960 RBRB 0.5 $63
Acres of terrestrial habitat restored or enhanced HBT-ENH-TERR *Costs are total costs per bli based on locally derived average cost per acre of $236.34/acre across all bli's*	Acres	105,520	BLI ACRES COSTS CFLN 4,052 $957,710 CMTL 2 $544 CWFS 904 $213,557 NFHF 45,759 $10,814,574 NFRG 2,920 $690,078 NFRW 18 $4,194 NFTM 9,342 $2,207,829 NFVW 175 $41,360 NFWF 4,110 $971,347 NFXN 1,888 $446,224 PTNR 6,429 $1,519,405 RBRB 44 $10,452 RTRT 782 $184,748 SRS2 189 $44,643 WFHF 5,224 $1,234,593 WFSU 23,683 $5,597,240
Acres of rangeland vegetation improved RG-VEG-IMP *Costs are total costs per bli based on locally derived average cost per acre of $30.00/acre across all bli's*	Acres	39,224	BLI ACRES COSTS CWFS 1,335 $40,050 CWKV 59 $1,770 NFHF 6,960 $208,794 NFRG 11,425 $342,750 NFTM 4,652 $139,560 NFVW 2,329 $69,870 NFXF 51 $1,530 NFXN 2,552 $76,560 NONE 1,466 $43,980 SSCC 904 $27,120 WFSU 7,491 $224,730
Miles of high clearance system roads receiving maintenance RD-HC-MAIN	Miles	265.8	BLI MILES COSTS CMRD 148.0 $59,205

Performance Measure	Unit of measure	Total Units Accomplished	Total Treatment Cost ($) *(Contract Costs)*
Are total costs per bli based on locally derived average cost per acre of $400.00/mile across all bli's			NONE 117.8 $47,114
Miles of passenger car system roads receiving maintenance RD-PC-MAINT *Costs are total costs per bli based on locally derived average cost per acre of $2,000.00/mile across all bli's*	Miles	375.2	BLI MILES COSTS CMRD 365.0 $729,974 NONE 10.2 $20,491
Miles of road decommissioned RD-DECOM *Costs are total costs per bli based on locally derived average cost per acre of $1,000.00/mile across all bli's*	Miles	14.8[14]	BLI MILES COSTS CMRD 14.8 $14,799
Miles of passenger car system roads improved RD-PC-IMP *Costs are total costs per bli based on locally derived average cost per acre of $21,000.00/mile across all bli's*	Miles	38.3[15]	BLI MILES COSTS CMRD 38.3 $805,308
Miles of high clearance system road improved RD-HC-IMP *Costs are total costs per bli based on locally derived average cost per acre of $1,000.00/mile across all bli's*	Miles	14.2[16]	BLI MILES COSTS CMRD 14.2 $14,229
Road Storage	Miles	No data	No data
Number of stream crossings constructed or reconstructed to provide for aquatic organism passage STRM-CROS-MTG-STD	Number	No data	No data
Miles of system trail maintained to standard TL-MAINT-STD *Costs are total costs per bli based on locally derived average cost per acre of $3,100.00/mile across all bli's. Note NFRW is not an approved match bli and is not included in match funding displayed in the expenditures table above.*	Miles	203.1	BLI MILES COSTS NFRW 2.2 $6,783 PTNR 200.9 $622,840
Miles of system trail improved to standard TL-IMP-STD *Costs are total costs per bli based on locally derived average cost per acre of $11,300.00/mile across all bli's*	Miles	9.3	BLI MILES COSTS CMTL 0.4 $4,520 PTNR 8.9 $100,672
Miles of property line marked/maintained to standard LND-BL-MRK-MAINT	Miles	19.2[17]	BLI MILES COSTS LND-BL-MAINT-STD 7.5 $9,375 NFHF 0.8 $1,000

[14] Are non-system roads as reported in the WIT database and displayed in gPAS accomplishment report.
[15] Are RD-PC-RCNSTR miles as reported in INFRA database and displayed in gPAS accomplishment report.
[16] Are RD-HC-RCNSTR miles as reported in INFRA database and displayed in gPAS accomplishment report.
[17] Value is a combination of the LND-BL-MAINT-STD and LND-BL-MRK-STD accomplishments reported on the initiative gPAS final report

Performance Measure	Unit of measure	Total Units Accomplished	Total Treatment Cost ($) *(Contract Costs)*
Costs are total costs per bli based on locally derived average cost per acre of $1,250.00/mile across all bli's for LND-BL-MAINT-STD and average cost per acre of $10,000.00/mile across all bli's for LND-BL-MRK-STD			NFTM 6.7 $8,375 LND-BL-MRK-STD 11.7 $117,000 NFHF 3.7 $37,000 NFTM 4.6 $46,000 WFHF 3.4 $34,000
Acres of forestlands treated using timber sales TMBR-SALES-TRT-AC *Costs are total costs per bli based on locally derived average cost per acre of $135/acre across all bli's*	Acres	7,992	BLI ACRES COSTS CFLN 2,734 $369,052 NFHF 44 $5,978 NFTM 18 $2,430 NONE 2,715 $366,512 RTRT 10 $1,350 SSCC 2,471 $333,585
Volume of Timber Harvested TMBR-VOL-HVST	CCF	No data	No data
Volume of timber sold TMBR-VOL-SLD *Costs are total costs per bli based on locally derived average cost per acre of $62.02/CCF across all bli's*	CCF	180,863	BLI CCF COSTS CFLN 154,515 $9,583,015 NFTM 25,611 $1,588,417 SSSS 737 $45,706
Green tons from small diameter and low value trees removed from NFS lands and made available for bio-energy production BIO-NRG *No locally derived costs available. These costs are part of the TMBR-VOL-SOLD costs.*	Green tons	140,694	BLI Green Tons COSTS None 140,694 No data
Acres of hazardous fuels treated outside the wildland/urban interface (WUI) to reduce the risk of catastrophic wildland fire FP-FUELS-NON-WUI *Costs are total costs per bli based on locally derived average cost per acre of $105.00/acre across all bli's*	Acre	40,342	BLI ACRES COSTS CWFS 2,003 $210,263 NFHF 20,711 $2,174,603 NFTM 2,385 $250,425 NFXN 261 $27,353 NONE 2,159 $226,695 SPFH 312 $32,760 WFPR 1,198 $125,738 WFSU 11,315 $1,188,075
Acres of wildland/urban interface (WUI) high priority hazardous fuels treated to reduce the risk of catastrophic wildland fire FP-FUELS-WUI *Costs are total costs per bli based on locally derived average cost per acre of $210.00/acre across all bli's*	Acres	88,826	BLI ACRES COSTS CFLN 2,185 $458,850 CWFS 999 $209,685 CWKV 364 $76,440 NFHF 53,614 $11,258,898 NFTM 10,454 $2,195,340 NFXN 4 $840 NONE 5,244 $1,101,240 PTNR 1,238 $259,980 SPFH 437 $91,770 SSCC 2,290 $480,900 WFPR 999 $209,685 WFSU 10,999 $2,309,790

Performance Measure	Unit of measure	Total Units Accomplished	Total Treatment Cost ($) *(Contract Costs)*
Acres mitigated FP-FUELS-ALL-MIT-NFS *No locally derived costs available*	Acres	35,047[18]	BLI ACRES COSTS BDBD 5 CWFS 999 CWKV 164 NFHF 26,438 PTNR 5,028 SPFH 749 SSSS 136 WFPR 1,529
Please also include the acres of prescribed fire accomplished *Costs from locally derived costs for FP-FUELS WUI ($210.00/acre) and FP-FUELS NON-WUI ($105.00/acre) across all blis*	Acres	59,074[19]	BLI ACRES COSTS WUI CWFS 999 $209,685 WFHF 41,619 $8,739,990 WFPR 999 $209,685 NON-WUI CWFS 668 $70,088 NFHF 13,593 $1,427,265 WFPR 1,198 $125,738
Number of priority acres treated annually for invasive species on Federal lands SP-INVSPE-FED-AC	Acres	No data	No data
Number of priority acres treated annually for native pests on Federal lands SP-NATIVE-FED-AC	Acres	No data	No data

Units accomplished should match the accomplishments recorded in the Databases of Record.

7. **FY 2018 accomplishment narrative** – Summarize key accomplishments and evaluate project progress *not already described elsewhere* in this report. (Please limit answer to three pages.)

2018 saw another productive year, with the total footprint acres increasing by 104,325 acres (83,155 acres net footprint acres-see map below), with many of those acres coming from prescribed and wildfire acres. The total acres of fuels treatments within the Wildland Urban Interface (WUI) were 88, 826 acres, and fuels treatments within the non-WUI were 40,432 acres. Note that some acres have a duel fuels accomplishment so the total acres exceed the actual footprint for the project area.

Mechanical harvest treatment accomplishments were a mixed bag in 2018. The Forest Service continued the accelerated timber offerings outside of the 4FRI phase 1 contract on the east side (a total of 18,489 acres were offered and awarded on the Apache-Sitgreaves and Tonto National Forests to existing White Mountain industries). The west side of the project on the Coconino and Kaibab National Forests were very successful in preparing and offering 28,575 acres of contracts. However, multiple factors, including lack of markets for the offered products, led to eleven no bids on the west side of the project and only 6,714 acres awarded on the Coconino and Kaibab National Forests.

[18] From FACTS FP_FUELS_ALL_MIT_NFS report run November 10, 2018

[19] From FACTS FP-FUELS-WUI and FP-FUELS-NON-WUI report ran November 10, 2018 for activity codes 1111, 1112 and 1130

Overall, The pace and scale of preparation of timber sales has greatly increased in the last three years, primarily with the use of Designation by Prescription (D x P) on all sales since the authority to use of D x P was expanded with the passage of the 2014 Farm Bill. D x P has greatly decreased the time and costs pf sale preparation. The 4FRI forests have also used the shared resources concept in the timber arena as well. The timber arena also utilized IDIQ marking and layout contracts, as well as Enterprise personnel for sale layout to augment the existing personnel. The Four Forest were able to offer 46,422 acres of sales last year, the year before 32,514 acres offered. The main difference with being able to offer these additional acres was the over 14,000 acres of DxP that were in sales, compared to the 3,500 acres of D x P in sales in FY 2017. However, the lack of timber markets on the west side of the project (Kaibab and Coconino National Forests), resulted in 11 no bids and only 21,983 acres of contracts were awarded (see table below). Discussions with industry confirmed that the lack of a place to take the wood is the main reason for the no bids. There were two no bids on the Apache-Sitgreaves National Forest that were subsequently repackages and sold to the existing industry.

Looking to the future availability of restoration byproducts for industry, the Forest Service issued a second Request for Information (RFI) on a possible solicitation for a new long-term contract through FEDBIZOPS. The Forest Service and partners have synthesized the responses to the RFI and are putting together a New Request for Proposal in 2018/2019. Creating and stabilizing industry partners in a restoration economy will allow for the ability to get more acres treated through mechanical harvests, thus increasing forest resiliency across the initiative.

The partnership between the National Forest Foundation and Salt River Project, the Northern Arizona Forest Fund (NAFF) continued in FY 18. The NAFF provides an opportunity for Arizona businesses and residents to invest in restoration projects on national forest lands in the Salt and Verde River watersheds. During FY18, the NAFF contributed $345,000 to on-the-ground restoration in the 4FRI footprint in the Salt and Verde watersheds. Projects funded this year in the 4FRI footprint include the Long Valley Draw Restoration Project-Phase 2 on the Coconino National Forest, Rosilda Spring Restoration and Twin Springs Fuels Reduction Restoration Project on the Kaibab National Forest, and the Black River Stream and Riparian Protection Project on the Apache-Sitgreaves National Forest. A summary of these projects can be found at Northern Arizona Forest Fund. The NAFF increases the ability of the Forest Service to implement more restoration projects and increases resiliency across the landscape. This can also be a model for other collaborative to look at alternative funding sources to meet restoration goals.

Work continued on the 1.2 million acre Rim Country EIS that covers portions of the Coconino, Tonto and Apache-Sitgreaves National Forests. A draft Environmental Impact Statement is expected in early 2019. On the Apache-Sitgreaves NF, work has begun on the Black River Restoration Project EA that is expected to have a decision in late 2019 and the CC Cragin Watershed Restoration EA was were completed and signed in FY 2018.

2018 also provided opportunities for innovation across the landscape and tie those into the Forest Service's nationwide Forest Products Modernization process. The Ecological Restoration Institute hosted a 4FRI and Efficiencies two day workshop in Phoenix that brought together Forest Service leaders from the Washington office down to the individual forests to discuss efficiencies that are being tested in 4FRI landscape. There are nine specific items that are being tested in the 4FRI landscape that are tied to the Forest Products Modernization effort FPM share point site 4FRI learning journey. Many of these innovations are tied to The Nature Conservancy (TNC) Stewardship Agreement. The agreement is a laboratory for testing efficiencies and cost saving measures such as the digital prescription guide, lengthened time to leave wood in the forest before hauling (which will lower log haul cost), and different log accountability measures.

Volunteer work across the project area was strong again in 2018. The Arizona Elk Society again put together impressive numbers of volunteers and project accomplishments completing the second phase of the Long Valley Meadow Restoration project Arizona Elk Society Long Valley Draw Restoration. The Grand Canyon Trust continued to lead the

way in marshalling volunteers for citizen science projects using a phone app to gather ephemeral stream course and wet/dry stream course data across the Coconino Forests as well as gathering volunteers for the Rosilda Springs Restoration project. Trout Unlimited continued being a major contributor of volunteer hours to gather stream temperature monitoring data across the 4FRI footprint, primarily on the Apache-Sitgreaves and Tonto National Forests. In addition, Trout Unlimited volunteers provided the work force to plant woody riparian vegetation on the Black River Stream and Riparian Restoration Project on the Apache-Sitgreaves NF. The Friends of Northern Arizona Forests continue their impressive work providing the workforce to construct and maintain ungulate proof fencing around 70+ aspen or riparian areas on the Coconino National Forest. In addition to the work done on the 4FRI forests by FONAF, they were named by the *Arizona Daily Sun* as their organization of the year.

Tribal engagement was highlighted by two actions in FY 18. The Forest Service received a $25k grant through the Forest Service Citizen Science Competitive Funding Program to collaborate with NAU and southwestern tribes on the identification, documentation, and future management of culturally important plants within the 4FRI footprint. The intent of this project is to develop tools, and management recommendations that can be applied across the 4FRI project area. As this is the first year for the CFP program, this project will be highlighted as a pilot project to develop best management practices for future citizen science projects.

The Forest Service and the San Carlos Apache, Tonto Apache, White Mountain Apache and Zuni tribes have signed a Master Participating Agreement to partner on a wide range of restoration activities within the 4FRI footprint. Staff on all four forests have been discussing potential projects with tribes for some time, so implementation of the MPA will allow each unit to move forward on developing forest-level SPA's to implement these projects.

Finally, 4FRI hosted many outreach activities. During the first week of October, 4FRI hosted two separate groups to highlight the accomplishments and challenges with implementing the largest Forest restoration project in the country. The Eastern Arizona Counties Organization (EACO) hosted state and local elected officials in a tour of the eastern portion of 4FRI. At the same time, 4FRI hosted a national review of the CFLRP program from Forest Service leadership. Never one to not take advantage of spreading the word, both parties met in Payson for BBQ lunch sponsored by EACO. The first week in May also brought the Federal Timber Purchasers Committee to Flagstaff with a highlighted section on the challenges of implementing mechanical treatments

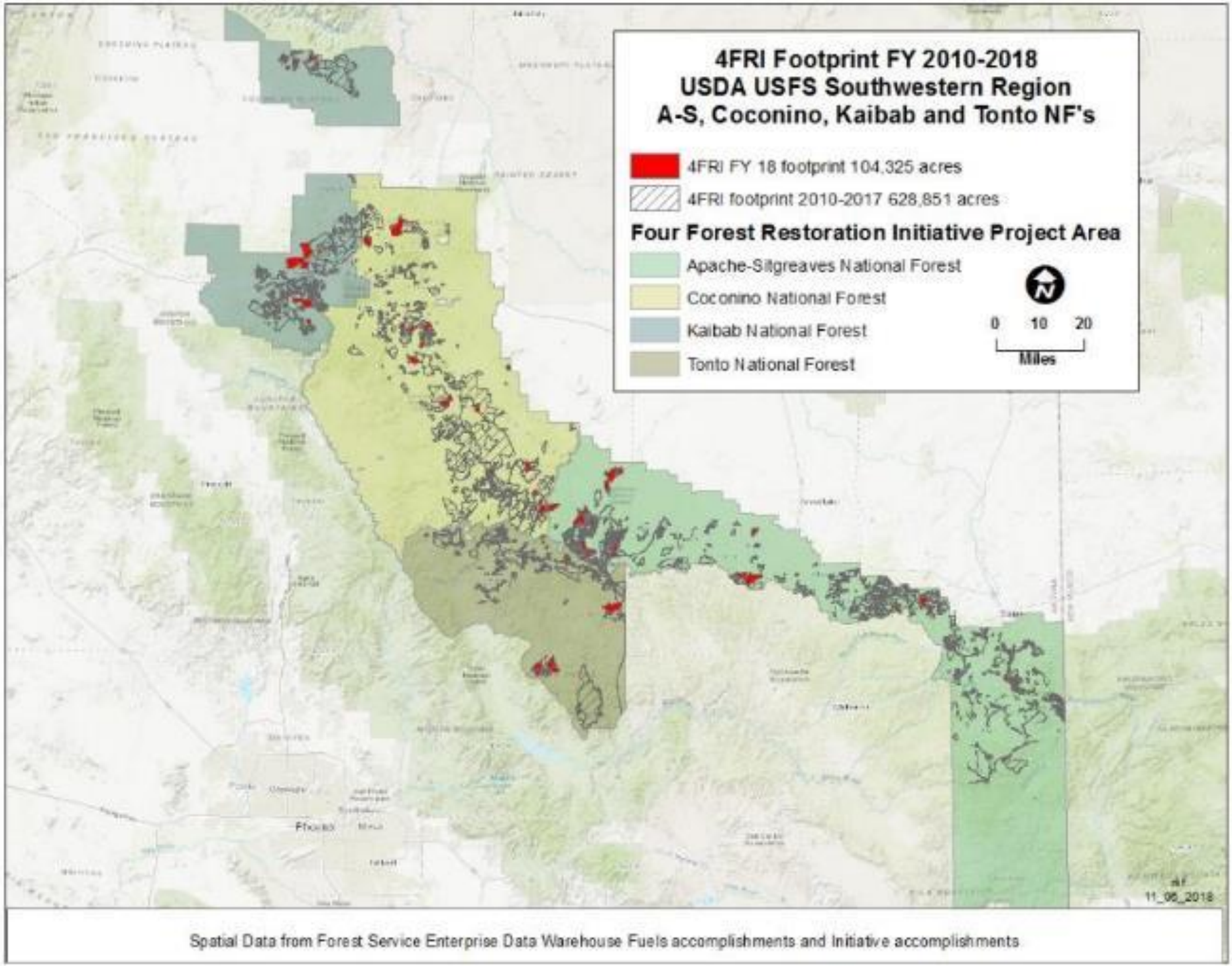
8. **The WO (EDW) will use spatial data provided in the databases of record to estimate a treatment footprint for your review and verification**.

- **If the gPAS spatial information does NOT appear accurate**, describe the total acres treated in the course of the CFLR project below (cumulative footprint acres; not a cumulative total of performance accomplishments). What was the total number of acres treated? Total number of acres treated were 104,325 acres in FY 2018.

Fiscal Year	Footprint of Acres Treated (without counting an acre of treatment on the land in more than one treatment category)
FY 2010	75,255
FY 2011	57,684
FY 2012	37,079
FY 2013	46,655
FY 2014	84,841
FY 2015	84,997
FY 2016	144,443
FY 2017	124,320
FY 2018	104,325[20]
Estimated Cumulative Footprint of Acres (2010 or 2012 through 2018)	712,006

If you did not use the EDW estimate, please briefly describe how you arrived at the total number of footprint acres: what approach did you use to calculate the footprint? The EDW process appeared to severely under report that acres accomplished for 4FRI, especially given the gPAS accomplishment report had over 126,000 acres of FP-FUELS accomplishment and EDW estimated 41,127 acres of footprint. To explore this apparent under reporting, 4FRI utilized a GIS exercise to check the EDW output. The process selected all the timber harvest FACTS activity codes that were tagged as CFLRP accomplishments that were displayed as accomplished (contract awarded) and all fuels related FACTS activity codes that were shown as completed in FY 2018 and all non-commercial thinning that was shown as accomplished in FY 2018 (contract awarded for TSI). This last item likely is under reporting any force account TSI, but there is no clean way to do that using FACTS activity codes with planned and accomplished. These outputs were unioned together and then dissolved to get the footprint acres.

[20] Net treatment acres are 83,155 acres. There are 21,170 acres that were treated on areas that have had previous 4FRI treatment.


4FRI Footprint FY 2010-2018
USDA USFS Southwestern Region
A-S, Coconino, Kaibab and Tonto NF's
4FRI FY 18 footprint 104,325 acres
4FRI footprint 2010-2017 628,851 acres
Four Forest Restoration Initiative Project Area
Apache-Sitgreaves National Forest
Coconino National Forest
Kaibab National Forest
Tonto National Forest
N
0 10 20
Miles
11_06_2018
Spatial Data from Forest Service Enterprise Data Warehouse Fuels accomplishments and Initiative accomplishments

9. **Describe any reasons that the FY 2018 annual report does not reflect your project proposal, previously reported planned accomplishments, or work plan.** Did you face any unexpected challenges this year that caused you to change what was outlined in your proposal? (Please limit answer to two pages).

The lack of timber markets on the west side of the project led to 11 not bids that limited our ability to get to our TMBR-VOL-SOLD and BIO-NRG goals. Had we successfully sold all of the sales, we would have reported 356,000 CCF and 320,000 Green tons of biomass.

Performance Measure	Unit	FY 18 goal	FY 18 actual
Volume of timber sold (CCF)	CCF	339,652	180,863
Green tons from small diameter and low value trees removed from NFS lands and made available for bio-energy production	Green tons	315,000	140,694

10. Planned FY 2019 Accomplishments

4FRI expects there outputs to be the same as the planned FY 19 outputs. We have met early in FY 19 with industry to try and resolve the no bid situation that occurred in FY 18.

11. **Planned accomplishment narrative and justification if planned FY 2019 accomplishments and/or funding differs from CFLRP project work plan** (no more than 1 page): No difference is expected from the planned to what is expected to be completed.

12. **Please include an up to date list of the members of your collaborative if it has changed from previous years**. If the information is available online, you can simply include the hyperlink here. If you have engaged new collaborative members this year, please provide a brief description of their engagement.

The membership has stayed the same since FY 17 report.

Organization Name	Organization Name
Apache County	Arizona Elk Society
Arizona Game and Fish Department	Arizona State Forestry
Arizona Wildlife Federation	Bejac Corp
Campbell Global	Canyon Creek Logging
Center for Biological Diversity	Coconino County Board of Supervisors
Coconino Natural Resources Conservation District	Coconino Rural Environment Corps
Eastern Arizona Counties Organization	Ecological Restoration Institute
Empire Machinery	Flagstaff Fire Department
Grand Canyon Trust	Forest Energy Corporation
Great Old Broads for Wilderness	Gila County
Greater Flagstaff Forest Partnership	Greenlee County
Navajo County and Natural Resources Working Group	Mottek Consulting
Northern Arizona University Forest Ecosystem Restoration Analysis	Navajo County
Northland Pioneer College	Northern Arizona Loggers Association
Novo Star Wood Products	Northern Arizona Wood Products Association
Pine Strawberry Fuel Reduction Inc. Pioneer Forest Products	Novo BioPower

Organization Name	Organization Name
Real Arizona Development Corridor	Southwest Forest Little Colorado NRCD
The Nature Conservancy	Southwest Forestry Inc.
Tri Star Logging Inc.	Town of Pinetop - Lakeside
U.S. Fish and Wildlife Service	Town of Snowflake
University of Arizona Cooperative Extension	TRACKS
White Mountain Stewardship - Monitoring Board	Trout Unlimited
White Mountain Conservation League	Governor's Forest Health Council
Wildwood Consulting	Life in the Forest

13. **Media recap**. Please share with us any hyperlinks to videos, newspaper articles, press releases, scholarly works, and photos of your project in the media that you have available. You are welcome to include links or to copy/paste.

MEDIA

Arizona Republic new plan October 14 2017 - Link

Arizona Daily Sun October 25 2017 - Link

Cal Joyner speaking, Arizona, Future Forest Project, Nature Conservancy thinning project, digital tablets: Link

White Mountain Independent Nov 7, 2017 - Link

Arizona Elk Society Long valley Meadow - Link

SRP donates $400K to support TNC's Future Forests Project - Link

Large prescribed burn produces smoke - Link

Smoke from prescribed burn causes air quality issues - Link

Forest Service plan would return unauthorized dirt roads to forest - Link

USFS plans to undo unauthorized dirt roads near Flagstaff - Link

Prescribed burning to start Monday - Link

Controlled burns generate a pall of smoke - Link

Victorine Prescribed Burn Project Starts Today - Link

Arizona utility regulators explore forest biomass - Link

Tree thinning tackles Ponderosa pines to lessen wildfire danger - Link

Tour of chimney springs and grand canyon forest products - Link

FoNAF organization of the year - Link

Dry winter stressing Flagstaff's ponderosa trees - Link

With biomass energy, weighing forest restoration and carbon emissions - Link

Good news for spotted owls – and thinning projects - Link

Op-Ed A way to break the terrifying pattern of fire and flood - Link

KNAU earth Notes inaturalist - Link

Flagstaff-area forest thinning falters - Link

Taking a chance on industry changes - Link

FLAGSTAFF WATERSHED PROTECTION PROJECT -- City: $10 million bond not enough to cover Flagstaff forest thinning - Link

Our View: Better oversight needed on forest projects spending city's money - Link

Forest Service puts new 4FRI large-scale forest thinning contract on hold - Link

Thinning the Forest, Part 1: Prescription - Link

Part 2: Economics - Link

Controlled burns reduce dangers of wildfire smoke - Link

Cultivating regional forest industries - Link

A NORTHERN ARIZONA FOREST FUND SUCCESS STORY – THE CASE OF BANFIELD AND SNAKE RIDGE FIRES, AND CONNECTING WATER AND POWER - Link

Two steps forward, one step back at restored spring south of Flagstaff - Link

Ready to burn official prepare for big fire season in Flagstaff - Link

Getting Ready: Catastrophic Wildfire in the American West ~ An Interview with Jeff Whitney - Link

Our View: Time to get serious about fire season and close the forests - Link

In Flagstaff, restoring forests to prevent fire and disaster - Link

Arizona's forests are being ravaged by climate change. How much can we save? - Link

Plan Finalized for Thinning Forest Near Payson, Over One Group's Objections - Link

Tree thinning begins near Sechrist Elementary - Link

New Perkins Fire near Williams helps forest restoration - Link

VIDEOS

Restoring the West conference: If the trees don't pay for restoration, what will

Link

Restoring the West conference: I The Challenges and Successes of the Nation's Largest Collaborative Restoration Project

Four Forest Restoration Initiative, CFLRP Annual Report: 2018
Link

Restoring the West conference: Embracing Partnership and Realizing the Co-benefits of Collaboration - Link

Restoring the West conference: Forest Restoration in Northern Arizona - Link

ACE thinning in FWPP - Link

Fire and water video - Link

Long Valley Draw video - Link

JOURNAL ARTICLES and PUBLICATIONS
Strategies for success under forest service restoration initiatives - Link

Changes in potential wildland fire suppression costs due to restoration treatments in Northern Arizona Ponderosa pine forests. Forest Policy and Economics Volume 87, February 2018, Pages 101-114. Link

Accelerating Workshop and Implementation workshop fact sheet - Link

Accelerating Workshop and Implementation workshop - Link

Social perspectives on the use of reference conditions in restoration of fire-adapted forest landscapes - Link

Visions of Restoration in Fire-Adapted Forest Landscapes: Lessons from the Collaborative Forest Landscape Restoration Program - Link

Journal Articles

Fitch, R.A., Y.S. Kim, A.E.M. Waltz, and J.E. Crouse. 2018. Changes in potential wildland fire suppression costs due to restoration treatments in northern Arizona ponderosa pine forests. *Forest Policy and Economics*, 87: 101–114.

With growing concern over wildfire suppression costs, this analysis addresses restoration treatment effectiveness in reducing wildfire suppression costs. Researchers found that more comprehensive treatments are more effective in reducing wildfire suppression costs, except in the case of severe wind and weather events.

Fitch, R.A., and Y.S. Kim. 2018. Incorporating ecosystem health and fire resilience within the unified economic model of fire program analysis. *Ecological Economics*, 149: 98-104.

Researchers tested a wildfire economic model and marginal analysis that can help land managers determine threshold states to transition the landscape toward fire program optimization.

Goodrich, B.A., Waring, K.M., Auty, A. and A.J. Sánchez Meador. 2018. Interactions of management and white pine blister rust on *Pinus strobiformis*regeneration abundance in southwestern United States. *Forestry*, https://doi.org/10.1093/forestry/cpy009.

This paper examined southwestern white pine (SWWP) regeneration across six mountain ranges. Researchers

recommend silviculture treatments that reduce basal area to historical ranges and leave large canopy openings to enhance natural SWWP regeneration.

Han, H.-S., A. Jacobson, E.M. Bilek, J. Sessions. 2018. Waste to wisdom: Utilizing forest residues for the production of bioenergy and biobased products. *Applied Engineering in Agriculture*, Vol. 34(1): 5–10.

The Waste to Wisdom project was part of the Biomass Research and Development Initiative and funded by the Department of Energy. An interdisciplinary research team worked together to examine feedstock development, biomass conversion technologies, and the financial and environmental benefits of using forest residues for the production of bioenergy and biobased products.

Kizha, R., H.-S. Han, J. Paulson, and A. Koirala. 2018. Strategies for reducing moisture content in forest residues at the harvest site. Applied Engineering in Agriculture, Vol. 34(1): 25–33.

The goal of this study was to develop strategies for reducing biomass moisture content by evaluating different arrangement patterns of forest residues and their effect on moisture content reduction at the harvest site.

Woo, H., and H.-S. Han. 2018. Performance of screening biomass feedstocks using star and deck screen machines. *Applied Engineering in Agriculture*, Vol. 34(1): 35–42.

This paper compares productivity and effectiveness of star screener and deck screeners in separating chipped and ground material, the most commonly traded forms of biomass energy feedstock. Particle size distribution of these feedstocks is a key characteristic that affects efficient feedstock handling and biomass conversion.

Fact Sheets

Huffman, D.W. 2018. Restoration Benefits of Re-Entry with Resource Objective Wildfire on a Ponderosa Pine Landscape in Northern Arizona. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.

Researchers tested the assertion that restoration objectives could be met incrementally by allowing repeated, low-severity fires to reburn sites. Findings suggest that managing wildfires to allow for more moderate severity burning with a single entry may be more effective for restoring ponderosa pine forests than repeated, low-severity entries.

Laughlin, D.C. 2018. Using Trait-Based Ecology to Restore Resilient Ecosystems. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.

This fact sheet summarizes a study that compared restoration prescriptions based on historical reference conditions of forest assemblages to those based on traits of well-adapted species. To restore resilient ecosystems, practitioners can select species with favorable trait combinations to reduce mortality risk under changing environmental conditions.

Owen, S. 2017. Spatial Patterns of Ponderosa Pine Regeneration in High-Severity Burn Patches. ERI Fact Sheet. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.

This study examined spatial patterns of ponderosa pine regeneration, and interactions with sprouting species near live forest edges and the interiors of high-severity burn patches. An important implication is that managers may want to take a "wait and see" approach to monitor natural regeneration over time before replanting in some areas.

Rodman, K. 2018. Reference Conditions Are Influenced by the Physical Template and Vary by Forest Type. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.

Researchers investigated the abiotic factors that may have led to variation in the natural ranges of variation on 33 stem-mapped sites in Arizona and New Mexico. Results show that variability was an inherent component of ponderosa pine-dominated forests and that knowledge of growth conditions and abiotic factors on a site can be helpful to localize historical forest conditions in an area.

Working Papers

Huffman, D.W., J.D. Springer, and J.E. Crouse. 2018. Reference Conditions and Restoration of Transitional Ponderosa Pine Forests in the Southwest. ERI Working Paper No. 38. Ecological Restoration Institute, Northern Arizona University. 14 p.

ERI researchers reviewed and summarized available literature to describe pre-Euro-American fire regimes, historical forest structure, and impacts of settlement on ponderosa pine forests associated with interior chaparral and Madrean evergreen woodland biotic communities. Published studies found an increase in understory shrubs in forests where frequent surface fire has been excluded.

West-Wide

The ERI partnered with Dr. Alan Ager at the Rocky Mountain Research Station (RMRS) to translate and facilitate the use of an All-Lands Wildfire Risk and Transmission Framework in Arizona. The goals were to introduce a cross-boundary wildfire risk model, initiate conversations around multi-jurisdictional planning and coordination, and facilitate an all-lands approach to wildfire risk reduction. We held a well-attended All-Lands workshop in Prescott and a roundtable in Flagstaff to present this work, which was conducted in close collaboration with RMRS and the Arizona Department of Forestry and Fire Management.

Forest Projects

As part of the Kaibab National Forest's (KNF) Forest Plan, the ERI partnered with KNF to collect rapid plot data for

forest plan monitoring in an effort to move toward desired conditions and support adaptive management. Our objectives were to collect baseline data on current stand conditions, use pre-settlement evidence to inform the natural range of variability, and aid land managers' understanding of landscape-level conditions. We developed recommendations for incorporating partner data into Forest Service corporate databases, integrating forest-level monitoring with regional monitoring efforts, and identified opportunities for engaging partner and citizen science.

Signatures:

Recommended by Project Coordinator: _/s/ Dick Fleishman_____

Approved by Apache-Sitgreaves Forest Supervisor: __/s/ Steve Best__

Approved by Coconino Forest Supervisor: __/s/__Laura Jo West_____

Approved by Kaibab Forest Supervisor: __/s/_Heather Provencio_____

Approved by Tonto Forest Supervisor: __/s/ Neil Bosworth_____

Draft reviewed by (collaborative chair or representative): _____