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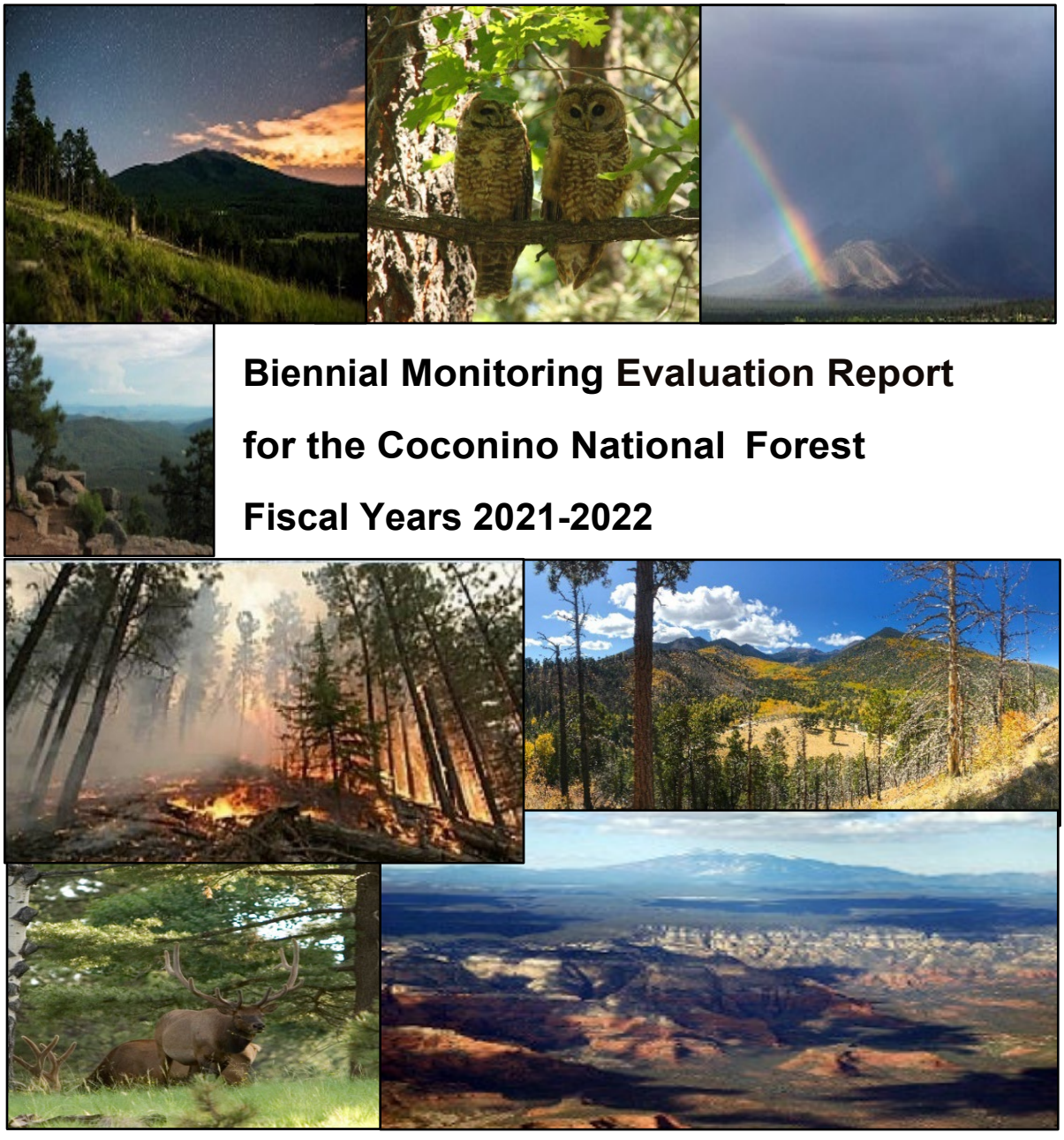

Biennial Monitoring Evaluation Report for the Coconino National Forest Fiscal Years 2021-2022

Forest Service

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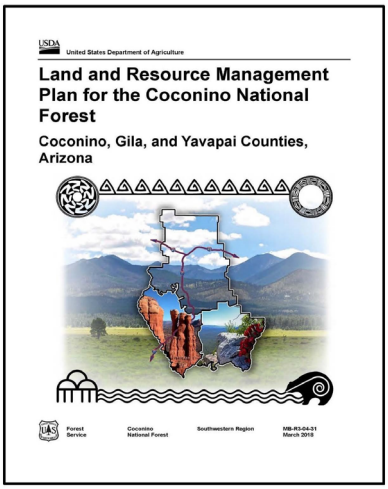
About the Coconino's Plan Monitoring Program

Purpose

The purpose of this Biennial Monitoring Evaluation Report is to inform the public, partners, stakeholders, other government agencies, and tribes of the completed and ongoing monitoring of forest plan implementation activities in the Coconino National Forest. The monitoring results presented in this report help the Forest Supervisor determine whether a change is needed in forest plan direction, plan components, or other plan content that guide management of resources in the Coconino National Forest. The Biennial Monitoring Evaluation Report represents one part of the Forest Service's overall monitoring program for this national forest. It is not a decision document. It evaluates monitoring questions and indicators presented in Chapter 5, Monitoring Strategy, of the revised Coconino Forest Plan (2018), and reports on the results of monitoring of management actions carried out in the forest.



The Coconino monitoring plan addresses the following topics. The specific monitoring questions for these topics are in Table 1 below (Coconino NF plan monitoring questions (Revised Coconino Forest Plan, pp. 203-208)).

- Air quality
- Visibility in Class I Areas
- Grasslands
- Reducing uncharacteristic fire in fire-adapted ecosystems
- Improving stream riparian areas and wetlands
- Restoring riparian function to springs
- Water rights, surface water
- Incidence/abundance of aquatic invasive species and invasive plants
- Extent of insect and pathogen outbreaks
- Water quality, priority watersheds
- Long-term soil productivity
- Threatened, endangered, or proposed species
- Focal species (songbirds)
- Habitat diversity (early seral (aspen))
- Recreation opportunities, scenic integrity
- Changes causing issues and requiring plan amendments
- Progress toward meeting plan objectives
- Monitoring partnerships

Objectives

- Monitor how the forest plan is applied with project activities.
- Evaluate monitoring data for indicators of trends of or effects on forest resources, and how well plan implementation is moving forest resources toward desired conditions.
- Document and report the results of completed forest plan implementation, monitoring, and evaluation (this monitoring evaluation report).
- Document scheduled monitoring that has not been completed and the reasons and rationale why.
- Present recommended change opportunities to the responsible official.
- Through a management review of the monitoring evaluation report by the Forest Supervisor, determine if any changes are needed in monitoring indicators or methods, management actions, or forest plan management direction.

Table 1. Coconino NF Plan Monitoring Questions (Revised Coconino Forest Plan, pp. 203-208)

Question Number	Question	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability[1]
1	What is the contribution of forest management to air quality in the three smoke management units that overlap the Coconino NF (Colorado River airshed, Little Colorado River airshed, Verde River airshed) when there are exceedances of State of Arizona's air quality standards? Scale: Greater than forestwide	**Metric:** Various, depending on pollutant. **Source:** Data from any Arizona Department of Environmental Quality (ADEQ) air quality monitoring station in the three smoke management units that overlap the forest. **Evaluation:** Forest activities that relate to air quality on day of exceedance.	Information is collected by ADEQ daily.	A
2	What is the contribution of forest management to visibility within the Sycamore Wilderness and Mazatzal Wilderness Class I Areas when there are exceedances of the Regional Haze Implementation Plan? Scale: Greater than forestwide	**Metric:** Various, depending on pollutant. **Source:** Data from IMPROVE[2] program (Environmental Protection Agency air quality monitoring stations at Ike's Backbone and Sycamore Canyon). **Evaluation:** forest activities that relate to visibility on day of exceedance.	Weekly	A
3	How much have management activities contributed to maintaining or making progress toward DCs related to vegetation structure for the Semi-desert Grassland, Pinyon Juniper with Grass, Great Basin Grassland, and Montane/Subalpine Grassland ERUs?	**Metric:** Acres of vegetation treated in each ERU. **Source:** Database of record such as FACTS[3] database (Forest Activity Tracking System).	Annually	A
4	Are downed logs and snags falling within the ranges established in desired conditions for Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs?	**Metric:** Frequency of snags and downed logs. Source: Field data and database of record such as FACTS.	3 to 5 years	A
5	Are tree densities within forested areas falling within the basal area ranges established in the desired conditions for Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs?	**Metric:** Basal area. **Source:** Field data and database of record such as FACTS.	3 to 5 years	A

Question Number	Question	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability[1]
6	How much have management activities contributed to reducing the risk of uncharacteristic fire?	**Metric:** acres mechanically treated, acres of prescribed fire, acres of wildfire for resource objectives. **Source:** Database of record such as FACTS.	Annually	A
7	How much have management activities contributed to returning fire to fire-adapted ecosystems?	**Metric:** acres of prescribed fire and acres of wildfire managed for resource objectives that maintain or move towards desired conditions in the forest plan. **Source:** Database of record such as FACTS.	Annually	A
8	How much have management activities improved functional-at-risk or nonfunctional stream riparian areas and wetlands?	**Metric:** acres/miles of functional-at-risk or nonfunctional stream riparian areas improved and number and acres of functional-at-risk or nonfunctional wetlands improved. **Source:** Database of record such as WIT[4] database (Watershed Improvement Tracking).	Annually	A, B
9	How much have management activities contributed to the restoration of riparian function to springs not in proper functioning condition?	**Metric:** number of springs improved or restored. **Source:** Database of record such as WIT.	Annually	A
10	How many water rights have been procured or how many water rights filings have been done?	**Metric:** number of water rights procured or filings completed **Source:** USDA Forest Service Water Rights and Uses (WRU) database and Arizona Department of Water Resources	Annually	A
11	What are surface water trends for Oak Creek, Wet Beaver Creek, and Fossil Creek?	**Metric:** annual mean discharge and peak streamflow **Source:** U.S. Geological Survey Gaging Stations	Annually	A
12	How much have management activities contributed to reducing the incidence or abundance of aquatic	**Metric:** miles of streams and acres of lakes, ponds, or wetlands with non-native species	Annually	A, B

Question Number	Question	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability[1]
	invasive species?	removal or are affected by a fish barrier or other structure. Number of new populations of aquatic invasive species. **Source:** surveys and reports, including from partner agencies and organizations (such as Fossil Creek native fish annual monitoring report); information from State and Federal agencies on new populations of aquatic invasive species.		
13	How much have management activities contributed toward reducing the incidence or abundance of invasive plants?	**Metric:** Acres of invasive plants treated. **Source:** Database of record such as FACTS.	Annually	A
14	To what extent are undesirable outbreaks of insects and pathogens occurring on the forest? (1982 Planning Rule (sec. 219.12(k)(5)(iv))	**Metric:** acres of damage or mortality. **Source:** Forest Health and Condition Report, Southwestern Region.	Annually	A, B
15	How much have implemented projects and soil best management practices contributed to protecting soil, reducing accelerated erosion, reducing soil compaction, and maintaining soil and nutrient cycling thus maintaining long term soil productivity?	**Metric**: Acres of implemented projects that maintain or trend toward satisfactory soil condition. Acres and number of projects where BMP implementation was effective at protecting soil productivity. **Source:** Field data from a sample of implemented projects on the forest (soil condition and soil productivity), including implemented BMPs.	Every 3 to 5 yrs for soil condition assessments. Annually for BMP implementation.	B
16	Have management activities contributed to impairment of warm water or cold water streams based on aquatic macroinvertebrate metrics? Aquatic macroinvertebrates are an ecological indicator of water quality.	**Metric:** Streams added to or removed from ADEQ's impaired or non-attaining list. **Source:** ADEQ 305(b) reports.	Every 3 years.	A
17	Have management activities contributed to the delisting and improvement of impaired waters, or	**Metric:** number of streams or lakes removed or added to ADEQ's impaired or non- attaining	Every 3 years	A

Question Number	Question	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability[1]
	waters non-attaining Arizona water quality standards?	list. **Source:** ADEQ 305(b) reports.		
18	How much have management activities contributed to maintaining or moving towards desired conditions of functioning properly for priority 6th code watersheds identified in the watershed condition assessment?	**Metric:** Acres of watershed maintenance or restoration activities and acres of vegetation treatments within priority 6th code watersheds. Name and number of 6th code watersheds that have moved to an improved class. **Source:** In forestwide WCATT (Watershed Condition Assessment Tracking Tool) and database of record such as FACTS.	Every 3 to 5 years	A
19	A. How much have management activities improved habitat for aquatic and riparian-dependent threatened, endangered, or proposed species (related to question 8)? B. How much have management activities contributed to reducing the incidence or abundance of aquatic invasive species in habitat for threatened, endangered or proposed species (related to question 10)?	**A. Metric:** acres/miles of functional-at-risk or nonfunctional stream riparian areas improved and number and acres of functional-at-risk or nonfunctional wetlands improved as related to threatened, endangered, and proposed species habitat. **A. Source:** Database of record such as WIT database. **B. Metric:** miles of streams and acres of lakes, ponds, or wetlands with non-native species removal or are affected by a fish barrier or other structure. **B. Source:** project files for structures completed. **B. Metric:** Number of new populations of aquatic invasive species. **B. Source**: surveys and reports, including from partner agencies and organizations (such as Fossil Creek native fish annual monitoring report); information from State and Federal agencies on new populations of aquatic	Annually	B

Question Number	Question	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability[1]
		invasive species.		
20	What is the status of the three songbirds identified as focal species (Grace's warbler, black-throated gray warbler, and juniper titmouse)?	**Metric:** Trends in occupancy (proportion of grid cells occupied across the forest) and density (birds per square kilometer) for each species. To monitor local populations and infer changes from restoration treatments, changes in cells/routes that had restoration treatments could be compared to untreated cells. **Source:** Bird Conservatory of the Rockies (BCOR) Integrated Monitoring in Bird Conservation Regions (IMBCR) data; state bird monitoring and long-standing bird monitoring data sets such as the Christmas Bird Count and Breeding Bird Surveys.	3 to 5 years	A
21	A. How much have management activities contributed to returning fire to Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs? B. Are plan components guiding fuels reduction and forest restoration activities maintaining the suite of late-seral ecological conditions within mixed conifer and pine-oak habitats that contribute to stable or increasing MSO populations?	**A. Metric:** Acres mechanically treated, acres of prescribed fire, acres of wildfire for resource objectives. **A. Source:** Field data and database of record such as FACTS. **B. Metric:** Acres of change in late seral mixed conifer and pine-oak habitats. **B. Source:** Best available remote sensing data (satellite, land cover databases) to measure change in acres. Results from Monitoring Questions 4, 5, and 6.	5 to 10 years	A, B
22	How much have management activities contributed to maintaining or moving toward desired conditions for aspen? Aspen is an ecological indicator of habitat diversity, and early seral stages in the following ERUs: Mixed Conifer with Infrequent	**Metric:** Acres of aspen protected or maintained. **Source:** Database of record such as FACTS database.	Annually	A

Question Number	Question	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability[1]
	Fire, Mixed Conifer with Frequent Fire, Spruce-Fir, and in localized areas in Ponderosa Pine.			
23	Have areas classified as unsuited for timber production become suitable? (sec. 219.12(k)(5)(ii))	**Metric:** Acres of suitable timber. Method: Reapply timber suitability criteria and process. **Source:** TimCo (Timber code) Forest Service database	Every 10 years	A
24	Are forests and woodlands adequately restocked within 5 years of final harvest treatment when openings are created for the purpose of regeneration? (sec. 219.12(k)(5)(i)	**Metric:** Percentage of area adequately restocked. **Source:** Review annual reforestation needs report, stocking certifications, silvicultural prescriptions, and FACTS database.	1 to 5 years	A, B
25	Should maximum size limits of 40 acres for even-aged management harvest areas be continued? (sec. 219.12(k)(5)(iii)), 219.27 (d)(2)	**Metric:** Percentage of harvest units that exceed 40 acres for even-aged management. **Source:** FACTS database.	1 to 5 years	A, B
26	How many new recreation opportunities have been added to the system?	**Metric:** Number of new facilities. Number of miles and type of new trails provided. **Source:** INFRA[5] database	Every 5 years	A
27	How many recreation sites or locations have been improved, relocated, or decommissioned in response to known resource damage?	**Metric:** Number of facilities or dispersed sites. **Source:** INFRA database, PALS (Planning, Appeals, Litigation System) Forest Service database	Every 5 years	A
28	How much have management activities contributed to progress toward scenic integrity desired conditions in areas identified as needing rehabilitation?	**Metric:** Percentage of acres that have been thinned and burned and that improved (by at least one level) areas identified as needing rehabilitation. **Source:** FACTS database, Scenery Management – Scenic Integrity Objectives Rehabilitation Map (map14) included with the plan, and other areas identified by scenery resource specialists as needing rehabilitation.	Annually	A, B

Question Number	Question	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability[1]
29	Have there been changes that have resulted in unforeseen issues requiring plan amendments? (sec. 219.12(k))	**Metric:** Number, type, and content of plan amendments. **Source:** database of record for number, type, and content of plan amendments.	Annually	B
30	How do actual accomplishments compare with plan objectives? (sec. 219.12(k)(1))	**Metric:** Various, as described in plan objectives. **Source:** database of record for the various accomplishments, such as: FACTS, INFRA, PALS, and WIT databases.	Annually	B

[1] Data Precision and Reliability: An indication of how rigorous the information used to evaluate the monitoring question is with respect to repeatability, reliability, accuracy, and precision. Two categories of precision and reliability are appropriate at the plan scale, and because of varying methods and data sources used to evaluate the monitoring question, both classes may be indicated. Classes of precision and reliability, however, are not meant to identify which methods and data sources may be most appropriate to answer the monitoring question.

- Class A: Methods that are generally well-accepted for modeling or quantitative measurement. Results have a high degree of repeatability, reliability, accuracy, and precision.
- Class B: Methods or measurements that are based on project records, personal communications, ocular estimates, pace transects, informal visitor surveys, and similar types of assessments. The degree of repeatability, reliability, accuracy, and precision are not as high as Class A methods, but they still provide valuable information.

[2] The Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring program was established in 1985 to aid the creation of Federal and State implementation plans for the protection of visibility in Class I areas (156 national parks and wilderness areas) as stipulated in the 1977 amendments to the Clean Air Act.

[3] FACTS refers to the Forest Activity Tracking System database that is part of the Natural Resource Manager's (NRM) system of database tools for managing agency data across the Forest Service. It is an activity tracking application for all levels of the Forest Service. The application allows tracking and monitoring of National Environmental Policy Act (NEPA) decisions as well as the ability to create and manage Knutson-Vandenberg (KV) trust fund plans at the timber sale level.

[4] WIT refers to the Watershed Improvement Tracking database that is part of the NRM system of database tools for managing agency data across the Forest Service. WIT manages data, observations and planning details about sites that need to be (or have been) restored or improved with the intent of benefiting watershed and aquatic ecosystem health and function. The application is a watershed restoration activity tracker that addresses site conditions, administrative plans and actions, and outcomes.

[5] INFRA refers to the Infrastructure database that is part of the NRM system of database tools for managing agency data across the Forest Service.

Summary

Monitoring was completed in 2021 and 2022 to address the following topics in the Coconino's Monitoring Plan, covering 26 of the 30 monitoring questions. The results and recommendations from this monitoring are described in this 2023 Biennial Monitoring Evaluation Report for the Coconino National Forest. This report documents recommendations as to whether a change to the Forest Plan or a change to the monitoring program is warranted based on new information, whether a new assessment may be needed, or whether there is no need for change at this time.

- Air quality (Monitoring Question 1)
- Visibility in Class I Areas (Monitoring Question 2)
- Grasslands (Monitoring Question 3)
- Downed logs, snags, tree densities in Frequent Fire ERUs (Monitoring Questions 4 and 5)
- Reducing uncharacteristic fire in fire-adapted ecosystems (Monitoring Questions 6 and 7)
- Improving stream riparian areas and wetlands (Monitoring Question 8)
- Restoring riparian function to springs (Monitoring Question 9)
- Water rights, surface water (Monitoring Questions 10 and 11)
- Incidence/abundance of aquatic invasive species and invasive plants (Monitoring Questions 12 and 13)
- Extent of insect and pathogen outbreaks (Monitoring Question 14)
- Long-term soil productivity (Monitoring Question 15a)
- Protecting soil productivity (Monitoring Question 15b)
- Water quality, priority watersheds (Monitoring Questions 16, 17, and 18)
- Aquatic and riparian-dependent threatened, endangered, or proposed species (Monitoring Question 19)
- Focal species (Monitoring Question 20)
- Habitat diversity (early seral (aspen)) (Monitoring Question 22)
- Recreation opportunities (Monitoring Questions 26 and 27)
- Scenic integrity (Monitoring Question 28)
- Changes causing issues and requiring plan amendments (Monitoring Question 29)
- Progress toward meeting plan objectives (Monitoring Question 30)

Monitoring for the following topics/monitoring questions will be reported in the 2025 or later Biennial Monitoring Evaluation Reports for the Coconino, as their monitoring frequency is greater than five (5) years or the forest does not yet have monitoring results for them.

- Habitat diversity (late seral) (Monitoring Question 21)
- Suitability for timber production, adequate regeneration, maximum size of even-aged management (Monitoring Questions 23, 24, and 25)

Monitoring results show that, in general, project activities implemented per the revised forest plan have moved forest resources toward desired conditions for those resources. As of this

reporting, there are no resource areas monitored for which a Forest Plan amendment needs to be considered to change the existing management direction or the monitoring strategy.

An amendment that will be completed in the next year is to incorporate the new management direction for the Fossil Creek Designated Wild and Scenic River Special Area, as well as make the boundary adjustments to that special area and the Designated Fossil Springs Botanical Area. This is an amendment analyzed and approved in the Fossil Creek Comprehensive River Management Plan (CRMP) Final Environmental Impact Statement and Record of Decision. Another foreseen forest plan amendment in the years to come is to evaluate adding management direction for the San Francisco Peaks Traditional Cultural Property. Both of these amendments are described in more detail in the Amendments and Objectives section of this report.

There are seven (7) resource areas for which management activities may need to be increased or concentrated to better meet forest plan objectives, namely grasslands, maple habitat, ponderosa pine and mixed conifer forest, wetlands, and springs, and soils. Forest plan objectives, to what extent they were met in the first five years of the current 10-year planning period, and recommendations to fully meet them, for these resources are listed in the Amendments and Objectives section.

Table 2 summarizes the results of evaluating the monitoring questions covered in this report. It displays if the monitoring metrics gathered are in accord with forest plan direction and if changes to plan direction, management activities, or the plan monitoring program should be considered.

Table 2. Number of Evaluated Monitoring Questions Resulting in Adaptive Management Recommendations

	Yes	Unsure	No
Forest Plan direction met	26	0	0
Change to Forest Plan warranted	0	0	26
Additional management activities recommended	9	0	17
Additional monitoring recommended	6	0	20
Change to Plan monitoring program warranted	0	1	25

Table 3 summarizes the findings of this report for each of the plan monitoring questions evaluated in the resource sections.

Table 3. Summary of Findings by Plan Monitoring Question

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
1. What is the contribution of forest management to air quality in the three smoke management units that overlap the Coconino NF (Colorado River airshed, Little Colorado River airshed, Verde River airshed) when there are exceedances of State of Arizona's air quality standards? Scale: Greater than forestwide	**Yes.** No notices of exceedance were sent to the forest during the 2021 and 2022 fiscal years. None of the forest management activities, including prescribed burns and unplanned ignitions, resulted in concerns for the air quality in the three local airsheds monitored.	**None**	Continue to coordinate with the Arizona Department of Environmental Quality (ADEQ) in the monitoring of the Colorado River, Little Colorado River, and Verde River airsheds.
2. What is the contribution of forest management to visibility within the Sycamore Wilderness and Mazatzal Wilderness Class I Areas when there are exceedances of the Regional Haze Implementation Plan? Scale: Greater than forestwide	**Yes.** None of the forest management activities, including prescribed burns and unplanned ignitions, resulted in concerns for visibility in the Sycamore Wilderness and Mazatzal Wilderness Class I Areas monitored.	**None**	Continue to coordinate with the Environmental Protection Agency in the IMPROVE monitoring program stations at Ike's Backbone and Sycamore Canyon.
3. How much have management activities contributed to maintaining or making progress toward DCs related to vegetation structure for the Semi-desert Grassland, Pinyon Juniper with Grass, Great Basin Grassland, and Montane/Subalpine Grassland ERUs?	**Yes.** Mechanical and prescribed fire treatments implemented, as well as the wildfire occurring, in these grassland ERUs have maintained or made progress toward desired conditions.	Increase management activities.	Continue to implement mechanical, fire, and invasives treatments to restore and improve grasslands, and consider ways to successfully treat more Great Basin and Montane/Subalpine grasslands. Restore or improve about 6,600 acres of Great Basin Grasslands, and 4,300 acres of Montane/Subalpine Grasslands in FYs 2023 to 2028.
4. Are downed logs and snags falling within the ranges established in desired conditions for Ponderosa Pine and	**Yes.** Snags, downed logs, and coarse woody debris are generally maintained and representative of the species within each ERU. Follow-up prescribed	Improve monitoring.	The data for Monitoring Question 4 need to be gathered and analyzed in a

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
Mixed Conifer with Frequent Fire ERUs?	burns often create additional snags and future downed logs. Coarse woody debris, including downed logs, generally range from 3 to 10 tons per acre.		coordinated way in order to respond to these forest plan monitoring questions more precisely in the next BMER.
5. Are tree densities within forested areas falling within the basal area ranges established in the desired conditions for Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs?	**Yes.** Thinning prescriptions specify basal area targets that are well within the desired conditions as described in the Forest Plan. Tree density within forested areas is generally reduced to range from 22 to 89 square feet of basal area per acre in the ponderosa pine ERU.	Improve monitoring.	The data for Monitoring Question 5 need to be gathered and analyzed in a coordinated way in order to respond to these forest plan monitoring questions more precisely in the next BMER.
6. How much have management activities contributed to reducing the risk of uncharacteristic fire?	**Yes.** The mechanical and prescribed fire treatments implemented, as well as wildfires managed to meet resource objectives, in all forest ERUs during these two fiscal years have reduced the risk of uncharacteristic fire by: • Reducing fuel loads and tree densities on over 81,280 acres of the forest. • Using prescribed fire after mechanical treatments. • Managing wildfires for resource objectives and restoring fire return intervals.	Increase management activities.	Use prescribed fire on about 82,970 acres of the Ponderosa Pine ERU and about 7,280 acres of the Mixed Conifer ERUs in FYs 2023 to 2028).
7. How much have management activities contributed to returning fire to fire-adapted ecosystems?	**Yes.** The mechanical and prescribed fire treatments implemented, as well as wildfires managed to meet resource objectives, in all forest ERUs during these two fiscal years have helped return fire to these fire-adapted ecosystems by: • Increasing fire treatments to achieve and/or maintain composition, structure, and function of fire-adapted ERUs. • Using prescribed fire after mechanical treatments. • Managing wildfires for resource objectives and restoring fire return intervals	Increase management activities.	Use prescribed fire on at least 82,970 acres of the Ponderosa Pine ERU and at least 7,280 acres of the Mixed Conifer ERUs in FYs 2023 to 2028).
8. How much have management activities improved functional-at-risk or nonfunctional stream riparian areas and	**Yes.** Implemented management activities have improved functional-at-risk or nonfunctional stream riparian areas and wetlands by: • Stabilizing active headcuts using loose rock	Increase management activities.	Restore two (2) more forest wetlands, in FYs 2023 to 2028.

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
wetlands?	structures. • Improving soil water infiltration and storage. • Addressing channel incision with gully stabilization treatments. • Improving vegetation establishment and robustness along streambanks and around springs. • Increasing the wetted area with stabilization treatments. • Fencing to protect springs, their sources, and their cultural values from degradation. • Reducing invasive plants (see Invasives, Insects, and Disease section). • Making progress in meeting forest plan objectives for Riparian Forest Types, Wetlands, Springs, and Soils (see the Plan Amendments/Objectives section).		
9. How much have management activities contributed to the restoration of riparian function to springs not in proper functioning condition?	**Yes.** Implemented management activities have contributed to the restoration of riparian function to springs not in proper functioning condition by: • Maintaining or improving native riparian vegetation around springs. • Protecting springs, their sources, and their cultural values from degradation. • Reducing invasive plants. In riparian and spring areas treated, protective vegetative ground cover is increasing, and soil productivity and function is improving.	Increase management activities.	Restore the riparian function of 12 springs in FYs 2023 to 2028.
10. How many water rights have been procured or how many water rights filings have been done?	**Yes.** No new water rights were procured; however, approximately 110 new surface water rights claims were filed in the Lower Little Colorado Basin.in 2021. The Coconino employed a 3-person American Conservation Experience (ACE) crew to complete field verification and data collection on water rights, including stock tanks, springs, and water systems	**None**	N/A

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
	requiring new surface water claims. The crew visited approximately 50 sites in 2022 to prepare for new surface water claims and statements of claimants in the Verde Water Rights Adjudication.		
11. What are surface water trends for Oak Creek, Wet Beaver Creek, and Fossil Creek?	**Yes.** In these two fiscal years, average annual discharges measured ranged from the lowest in 13 years to higher than four of those years for Fossil Creek; and from higher than 19% of the years on record to higher than 41% of the years on record for Oak and Wet Beaver Creeks.	Additional assessment.	Assessing an additional streamflow metric such as baseflow may provide a better response to this monitoring question.
12. How much have management activities contributed to reducing the incidence or abundance of aquatic invasive species?	**Yes.** The management activities implemented in streams, lakes, ponds, or wetlands have contributed to reducing the incidence or abundance of aquatic invasive species. The number of new populations of aquatic invasive species remained very low (only one) in FYs 2021 and 2022. These management activities, as well as continued monitoring of non-native fish populations, have reduced aquatic invasive species by: • Removing non-native fish to improve the survival and success of reintroduced populations of native fish. • Reducing predation and competition from aquatic invasive species, and threats to the sustainability of listed species such as the Chiricahua leopard frog.	**None**	N/A
13. How much have management activities contributed toward reducing the incidence or abundance of invasive plants?	**Yes.** An integrated approach to treating identified populations of invasive plants has moved forest ERUs toward their desired conditions. The number of new populations of invasive species remained low to moderate in FYs 2021 and 2022. These invasive populations were identified, inventoried, and referenced with the Coconino's Invasive Plant List, which categorizes species based on abundance and aggressiveness of spread. and treatments were designed and implemented to stop their spread and	**None**	N/A

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
	eliminate them.		
14. To what extent are undesirable outbreaks of insects and pathogens occurring on the forest? (1982 Planning Rule (sec. 219.12(k)(5)(iv))	**Yes.** Acres of damage or mortality from insects and disease varied but remained in the tens of thousands of acres during FYs 2021 and 2022.	Increase management activities.	Address the thousands of acres with damage or mortality from insect and disease outbreaks (245,120 acres in FYs 2021 and 2022). During project planning each year, address those forest stands affected by these outbreaks. This increased susceptibility to insect and disease should be addressed with additional mechanical thinning and fire treatments to return stands to healthier reference conditions.
15. How much have implemented projects and soil best management practices [BMPs] contributed to protecting soil, reducing accelerated erosion, reducing soil compaction, and maintaining soil and nutrient cycling thus maintaining long term soil productivity (soil condition assessments)?	**Yes.** In riparian areas treated, protective vegetative ground cover is increasing, and soil productivity and function is improving. Compaction and erosion is reduced.	Increase BMP monitoring, soil condition assessments.	There was a lack of BMP monitoring in FYs 2021 and 2022. The Coconino recognizes the need to address this monitoring requirement and the Watershed Program is committed to resuming BMP monitoring in the FY 2023 and 2024 monitoring cycles, planning to complete 14 BMP evaluations.
16. Have management activities contributed to impairment of warm water or cold water streams based on aquatic macroinvertebrate metrics? Aquatic macroinvertebrates are an ecological indicator of water quality.	**Yes.** Macroinvertebrate surveys and metrics do not show impairment of water quality in streams. No forest streams have been added to ADEQ's impaired or non-attaining list.	**None**	Continue annual macroinvertebrate surveys with ADEQ.
17. Have management activities	**Yes.** No forest lakes or streams have been removed	**None**	N/A

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
contributed to the delisting and improvement of impaired waters, or waters non-attaining Arizona water quality standards?	from or added to ADEQ's impaired or non- attaining list.		
18. How much have management activities contributed to maintaining or moving towards desired conditions of functioning properly for priority 6th code watersheds identified in the watershed condition assessment?	**Yes.** Watershed restoration work continued in the Coconino's three existing priority watersheds designated under the National Watershed Condition Framework (WCF): Fossil Creek, and Middle and Lower Oak Creek, with the goal of improving watershed conditions.	Reassess watershed conditions, prioritize restoration.	The Coconino plans to re-assess watershed condition in the next monitoring cycle, targeting subwatersheds that have experienced fires and other large scale treatments, as well as subwatersheds in the Verde Basin as part of the Friends of the Verde River's watershed report card process. The Coconino also plans to designate the Upper and Lower Lake Mary and Walnut Canyon subwater-sheds as priority 6th code watersheds, and develop a WRAP to plan and prioritize restoration to improve watershed conditions.
19. A. How much have management activities improved habitat for aquatic and riparian-dependent threatened, endangered, or proposed species (related to question 8)? B. How much have management activities contributed to reducing the incidence or abundance of aquatic invasive species in habitat for threatened, endangered or proposed species (related to question 10)?	**Yes.** Management activities implemented have improved habitat for aquatic and riparian-dependent threatened, endangered, or proposed species by: • Maintaining or improving native riparian vegetation along streambanks and around springs. • Reducing riparian fragmentation, the threat of excessive sedimentation, soil compaction, water quality concerns, and vegetation damage from dispersed recreation. • Reducing the threat of uncharacteristic wildfire. • Reducing invasive plants. • Protecting springs and their sources from degradation.	Increase management activities	Restore another two miles of stream habitat in FYs 2023 to 2028.

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
	• Making progress in meeting forest plan objectives for Riparian Forest Types, Wetlands, and Springs. In riparian and spring areas treated, protective vegetative ground cover is increasing. The number of new populations of aquatic invasive species remained very low (only one) in FYs 2021 and 2022. Management activities, as well as continued monitoring of non-native fish populations, have reduced aquatic invasive species by: • Removing non-native fish to improve the survival and success of reintroduced populations of native fish. • Reducing predation and competition from aquatic invasive species, and threats to the sustainability of listed species such as the Chiricahua leopard frog.		
20. What is the status of the three songbirds identified as focal species (Grace's warbler, black-throated gray warbler, and juniper titmouse)?	**Yes.** Density and occupancy for the three songbird focal species remained relatively stable through FY 2022 with only minor fluctuations occurring (no more than a three percent change).	**None**	Continue pre-treatment/base-line monitoring. Investigate ways to better address the comparisons between treated and untreated survey areas in monitoring for focal species.
22. How much have management activities contributed to maintaining or moving toward desired conditions for aspen? Aspen is an ecological indicator of habitat diversity, and early seral stages in the following ERUs: Mixed Conifer with Infrequent Fire, Mixed Conifer with Frequent Fire, Spruce-Fir, and in localized areas in Ponderosa Pine.	**Yes.** The management activities implemented to restore, protect, and maintain aspen have contributed to habitat diversity and early seral stages in forest ERUs. Aspen was regenerated and protected with planting and fencing, released with conifer weeding and maintenance treatments, and treated for oystershell scale. Aspen restoration on the Flagstaff Ranger District is making great progress and on target to meet forest plan objectives.	Increase management activities	Continue the great progress being made to restore aspen on the forest. Consider restoration activities that promote regeneration, remove competing vegetation, or remove disturbances that could negatively impact maple habitat in FYs 2023 to 2028.

Monitoring Question (covered in this biennial report)	Progress toward Desired Conditions Using Plan Direction?	Type of Change Recommended	Recommendation
26. How many new recreation opportunities have been added to the system?	**Yes.** The Coconino constructed a new trailhead, replaced 16 toilets at various campgrounds and day-use sites, made improvements at a visitor center to address deferred maintenance concerns, constructed and designated eight new dispersed camping areas, temporarily closed a day-use site for public health and safety purposes, made improvements at an OHV area, and constructed 12.1 new miles of trail.	Develop a recreation monitoring program.	The forest should consider developing a recreation monitoring program to inform future management decisions. This could include monitoring of motorized and non-motorized trails, wilderness management, developed and dispersed recreation sites, and winter sports.
27. How many recreation sites or locations have been improved, relocated, or decommissioned in response to known resource damage?	**Yes.** The Coconino improved or temporarily closed 17 recreational facilities. OC WRAP has and continues to remove unauthorized parking areas, remove or harden social trails, decommission unauthorized motorized routes, develop recreation sites to minimize high-use impacts, and improve aquatic organism passage.	**None**	N/A
28. How much have management activities contributed to progress toward scenic integrity desired conditions in areas identified as needing rehabilitation?	**Yes.** In the first five years of this planning period, the Coconino has met the objective for scenic resources, rehabilitating approximately 26,840 acres in the three SIO Rehabilitation Levels.	**None**	N/A
29. Have there been changes that have resulted in unforeseen issues requiring plan amendments? (sec. 219.12(k))	**Yes.** One amendment is needed to the Forest Plan, to add the specific management direction for the Fossil Creek Wild and Scenic River.	**None**	N/A
30. How do actual accomplishments compare with plan objectives? (sec. 219.12(k)(1))	**Yes.** The Coconino has made great progress in meeting plan objectives. See Recommendations in the Plan Amendments, Objectives section.	Increase management activities.	Eight (8) recommendations made to fully meet plan objectives in the first 10-year planning period. See by monitoring question in this table and in the Plan Amendments, Objectives section.

Forest Supervisor's Certification

This report documents the results of monitoring activities in Fiscal Year (FY) 2021 and FY 2022 on the Coconino National Forest. The monitoring frequency for some of the forest plan monitoring questions is longer than the five years since the Coconino Forest Plan was revised. Evaluation of monitoring data for those monitoring question topics will be included in later editions of this biennial report.

The Coconino National Forest recognizes the value of citizen science in engaging stakeholders and augmenting monitoring and existing data collection programs. Monitoring and data collection and analysis by partners is extensive and adds a great deal to the Coconino's community of knowledge about ecosystem restoration. With the help of engaged tribes, other agencies, partners, and stakeholders, the Coconino continues to share data and monitor forest resources per the forest monitoring plan. Monitoring by partners is included in this report by resource section. With the help of tribes, other agencies, partners, and stakeholders engaged with the forest, the Coconino continues to share data and monitor forest resources per the Coconino's Monitoring Plan.

I have evaluated the monitoring and evaluation results presented in this report and endorse them. I have found that there are no recommended changes to the management direction or monitoring strategy in the 2018 Revised Coconino Forest Plan at this time. There are, however, some recommendations as a result of these findings that management activities increase for some of the resources identified in the plan monitoring questions. There is also a need to increase monitoring of some resources to better respond to those questions. I therefore consider the Coconino Forest Plan sufficient to continue to guide land and resource management of the Coconino National Forest for the foreseeable future, and plan a deeper examination of any recommended changes with forest leadership and resource specialists. This Biennial Monitoring Evaluation Report is posted on the forest website and available for public review here: https://www.fs.usda.gov/land/coconino/landmanagement.

July 30, 2024

AARON W. MAYVILLE
Forest Supervisor
Coconino National Forest

Date

Air Quality and Visibility

The first two monitoring questions in the Coconino Forest Plan require monitoring for air quality and visibility.

1. What is the contribution of forest management to air quality in the three smoke management units that overlap the Coconino NF (Colorado River airshed, Little Colorado River airshed, Verde River airshed) when there are exceedances of State of Arizona's air quality standards?
2. What is the contribution of forest management to visibility within the Sycamore Wilderness and Mazatzal Wilderness Class I Areas when there are exceedances of the Regional Haze Implementation Plan?

Air Quality

There are three smoke management units that overlap the Coconino National Forest, the Colorado River, Little Colorado River, and Verde River airsheds. Air quality data are collected daily by Arizona Department of Environmental Quality (ADEQ) air quality monitoring stations in these airsheds and determine if there are any exceedances of State of Arizona's air quality standards for any pollutant measured. Forest managers receive notice of any exceedance and evaluate if it is related to any forest management activities being implemented on the forest.

Results: No notices of exceedance were sent to the Coconino National Forest during the 2021 or 2022 fiscal years. This reflects that none of the forest's management activities, including prescribed burns and unplanned ignitions, resulted in concerns for the air quality in the three local airsheds monitored.

Partners in Air Quality Monitoring

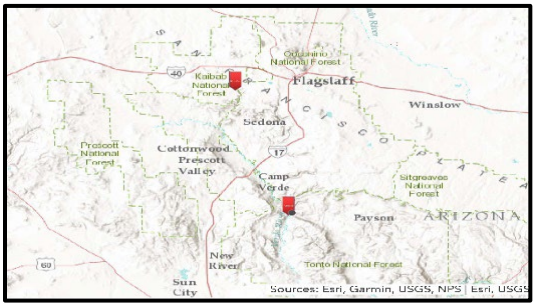
- Friends of the Forest – reading air quality monitors.

Visibility

The Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring program was established in 1985 to aid the creation of Federal and State implementation plans for the protection of visibility in Class I areas (156 national parks and wilderness areas) as stipulated in the 1977 amendments to the Clean Air Act. The Environmental Protection Agency's air quality monitoring stations at Ike's Backbone and Sycamore Canyon are part of the IMPROVE monitoring program. These stations collect data within the Sycamore Wilderness and Mazatzal

Wilderness Class I Areas and determine when there are exceedances of the Regional Haze Implementation Plan (The Regional Haze Plan | ADEQ Arizona Department of Environmental Quality (azdeq.gov)).

The Regional Haze Program relies upon the haze index to track two different trends: visibility on the haziest days annually and on the clearest days annually. The haziest days are also compared to a national visibility goal of no manmade impairment by 2064:

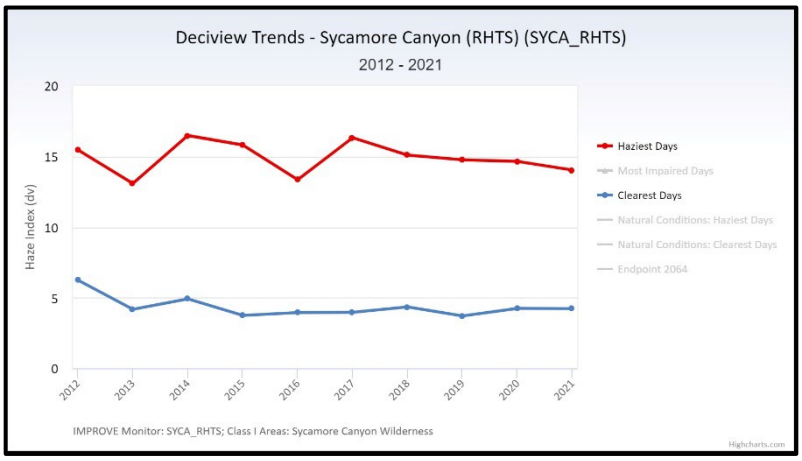


Location of the Sycamore Canyon and Ike's Backbone IMPROVE Monitors

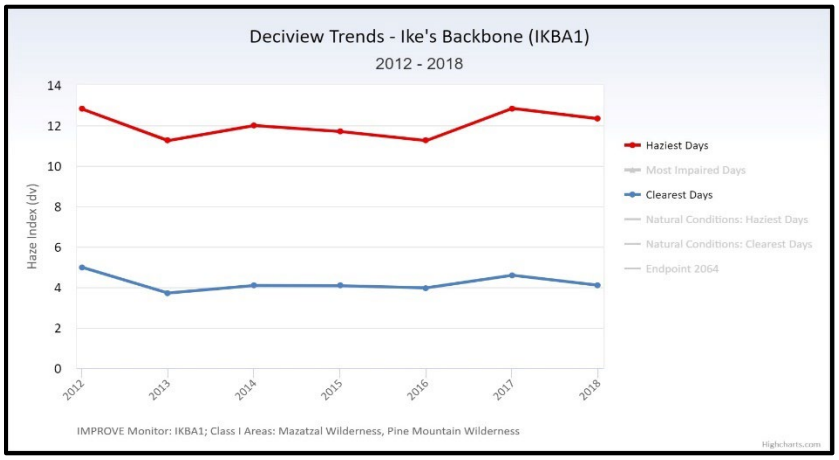
The prevention of any future, and the remedying of any existing impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution. (Section 169A) (Arizona Regional Haze State Implementation Plan Under Section 308 of Federal Regional Haze Rule (azdeq.gov), Chapter I, p. 4).

Sections 169A and 169B of the Clean Air Act were promulgated by Congress in the 1990 Clean Air Act Amendments with the intent of preventing any future, and remedying any existing, impairment of visibility caused by manmade sources in 156 mandatory Class I areas. Through this requirement, Congress set the goal of achieving natural visibility conditions in the Class I areas by 2064. In the interim, States are required to make reasonable progress towards the achievement of this national goal (ibid., Appendix D, p. 3).

Results: The following graphs show the trends in visibility over the last ten years, from 2010 through 2019, as measured by the Sycamore Canyon and Ike's Backbone IMPROVE monitors. The haze index has a unit of measure called a deciview and a one unit change in deciview may be noticeable under certain conditions. Higher deciview values correspond to hazier scenes.



The annual average haze index value collected by the Sycamore Canyon IMPROVE monitor on the haziest days from 2012 to 2021 ranged from a minimum of approximately 13.1 in 2013 to a maximum of approximately 16.3 in 2014. This same value collected on the clearest days at the Sycamore Canyon IMPROVE monitor ranged from a maximum of 6.2 in 2012 to a minimum of 3.7 in both 2015 and 2019.



The annual average haze index value collected by the Ike's Backbone IMPROVE monitor on the haziest days from 2012 to 2018 (data only to 2018 on website) ranged from a minimum of 11.3 in 2016 to a maximum of 13.5 in both 2012 and 2017. This same value collected on the clearest days at the Ike's Backbone IMPROVE monitor ranged from a maximum of 5.0 in 2012 to a minimum of 3.7 in 2013.
The trend for visibility for the last ten years of collection has been slightly downward on the haziest days for Sycamore Canyon (0.16 dv/yr) and flat for Ike's Backbone (0.007 dv/yr), neither considered a significant trend. The trend for visibility has been slightly downward on the clearest days for Sycamore Canyon (0.05 dv/yr) and flat for Ike's Backbone (0.003 dv/yr).

Forest managers receive notice of any exceedance and evaluate if it is related to any forest management activities being implemented on the forest. No notices of exceedance were sent to the Coconino National Forest during the 2021 or 2022 fiscal years. This reflects that none of the forest management activities, including prescribed burns and unplanned ignitions, resulted in concerns for visibility in the Sycamore Wilderness and Mazatzal Wilderness Class I Areas monitored.

Recommendations

Based on these results, the Coconino is not considering any changes to the direction for Air Quality or Visibility in the revised Coconino Forest plan. The forest will continue to coordinate with the Arizona Department of Environmental Quality (ADEQ) in the monitoring of the Colorado River, Little Colorado River, and Verde River airsheds, and continue to coordinate with the Environmental Protection Agency in the IMPROVE monitoring program stations at Ike's Backbone and Sycamore Canyon.

Grasslands

The purpose of Monitoring Question 3 is to determine the status and trend of the grassland ecological restoration units (ERUs) found on the Coconino National Forest: Semi-desert Grassland, Pinyon Juniper with Grass, Great Basin Grassland, and Montane/Subalpine Grassland.

3. How much have management activities contributed to maintaining or making progress toward DCs related to vegetation structure for the Semi-desert Grassland, Pinyon Juniper with Grass, Great Basin Grassland, and Montane/Subalpine Grassland ERUs?

Management activities in these grasslands are designed to maintain or make progress toward the desired conditions (DCs) related to vegetation structure for these grasslands, and are reported in the Forest Activity Tracking System (FACTS) database.

Monitoring Results

The acres of treatments implemented in these grasslands in FYs 2021 and 2022 are listed in Table 5 by fiscal year. The mechanical treatments implemented in these three fiscal years include group selection harvest, precommercial and commercial thinning, and chipping of fuels. The fire treatments implemented include prescribed broadcast burning, burning of piled material, and jackpot burning, as well as wildfire (natural ignition). The treatments to reduce invasives include pesticide application, mechanical/physical removal, and biocontrol methods.

Table 5. Acres of Management Activities in Grassland ERUs in FYs2021 and 2022

Grassland ERU Treatments	FY2021	FY2022	2-year Total for ERU
Semi-Desert Grassland			
Mechanical	0	0	**0**
Rx Fire	0	0	**0**
Wildfire (Natural Ignition)	5,090	0	**5,090**
Invasives	4	0	**4**

Grassland ERU Treatments	FY2021	FY2022	2-year Total for ERU
Pinyon Juniper with Grass			
Mechanical	6	1	**7**
Rx Fire	279	1	**280**
Wildfire (Natural Ignition)	4,843	0	**4,843**
Invasives	12	60	**72**
Great Basin Grassland			
Mechanical	276	1,240	**1,516**
Rx Fire	0	0	**0**
Wildfire (Natural Ignition)	889	0	**889**
Invasives	2	1	**3**
Montane/Subalpine Grassland			
Mechanical	244	324	**568**
Rx Fire	81	126	**207**
Wildfire (Natural Ignition)	19	0	**19**
Invasives	24	2	**26**
Total for FY	**11,769**	**1,755**	**13,524**

*Acre totals are approximate due to overlapping treatments in some areas (multiple treatments on the same acres).

Partners in Grasslands Monitoring

Partners with the Coconino in monitoring grasslands include the Friends of the Forest for pronghorn and game inventories, and the 4FRI MPMB for pronghorn habitat connectivity modeling.

Four Forest Restoration Initiative (4FRI) Multi-party Monitoring Board (MPMB)

Pronghorn habitat connectivity modeling has been conducted to answer the question of how restoration treatments affect habitat connectivity for grassland species. The 4FRI MPMB and Forest Service partnered with Northern Arizona University in 2019 in using pronghorn collar data from 1995 to 2017 to model pre-treatment habitat quality and landscape migration permeability. Among other findings, the study identified certain constrictive "pinch points" or bottleneck areas that exhibit high pronghorn movement among high quality habitat areas and that would be good candidates for treatments to reduce tree cover and improve near-ground visibility for pronghorn (Anderson and Dickson 2019). And that treatments in areas of high topographic diversity may have less benefit to pronghorn than similar treatments in flat areas. This can help the forest prioritize where to implement grassland treatments.

The mechanical and prescribed fire treatments implemented, as well as the wildfire occurring, in these grassland ERUs have maintained or made progress toward desired conditions by:

- Reducing the canopy cover of trees and shrubs to less than 10%.
- Increasing the regeneration of native grasses, forbs, and annuals.
- Increasing the diversity of vegetation that provides food and cover for invertebrates and wildlife.

Recommendations

Based on these results, the Coconino is not considering any changes to the direction for Grassland ERUs in the revised Coconino Forest Plan. The forest will continue to implement mechanical, fire, and invasives treatments to restore and improve grasslands, and consider ways to successfully treat more Great Basin and Montane/Subalpine grasslands. Though restoration work is planned each year, seasonal and scheduled grazing, clearance from specialists, and workforce limitations can hinder implementation. Suppression activities for large wildfires can be and have been used to aid implementation of restoration treatments. For example, fire lines used in suppressing wildfires can be left in place to help with future prescribed burn treatments. Forest Service wildlife biologists will continue to work with the 4FRI MPMB and Northern Arizona University to design treatments in grassland ERUs that will benefit pronghorn and other grassland species.

Fire-adapted Ecosystems

Monitoring Questions 6 and 7 address reducing the amount of uncharacteristic fire in fire-adapted ecosystems, and returning fire to fire-adapted ecosystems.

6. How much have management activities contributed to reducing the risk of uncharacteristic fire?
7. How much have management activities contributed to returning fire to fire-adapted ecosystems?

The acres of prescribed fire and acres of wildfire managed for resource objectives that are implemented to maintain or move towards desired conditions in these ecosystems are reported in the Forest Activity Tracking System (FACTS) database.

Monitoring Results

The following table summarizes the mechanical, prescribed fire, and wildfire treatments that were completed in fiscal years (FYs) 2021 and 2022. The different types of these treatments are reported in the FACTS database as listed. Both "Wildfire – Natural Ignition" and "Planned Treatment Burned in Wildfire" reported in the FACTS database represent acres of wildfire that moved the vegetation toward desired conditions.

Table 6. Acres of Mechanical and Fire Treatments Completed in FYs 2021 and 2022

Treatment	FY 2021	FY 2022	2-year Total
Group Selection Cut (UA/RH/FH)/Commercial Thin	2,807	1,913	**4,720**
Precommercial Thin/Tree Encroachment Control	476	1,433	**1,909**
Thinning for Hazardous Fuels Reduction	0	64	**64**
Tree Release and Weed	25	6	**31**
Total Acres Mechanically Treated	**3,308**	**3,416**	**6,724**
Broadcast Burning	5,145	2,801	**7,946**
Burning of Piled Material	992	596	**1,588**
Total Acres Prescribed Fire	**6,137**	**3,397**	**9,534**
Wildfire (Natural Ignition) for Resource Objectives	65,023	0	**65,023**
Total Acres of Fire	**71,160**	**3,397**	**74,557**
Total Acres of Treatments	**74,468**	**6,813**	**81,281**

*Acre totals are approximate due to overlapping treatments in some areas (multiple treatments on the same acres).

Partners in Fire-adapted Ecosystems Monitoring

Partners with the Coconino in monitoring fire-adapted ecosystems are many and include:

- The Landscape Conservation Initiative/Center for Adaptable Western Landscapes – rapid plot pre- and post-treatment surveys.
- The Nature Conservancy (TNC) – pre-treatment rapid plots, data
- Institute for Applied Ecology – designated species seed collection sites (survey, document), seed development and collection
- 4FRI MPMB – effects from vegetation and fire treatments

4FRI MPMB

Member organizations of the 4FRI MPMB are engaged in monitoring the effects from vegetation and fire treatments in the fire-adapted ecosystems of the Coconino National Forest:

Rapid plots: The 4FRI MPMB has collected plot-based pre-treatment data since 2015. From 2016 through 2021, pre-treatment data were collected in 21 4FRI treatment areas in the Coconino and Kaibab National Forests and selected based on areas where mechanical thinning treatments were scheduled or expected to occur. In 2016 and 2017, field crews from TNC and the Ecological Restoration Institute (ERI) collected rapid plot data in five treatment units; the pre-treatment data from the remaining 16 treatment areas were collected between 2016 and 2021. This monitoring includes plots to establish the pre-treatment diameter distributions of trees, number of trees per acre, ground cover types, and existing regeneration.

As expected in the project areas surveyed and reported in an initial 2019 report, ponderosa pine makes up the largest proportion of all tree density. The distributions of living trees show that 40 percent of trees are less than 16 inches in diameter. Grass and forbs are the predominant vegetative understory.

By the 2020 field season, thinning treatments were complete or in-progress in several of the treatment units where pre-treatment data had been collected. In 2020 and 2021, post-treatment data was collected in five treatment areas.

Plots will be re-surveyed following mechanical thinning and burning treatments to help understand the effects of treatments on overstory and understory structure and composition. The first post-treatment surveys with corresponding pre-treatment survey data were completed in 2020 in the Chimney Springs project area on the Flagstaff Ranger District.

The final report of February 2022 by Northern Arizona University's Center for Adaptable Western Landscapes, 4FRI Rapid Plot Monitoring: Implementation & Analysis, relays that trees per acre was reduced, there were more larger trees, and basal areas were reduced by 50%. As the report summarizes:

"Significant differences detected between data collected before and after treatment generally conform with the goals of forest restoration (Reynolds et al. 2013). Across the treatment unit, we observed lower tree density and more distribution across diameter classes (but overall increase in

average tree size). We also documented some increased evidence of disturbance (e.g., soil compaction, invasive species), and mixed responses in understory vegetation and ground cover."

The mechanical and prescribed fire treatments implemented, as well as wildfires managed to meet resource objectives, in all forest ERUs during these two fiscal years have moved ecosystems toward their desired conditions. They have both contributed to reducing the risk of uncharacteristic fire and helped return fire to these fire-adapted ecosystems by:

- Reducing fuel loads and tree densities on over 81,280 acres of the forest.
- Managing wildfires for resource objectives and restoring fire return intervals.
- Increasing fire treatments to achieve and/or maintain composition, structure, and function of fire-adapted ERUs.
- Emphasizing treatments in the wildland-urban interface (WUI).
- Using prescribed fire after mechanical treatments.
- Reducing invasive plants (see Invasives, Insects, and Disease section).
- Meeting forest plan objectives for Semi-Desert Grasslands, Pinyon Juniper ERUs, Riparian Forest Types, and Scenic Resources in the Coconino's fire-adapted ecosystems (see the Plan Amendments/Objectives section).

Recommendations

Based on the results of monitoring the mechanical, prescribed fire, and wildfire treatments completed in FYs 2021 and 2022, the Coconino is not considering any changes to the management direction for the fire-adapted Ecological Restoration Units (ERUs) in the revised Coconino Forest Plan.

The Coconino National Forest will continue to move more of the landscape toward a more open condition, reducing the risk of uncharacteristic wildfire and promoting resilient ecosystems. In addition, the forest will continue to improve the contracting process for harvesting operations, specifically when using Designation by Prescription (D x P). More attention is needed on the timing of maintenance treatments following mechanical thinning that opens the canopy. In several isolated instances where an overabundance of natural regeneration occurred, more expensive maintenance treatments were required to keep tree densities within desired conditions.

The data for Monitoring Questions 21, 23, 24, and 25 related to habitat diversity, timber suitability, regeneration, and even-aged management need to be gathered and analyzed to respond to these forest plan monitoring questions in the next BMER.

Watershed and Soil Resources

Monitoring Questions 8, 9, 10, 11, 15a, 16, 17, and 18 address improving stream riparian areas and wetlands, restoring riparian function to springs, water rights, surface water, long-term soil productivity, water quality, and priority watersheds.

8. How much have management activities improved functional-at-risk or nonfunctional stream riparian areas and wetlands?
9. How much have management activities contributed to the restoration of riparian function to springs not in proper functioning condition?
10. How many water rights have been procured or how many water rights filings have been done?
11. What are surface water trends for Oak Creek, Wet Beaver Creek, and Fossil Creek?
15. a. How much have implemented projects and soil best management practices contributed to protecting soil, reducing accelerated erosion, reducing soil compaction, and maintaining soil and nutrient cycling thus maintaining long term soil productivity (soil condition assessments)?
16. Have management activities contributed to impairment of warm water or cold water streams based on aquatic macroinvertebrate metrics? Aquatic macroinvertebrates are an ecological indicator of water quality.
17. Have management activities contributed to the delisting and improvement of impaired waters, or waters non-attaining Arizona water quality standards?
18. How much have management activities contributed to maintaining or moving towards desired conditions of functioning properly for priority 6th code watersheds identified in the watershed condition assessment?

The Watershed Improvement Tracking (WIT) database is used to collect and report acres and miles of improvement for Monitoring Questions 8 and 9. WIT manages data, observations, and

planning details about sites that need to be, or have been, restored or improved with the intent of benefiting watershed and aquatic ecosystem health and function.

Water rights activities for Monitoring Question 10 are tracked by the Forest Service Water Rights and Uses (WRU) database and the Arizona Department of Water Resources. Surface water trends (Monitoring Question 11) are monitored with U.S. Geological Survey gauging stations for Oak Creek, Wet Beaver Creek, and Fossil Creek.

Monitoring Question 15 looks at the maintenance of long-term soil productivity, assessing the effects on soils, and erosion and sedimentation from implemented projects every three to five years. The implementation and effectiveness of soil best management practices (BMPs) are to be monitored annually for implemented projects. The national BMP database is used to track BMP implementation and effectiveness monitoring. This database structure was updated by a WO development team in FY22.

Monitoring Questions 16 and 17 refer to the streams or lakes removed or added to the Arizona Department of Environmental Quality's (ADEQ) Water Quality Assessment, referred to as the 305(b) report. The 2022 Water Quality Assessment covers a 9-year period from 2012-2021; results are reported in the 2021 section of this report. Since there have been no changes to the 350(b) report within this monitoring cycle, this report will serve as the baseline upon which future monitoring reports will build to assess progress.

Watershed condition using the Watershed Condition Classification (WCC), a 12-indicator model to assess the condition (functioning, functioning at risk, not functioning) of all subwatersheds on the forest, is used to respond to Monitoring Question 18. The Coconino assessed condition using the WCC in 2011; a re-assessment of watershed condition has not occurred since that time. The WCC is part of the larger National Watershed Condition Framework (WCF) which includes assessment of conditions, prioritization of watersheds for restoration, development of Watershed Restoration Action Plans, implementation of projects, and monitoring. The goal of the WCF is to improve tracking and accountability of watershed restoration, and to focus restoration in priority watersheds to improve watershed conditions through targeted restoration in five to seven years.

The Coconino currently has three priority watersheds: Fossil Creek, and Middle and Lower Oak Creek. The Watershed Condition Assessment Tracking Tool (WCATT) is used to track watershed conditions and document progress toward improving watershed conditions in priority watersheds. The Watershed Improvement Tracking (WIT) database is used to plan and track watershed improvement activities in priority watersheds.

The 2011 WCC assessment found that approximately 28 percent of the stream system riparian areas on the Coconino National Forest are in functional-at-risk condition, and approximately five percent are in nonfunctional condition. Wetland riparian conditions range from fair to good on the 78 wetlands identified on the forest. There are at least 300 springs on the Coconino National Forest, in varied condition depending on the degree of modification and degree of protection

(revised Coconino Forest Plan Final Environmental Impact Statement, Volume I, pages 90-99). And it is estimated that approximately 21 percent of the soils across forest ERUs is in an impaired condition (revised Coconino Forest Plan Final Environmental Impact Statement, Volume I, Table 11, page 113).

The revised forest plan requires implementation of BMPs to prevent soil erosion and adverse effects to water quality; avoiding wetlands, springs, seasonally wet meadows, and montane meadows; and avoiding soils that are unstable and highly erodible where connected to streamcourses (revised Coconino Forest Plan, FW-RdsFac-G-5, page 99). BMPs are specified in project planning documents.

Monitoring Results

In fiscal year (FY) 2021:

- 10 acres of stream and wetland habitat were restored in Lockwood Draw by Grand Canyon Trust volunteers. Supplemental energy dissipation was installed in the runout channel in Lockwood Draw and Spring. This improved channel function and stability, and increased the wetted area by improving soil condition and water infiltration and storage. Installation of rock structures at Lockwood Spring improved spring stability and function and reduced potential erosion and sedimentation in the spring brook.
- Approximately 110 new surface water rights claims were filed in the Lower Little Colorado Basin. These were primarily for stock tanks for the purpose of livestock and wildlife watering as part of ongoing water rights adjudication efforts in the Lower Little Colorado Basin.
- The average annual discharge in Oak Creek in 2021 was 35.8 cfs (cubic feet per second). This was higher than 19% of the years on record. Average annual discharge in Wet Beaver Creek was 10.9 cfs. Average annual discharge in Fossil Creek was 40.7 cfs, the lowest discharge within the 13-year period of record.
- Best Management Practices (BMP) implementation and effectiveness were not monitored in 2021.

In FY 2022:

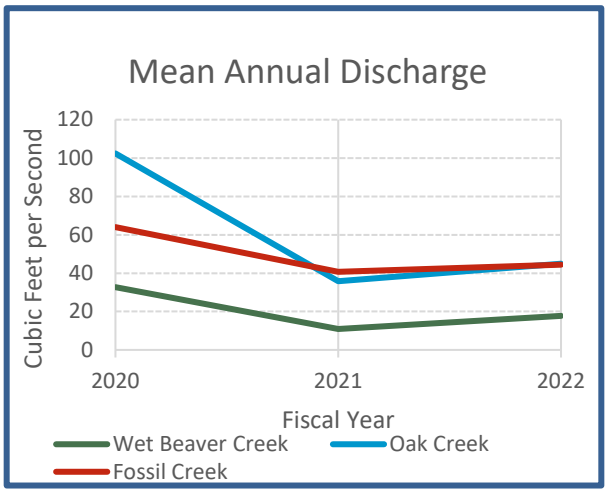
- Approximately 137 acres of riparian and wet meadow habitat were improved as part of the annual Arizona Elk Society project. Most of this work was in Lockwood Draw, Long Valley, and Houston Draw where loose rock structures and other gully stabilization treatments were implemented to address channel incision and de-watering of adjacent slope wetlands. These treatments effectively increased the wetted area adjacent to the stream channel. In addition, approximately 22 acres were treated in the Museum Fire burned area to reduce erosion and sedimentation. Treatments included construction of wide channels with grade control structures to spread out and slow flood flows, and to reduce further gullying and water and sediment delivery to downstream infrastructure.
- Fence exclosures protecting Wesley Spring, Big Willow Spring, Hackberry Spring, and Doren’s Defeat Spring were improved after the Backbone Fire. Exclosures at Hance,

Cottonwood, Mesquite, and Foster Springs were maintained to improve spring function. Invasive blackberry was removed with mechanical and chemical treatments at Fossil Springs. These treatments improved and maintained spring condition, protecting these features from the effects of livestock and native ungulates.

- Spring exclosure maintenance was completed by volunteers at Hance, Cottonwood, Mesquite, and Foster Springs on the Red Rock RD.
- With assistance from the Grand Canyon Trust, work continued at Lockwood Draw on the Mogollon Rim RD. Volunteers helped stabilize erosion and reduce headcutting by installing loose rock structures to prevent soil erosion within the spring runout channel. The area has experienced very heavy browsing by ungulates (mainly elk), leading to inadequate vegetative cover. These stabilization measures will increase the wetted area, improve vegetation establishment, and increase the robustness of the wetland vegetation.
- No additional water rights filings were completed (with the bulk of new claims submitted in early FY23). The Coconino employed a 3-person American Conservation Experience (ACE) crew to complete field verification and data collection on water rights, including stock tanks, springs, and water systems requiring new surface water claims. The crew visited approximately 50 sites in FY22 to prepare for new surface water claims and statements of claimants in the Verde Water Rights Adjudication.
- The mean annual discharge in Oak Creek was 44.9 cfs, wetter than 29% of the years on record. The mean annual discharge in Wet Beaver Creek was 17.8 cfs, wetter than 41% of the years on record. The mean annual discharge in Fossil Creek was 44.5 cfs, wetter than four or 33% of the previous 13 years of record.
- Best Management Practices (BMP) implementation and effectiveness per the National BMP Monitoring Program were not monitored in 2022.
- Watershed restoration work continued in the Coconino's three existing priority watersheds designated under the National Watershed Condition Framework (WCF): Fossil Creek, and Middle and Lower Oak Creek, with the goal of improving watershed conditions. Work outlined in the Watershed Restoration Action Plans (WRAPs) for these projects is ongoing and includes:
    a. Work in Fossil Creek centered around post-fire recovery efforts for the 2021 Backbone Fire. Closure of Fossil Creek access roads and road maintenance work contributed toward the recovery of bare soil areas from previous recreation impacts. Spring exclosures burned by the Backbone Fire were repaired at Wesley, Big Willow, Hackberry Springs, and Doren's Defeat.
    b. Essential projects in the Oak Creek Watershed Restoration Action Plan were funded in the Middle and Lower Oak Creek subwatersheds through the Collaborative Aquatic Landscape Restoration Program in the Bipartisan Infrastructure Law. The Coconino received 1.8 million dollars for a five-year program of restoration work, with partners providing substantial additional matching funds. Work centered on social trail rehabilitation and dispersed site improvement in Oak Creek Canyon, with approximately 40 sites treated to reduce soil erosion and sedimentation and better manage dispersed recreation. In

addition, 8 new pet waste stations were installed, and 37 total pet waste stations were maintained.

In Wet Beaver Creek, mean annual discharge has varied significantly over the 61-year period of record (1961-present), from a high of 102.9 cfs (1973) to a low of 6.8 cfs (2006). The Oak Creek gauge has an 82-year period of record (1940-present) and mean annual discharge has varied a full order of magnitude, from a high of 256.1 cfs (1993), to a low of 25.9 cfs (1996). The Fossil Creek gauge site was established in 2010, and mean annual discharge has not varied as significantly as in Oak and Wet Beaver Creeks. The highest mean discharge was 64.1cfs (2019), and the lowest was 40.7 in 2021.



Sections of Spring Creek, the Verde River, and 37.2 miles of Oak Creek are not attaining desired conditions due to Escherichia coli (E. coli) pollution. The Arizona Department of Environmental Quality (ADEQ) and the Coconino developed a Total Maximum Daily Load (TMDL), or clean water plan, which outlines activities to work toward attainment of desired conditions. A 12.6 mile reach of Oak Creek and Fossil Creek are also impaired by E. coli; however a TMDL has not been prepared for these streams. Stoneman Lake is considered impaired for dissolved oxygen and potential of hydrogen (pH). Upper and Lower Lake Mary, Soldier Lake and Annex, and Long Lake are impaired for mercury. ADEQ and the Forest Service work together under a MOU to implement and monitor TMDLs, with a strong focus of restoration in Oak Creek.

Table 7. Streams and lakes with water quality impairments, and TMDL status

Water Body	Pollutant	Length or Area	Status
Oak Creek	E. Coli	12.6 mi	Impaired, no TMDL
Oak Creek	E. Coli	37.2 mi	Not attaining, TMDL complete
Spring Creek	E. Coli	6.4 mi	Not attaining, TMDL complete
Fossil Creek	E. Coli	9.4 mi	Impaired, no TMDL
Verde River	E. Coli	5.9 mi	Impaired, no TMDL
Stoneman Lake	Dissolved oxygen, pH	149 acres	Not attaining, TMDL complete
Upper Lake Mary	Mercury	946 acres	Not attaining, TMDL complete

Water Body	Pollutant	Length or Area	Status
Lower Lake Mary	Mercury	787 acres	Not attaining, TMDL complete
Lower Long Lake	Mercury	345 acres	Not attaining, TMDL complete
Soldier Lake	Mercury	36 acres	Not attaining, TMDL complete
Soldier Lake Annex	Mercury	149 acres	Not attaining, TMDL complete

Table 8. Acres and Numbers of Watershed Resource Activities Completed in FYs 2021 and 2022

Watershed Resource Activity	FY 2021	FY 2022	2-year Total
Acres of functional-at-risk or nonfunctional stream riparian areas and wetlands improved (Q 8).*	10 acres	159 acres	**169 acres**
Number of springs improved or restored (Q 9).	1 spring	9 springs	**10 springs**
Number of water rights procured or filings completed (Q 10).	110 claims only	0	**None**
Annual mean discharge and peak streamflow (Q 11).	Oak Creek: 35.8 cfs Wet Beaver Crk: 10.9cfs Fossil Creek: 40.7 cfs	Oak Creek 44.9 cfs Wet Beaver Crk: 17.8 cfs Fossil Creek: 44.5 cfs	**N/A**
Acres of implemented projects that maintain or trend toward satisfactory soil condition (Q 15a).	10 acres	159 acres	**169 acres**
Number of projects where BMP implementation was effective at protecting soil productivity (Q 15b).	0	0	**0**
Streams added to or removed from ADEQ's impaired or non-attaining list (Q16).	0	0	**0**
Number of streams or lakes removed or added to ADEQ's impaired or non- attaining list (Q17).	0	0	**0**
Acres of watershed maintenance or restoration activities and acres of vegetation treatments within priority 6th code watersheds. Name and number of 6th code watersheds that have moved to an improved class (Q18).	15 acres 0 subwatersheds	35 acres/ 0 subwatersheds	**50 acres**

*All acres are approximate and based on the most recent WIT and GIS data available.

Forest Leadership Team (FLT) Monitoring

In addition to the monitoring reported above, one of the projects monitored by the Coconino FLT in 2022 was the East Clear Creek Watershed Health Improvement Project treatments in Houston Draw. The purpose of this project is to restore soils, meadow systems, and riparian areas; to improve watershed function and build resiliency to climate change and other disturbances; and to improve habitat for threatened, endangered, and sensitive (TES) species. Project design was completed in a contract with Natural Channel Designs (NCD). The National Forest Foundation (NFF) has helped to find donors to fund the project and the Arizona Elk Society (AES) has helped fund and lead implementation of the restoration work.

Approximately eight of the 21 acres proposed within Houston Draw have benefited from meadow restoration activities since April of 2019. The goals of this forest plan monitoring visit were to: 1) look at the effectiveness of implementing the approved activities to restore these Houston Draw sections of the project area, 2) evaluate how well restoration activities are enhancing the functional condition of the meadow system and making the watershed more resilient to disturbance [Coconino Forest Plan Monitoring Question 8], 3) determine if restoration work is maintaining or making progress toward desired conditions for stream riparian areas, and 4) document this project review, contribute to forest plan monitoring requirements, and make recommendations applicable to similar future projects on the Coconino National Forest.

The review team visited treatment areas in the lowest and middle watersheds of Houston Draw. The team found that the 2019 work in the draw helped stabilize the meadow. Loose rock structures (Zeedyk structures) were built to mimic ripple sections of the drainage system and pools were created for amphibians and aquatic bugs. If grazing is reduced and the meadow opened up for grass, it will become more stable. There is an aquatic passage culvert about a mile downstream from the draw. A lot of trees need to be removed, those not needed for bank stabilization or stream pockets, to improve function of the meadow.

Old elk exclosures were built to keep elk and cattle out of parts of the meadow. The purpose is to restore the herbaceous component, “resting” the meadow system from elk browsing. The review team discussed if the old goat fence type exclosures are appropriate or if they should be replaced by sucker rod or cable type exclosures. It was agreed that the fencing used for the exclosure needs to be modified to a design requiring less maintenance, and to allow birds and small animals access, while excluding ungulates.

Overall conclusions and recommendations from this FLT monitoring fieldtrip include the following:

1. The treatments conducted so far have improved watershed conditions, shoring up erosion features, increasing pools, reducing grazing, and increasing stability. Additional and modified work needs to be done to add and maintain gradient control structures to continue to improve function in Houston Draw.

2. One exclusion fence that is currently a wildlife hazard needs to be replaced, rebuilt, or removed.
3. Encroaching conifers that are not needed for bank stabilization need to be removed and aquatic passage improved.

Partners in Watershed and Soil Monitoring

- Spring Stewardship Institute of the Museum of Northern Arizona – the health and condition of springs across the 4FRI footprint.
- Grand Canyon Trust and Trout Unlimited – the condition of various streams and springs across 4FRI.
- Salt River Project – surface water flow
- U.S. Geological Survey (USGS) – stream gauge maintenance and data collection
- AZ Water Science Center – Unmanned Aircraft System (UAS) aerial surveys, canopy/forest pattern data collection and monitoring, post-fire erosion, and sedimentation monitoring
- Arizona Geological Survey (AZGS) – post-fire debris flow monitoring in watersheds affected by the Museum, Tunnel, and Pipeline Fires
- Friends of the Forest – water quality sampling, water rights and uses surveys
- Arizona Department of Environmental Quality (ADEQ) – water quality, aquatic macroinvertebrates surveys
- Oak Creek Watershed Council – BMPs analysis
- Arizona Elk Society – meadow restoration and fence conditions
- Rocky Mountain Research Station (RMRS) (with multiple collaborating researchers from various universities) – flow, soil moisture, riparian condition, aquatic and riparian plant and animal species, to support federal reserve water right claims in wilderness streams and the Verde Wild and Scenic River
- City of Flagstaff – Surface water and groundwater flow

4FRI MPMB

Member organizations of the 4FRI MPMB are engaged in the following monitoring of watershed resources in the Coconino National Forest:

Springs: The 4FRI MPMB has worked with the Grand Canyon Trust and the Forest Service since 2018 to monitor the site-level effects from spring restoration on aquatic and emergent vegetation, using pre- and post-restoration vegetation transects at select sites. These partners are also working together to refine and improve spring monitoring protocols.

In 2018 the 4FRI MPMB and Forest Service partnered with the Springs Stewardship Institute (SSI) at the Museum of Northern Arizona to develop a landscape-scale monitoring protocol that will detect ecosystem changes at springs resulting from upland thinning and burning treatments (Schenk et al. 2019).

In 2019 the MPMB and Forest Service funded a five-year agreement with SSI to implement the monitoring protocol at 56 springs across the Kaibab and Coconino National Forests. The purpose of the 4FRI Spring Health Monitoring Program is to document hydrologic and ecological changes that occur at springs as a result of 4FRI restoration actions. SSI hosts the database of completed spring condition surveys which supports restoration of selected springs and monitoring of those springs. Also in 2019, the 4FRI MPMB and Forest Service entered into an agreement with Northern Arizona University to place instruments and continuously monitor flows at four springs on the Kaibab and Coconino National Forests.

In 2019, SSI completed the data collection on the 56 4FRI springs selected. Those data serve as the baseline against which annual changes in discharge, spring area, spring invertebrates, and habitat conditions will be monitored through 2023. In 2020 and 2021, SSI completed hydrologic monitoring, recorded springs habitat changes, and revised sketchmaps. This hydrologic and habitat monitoring was repeated in 2022 (report to come in 2023). At the conclusion of the study in 2023, all sites will be fully re-inventoried, and changes in variables will be reported.

Preliminary results of this study as reported in the Spring Health Monitoring for the Four Forest Restoration Initiative, 2021 Annual Progress Report (completed in April 2022), include:

- The springs monitored exhibit a wide array of ecological integrity, ranging from pristine to highly impaired by livestock and wildlife impacts, flow manipulation, and proximity to development.
- Water quality results indicate that most springs are locally sourced (low specific conductance, pH similar to rainwater), this would indicate rapid response to disturbance including forest treatment.
- Ponds and cienegas (springs habitat) that were recorded as dry in the baseline dataset had standing water or discernible springs flow in 2020.
- Springs flow declined significantly at most sites between 2020 and 2021; this indicates very responsive springs ecosystems to short term climatic drivers (in this case drought).
- Several Ephemeroptera, Odonata, Plecoptera, and Trichoptera, elmid beetles, Enochrus hydrophilid beetles, as well as turbellarian flat worms are characteristic of ecologically intact, perennial springs, while sepsid, tipulid, and other Diptera, some caddisflies, Annelida, and non-native isopods and amphipods characterize ephemeral and ecologically impaired springs.

As of the April 2022 report, the study does not yet include any forest treatments near or at any of the 56 monitoring sites, so the results to date provide baseline information. The statistically significant drop in springs discharge between monitoring years indicates that the springs monitoring network reflects and is responsive to rapid climate changes and groundwater infiltration. This suggests that the effects from forest treatments will likely be noticeable at springs in this monitoring network in a relatively short (decadal or less) time period.

The restoration and improvement treatments implemented in stream riparian areas, wetlands, and at springs during these three fiscal years have moved these resources toward their desired conditions. These management activities, conducted with the appropriate BMPs, as well as dispersed recreation management, have improved functional-at-risk or nonfunctional stream riparian areas and wetlands, and contributed to the restoration of riparian function to springs not in proper functioning condition by:

- Stabilizing active headcuts using loose rock structures.
- Improving soil water infiltration and storage.
- Addressing channel incision with gully stabilization treatments.
- Improving vegetation establishment and robustness along streambanks and around springs.
- Increasing the wetted area with stabilization treatments.
- Fencing to protect springs, their sources, and their cultural values from degradation.
- Reducing invasive plants (see Invasives, Insects, and Disease section).
- Making progress in meeting forest plan objectives for Riparian Forest Types, Wetlands, Springs, and Soil (see the Plan Amendments/Objectives section).

In riparian and spring areas treated, protective vegetative ground cover is increasing, and soil productivity and function is improving. Compaction and erosion is reduced.

Recommendations

Based on the ongoing restoration work and monitoring results for these three fiscal years, the Coconino is not considering any changes to the management direction for Watershed and Soil Resources in the revised Coconino Forest Plan.

Additional and modified work needs to be done to add and maintain gradient control structures to continue to improve function in Houston Draw. Additional implementation guidance is needed to help field practitioners interpret Forest Plan direction for Aquatic Management Zones (AMZs). The current Forest Plan guidelines include one for AMZ widths based on soil stability; interpretation of this guideline is challenging. In the next monitoring cycle, the Watershed Program will produce guidance for the interpretation of AMZ widths. This will improve the management and protection of AMZs and help achieve desired conditions.

Monitoring Question 11: There are no discernable trends in mean annual discharge in Oak Creek, Wet Beaver Creek, or Fossil Creek over the period of record for each gauge. In the next monitoring cycle, assessing an additional streamflow metric such as baseflow may provide a better response to this monitoring question.

Monitoring Question 15: There was a lack of BMP monitoring in FYs 2021 and 2022. The Coconino recognizes the need to address this monitoring requirement and the Watershed Program is committed to resuming BMP monitoring in the FY 2023 and 2024 monitoring cycles, planning to complete 14 BMP evaluations. BMP implementation and monitoring is foundational to meeting Forest Plan objectives for watershed and soils. Interdisciplinary discussions during

this monitoring are key to a shared understanding of the importance of BMPs in mitigating effects on watershed function, soil productivity, and water quality.

Monitoring Question 18: Watershed conditions using the WCC have not been reassessed since 2011, and progress toward completion of essential projects in priority watersheds (Fossil, and Middle and Lower Oak Creek) has been slow. The Coconino plans to re-assess watershed condition in the next monitoring cycle, targeting subwatersheds that have experienced fires and other large scale treatments, as well as subwatersheds in the Verde Basin as part of the Friends of the Verde River's watershed report card process. The Coconino also plans to designate the Upper and Lower Lake Mary and Walnut Canyon subwatersheds as priority 6th code watersheds, and develop a WRAP to plan and prioritize restoration to improve watershed conditions. Finally, greater emphasis will be placed on prioritizing restoration treatments in existing priority watersheds to improve watershed conditions.

Invasives, Insects, and Disease

Monitoring Questions 12, 13, and 14 address the incidence and abundance of aquatic invasive species and invasive plants, and the extent of insect and pathogen outbreaks.

Monitoring Question 19.B. looks at how much management activities have contributed to reducing the incidence or abundance of aquatic invasive species in habitat for threatened, endangered or proposed species. One of its metrics is similar to that for Monitoring Question 12; its other metric is the number of new populations of aquatic invasives.

12. How much have management activities contributed to reducing the incidence or abundance of aquatic invasive species?

13. How much have management activities contributed toward reducing the incidence or abundance of invasive plants?

14. To what extent are undesirable outbreaks of insects and pathogens occurring on the forest? (1982 Planning Rule (sec. 219.12(k)(5)(iv))

19. B. How much have management activities contributed to reducing the incidence or abundance of aquatic invasive species in habitat for threatened, endangered or proposed species (related to Question 10)?

Monitoring Results

In fiscal year (FY) 2021:

- Green sunfish were removed in 4.2 miles of Red Tank Draw (Red Rock RD) and 4.2 miles of East Clear Creek (Mogollon Rim RD) by the Arizona Game & Fish Department (AZGFD).
- Seventy-six acres of invasive plants were manually removed; 293 acres of invasive plants were chemically treated. Biocontrol releases were conducted in four areas for Dalmatian toadflax and in 10 areas for diffuse knapweed.
- Ponderosa pine mortality across 165,660 acres; Pinyon ips beetles damaged 250 acres of pinyon-juniper forest; Douglas-fir beetles, fir engravers, and western balsam beetles damaged 3,870 acres of mixed conifer forest; spruce beetles damaged 100 acres of

spruce-fir forest. Total acres of damage or mortality from these undesirable outbreaks was 169,880 acres across ecological restoration units (ERUs).

In FY 2022:

- Bullhead were removed in 2.5 miles of Rarick Canyon (Red Rock RD) by AZGFD; green sunfish were removed from 4.7 miles of Red Tank Draw, Spring Creek, from 2.5 miles of Bear Canyon, and from 1.5 miles of Miller Canyon; greenies and smallmouth were removed in 3.0 miles of Walker Creek.
- One hundred seventy acres of invasive plants were manually removed; 42 acres of invasive plants were chemically treated. Biocontrol releases were conducted in five areas for Dalmatian toadflax.
- Ponderosa pine mortality across 67,020 acres; Pinyon ips beetles damaged 1,630 acres of pinyon-juniper forest; Douglas-fir beetles, fir engravers, and western balsam beetles damaged 6,560 acres of mixed conifer forest; spruce beetles damaged 30 acres of spruce-fir forest. Total acres of damage or mortality from these undesirable outbreaks was 75,240 acres across ecological restoration units (ERUs).
- A new population of green sunfish was found in 1.5 miles of Miller Canyon.

Table 9. Amount of Invasives Treatments and Insect and Disease Damage in FYs 2021 and 2022

Treatments/Damage*	FY 2021	FY 2022	2-year Total
Miles of streams and acres of lakes, ponds, or wetlands with non-native species removal or are affected by a fish barrier or other structure (Qs 12, 19B).	8.4 miles	14.2 miles	**22.6 miles**
Acres of invasive plants treated (additional biocontrol acres) (Q 13).	369 (701)	212 (328)	**581 (1,029) acres**
Acres of damage or mortality from insects and disease (Q 14).	169,880	75,240	**245,120 acres**
Number of new populations of aquatic invasive species (Q 19B).	0 new populations	1 new population	**1 new population**

*All miles and acres are approximate and based on the most recent FACTS and GIS data available.

Partners in Invasives Monitoring

- The Nature Conservancy – invasive plant populations in pre- & post-4FRI fuel reduction treatments (survey and map)
- Friends of the Verde River (FOVR) – non-native plants inventory and mapping
- American Conservation Experience (ACE)/Arizona AmeriCorps – invasive plant populations in pre- & post-4FRI fuel reduction treatments (survey, map, and treat), sensitive and rare plants (survey and map within project areas)
- National Park Service (NPS) Invasive Plant Management Team – invasive plant populations (survey, treat); Early Detection, Rapid Response (EDRR) on invasive populations requiring immediate action

4FRI MPMB

A partnership comprised of the 4FRI MPMB, Nature Conservancy, and Arizona (AZ) AmeriCorps have added to the Forest Service's capacity to conduct post-treatment monitoring of invasive species. The Nature Conservancy and AZ AmeriCorps team members have identified and mapped locations of invasive plant populations following thinning in one restoration treatment area on the Coconino. AZ AmeriCorps provided these invasive population data through the Invasive Species Mobile application, and these data were used to plan and prioritize infested areas for treatment.

In 2022, American Conservation Experience (ACE) began monitoring post-thinning project areas for the presence of invasive plants to facilitate early detection and treatment of new infestations of invasive and noxious weeds. ACE will continue their efforts in 2023.

The management activities implemented in streams, lakes, ponds, or wetlands have contributed to reducing the incidence or abundance of aquatic invasive species. An integrated approach to treating identified populations of invasive plants has moved forest ERUs toward their desired conditions. This combination of mechanical, biological, cultural, and chemical controls has helped forest managers to manage different species that vary based on phenology, location, growth type, and population size. To maintain desired conditions in these ERUs, monitoring and maintenance treatments were prioritized for invasive plant populations that either received initial treatments prior to 2023, are perennial, are aggressively spreading, or are found in low abundance on the forest. Observation of species presence, as well as regular monitoring of invasive plant population size, have been integral in responding to invasive plant threats.

These management activities, as well as continued monitoring of non-native fish and plant populations, have maintained, restored, and improved habitat by:

- Using mechanical, biological, cultural and chemical treatments to control and manage invasive species.
- Removing non-native fish to improve the survival and success of reintroduced populations of native fish.
- Reducing predation and competition from aquatic invasive species, and threats to the sustainability of listed species such as the Chiricahua leopard frog.
- Designing prescribed fire treatments to protect listed species habitat and reducing the threat of uncharacteristic wildfire.

The number of new populations of aquatic invasive species remained low in FYs 2021 and 2022. Invasive populations were identified, inventoried, and treatments were designed and implemented to stop their spread and eliminate them.

The number of new populations of invasive plants remained low to moderate in FYs 2021 and 2022. These invasive populations were identified, inventoried, and referenced with the

Coconino's Invasive Plant List, which categorizes species based on abundance and aggressiveness of spread. Treatments will be designed and implemented specific to each invasive species of concern to minimize dispersal, to contain populations from expanding, and to rapidly respond to new invasive threats. Invasive plants that are not found with frequency on the forest will be prioritized for Early Detection, Rapid Response (EDRR) survey and treatment.

The acres of damage or mortality from insects and disease increased to the hundreds of thousands of acres during FY 2021. This was primarily due to the drought conditions and lack of monsoonal moisture in 2020 that led to stressful conditions across the region heading into 2021. The number of acres decreased but was still in the tens of thousands in FY 2022.

Recommendations

Based on these results, the Coconino is not considering any changes to the direction for Invasives, Insects, & Disease in the revised Coconino Forest Plan.

Address the thousands of acres with damage or mortality from insect and disease outbreaks. During project planning each year, address those forest stands affected by these outbreaks. This increased susceptibility to insect and disease should be addressed with additional mechanical thinning and fire treatments to return stands to healthier conditions.

Threatened, Endangered, and Proposed Species; Habitat Diversity

Monitoring Questions 4 and 5 look at how management activities are moving the frequency of snags and downed logs, and the basal area/densities of Ponderosa pine and mixed conifer forest toward desired conditions.

Monitoring Question 19.A. addresses the status and trend of ecological conditions needed for aquatic and riparian-dependent threatened, endangered, and proposed species.

Monitoring Question 20 looks at the trend in occupancy and density for each of the three songbird focal species.

Monitoring Question 21.B. looks at treated forest stands to determine contributions to maintaining late-seral mixed conifer and pine-oak habitats.

Monitoring Question 22 looks at how management activities have helped maintain or moved toward desired conditions for aspen, an ecological indicator of habitat diversity and early seral stages.

4. Are downed logs and snags falling within the ranges established in desired conditions for Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs?

5. Are tree densities within forested areas falling within the basal area ranges established in the desired conditions for Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs?

19. A. How much have management activities improved habitat for aquatic and riparian-dependent threatened, endangered, or proposed species (related to question 8)?

20. What is the status of the three songbirds identified as focal species (Grace's warbler, black-throated gray warbler, and juniper titmouse)?

21. B. Are plan components guiding fuels reduction and forest restoration activities maintaining the suite of late-seral ecological conditions within mixed conifer and pine-oak habitats that

contribute to stable or increasing MSO populations? How much have management activities contributed to returning fire to Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs?

22. How much have management activities contributed to maintaining or moving toward desired conditions for aspen? Aspen is an ecological indicator of habitat diversity, and early seral stages in the following ERUs: Mixed Conifer with Infrequent Fire, Mixed Conifer with Frequent Fire, Spruce-Fir, and in localized areas in Ponderosa Pine.

Monitoring Question 9, addressing the restoration of riparian function to springs, is included in this section as well as in the previous Watershed and Soils Resources section.

Monitoring Results

In fiscal year (FY) 2021:

- Supplemental energy dissipation was installed in the runout channel in Lockwood Draw and Spring. This improved channel function and stability, and increased the wetted area by improving soil condition and water infiltration and storage. Installation of rock structures at Lockwood Spring improved spring stability and function and reduced potential erosion and sedimentation in the spring brook.
- 10 acres of stream and wetland habitat were restored in Lockwood Draw by Grand Canyon Trust volunteers.
- Gila topminnow & Gila chub stocking was completed in 4.2 miles of Red Tank Draw on the Red Rock RD by Arizona Game & Fish Department (AZGFD).
- Little Colorado spinedace translocations were completed in 8.9 miles of Barbershop Canyon on the Mogollon Rim RD by AZGFD and the U.S. Fish & Wildlife Service (USFWS).
- 291 acres of aspen were protected with exclosure fencing or maintained with conifer weeding and other release treatments.
- One spring was improved in FY 2021, Lockwood Spring. Supplemental energy dissipation was installed in the runout channel.

In FY 2022:

- Spring exclosure maintenance was completed by volunteers at Hance, Cottonwood, Mesquite, and Foster Springs on the Red Rock RD.
- Fence exclosures protecting Wesley Spring, Big Willow Spring, Hackberry Spring, and Doren's Defeat Spring were improved after the Backbone Fire. Exclosures at Hance, Cottonwood, Mesquite, and Foster Springs were maintained to improve spring function. Invasive blackberry was removed with mechanical and chemical treatments at Fossil Springs. These treatments improved and maintained spring condition, protecting these features from the effects of livestock and native ungulates.
- Spikedace and Gila topminnow stocking was completed in 3.2 miles of Spring Creek on the Red Rock RD by AZGFD.
- Little Colorado spinedace translocations were completed in 3.5 miles of Barbershop

Canyon on the Mogollon Rim RD by AZGFD & USFWS.

- Spikedace stocking was completed in six miles of Fossil Creek on the Red Rock RD by AZGFD.
- Gila trout stocking was completed in 2.5 miles of West Fork Oak Creek and Oak Creek on the Red Rock RD by AZGFD.
- A bank stabilization project was completed in Spring Creek that protected about three miles of aquatic habitat on the Red Rock RD by the Bureau of Reclamation with support from the Coconino.
- Illegal travel was restricted by improving the closure of a road into Leonard Canyon that protects about three miles of aquatic habitat on the Mogollon Rim RD.
- Meadow restoration using loose rock structures was completed on 10 acres of Lockwood Draw on the Mogollon Rim RD with assistance from Grand Canyon Trust volunteers.
- 305 acres of aspen were protected with exclosure fencing or maintained with conifer weeding, oystershell scale treatments, and other release treatments.

Snags and Downed Logs

Snags, downed logs, and coarse woody debris (Monitoring Question 4) are generally maintained and representative of the species within each ERU. Prescriptions aim to maintain 1 to 2 ponderosa pine snags >18 inches diameter. In the Gambel oak subtype, large oak snags (greater than 10 inches) are maintained where present. Downed logs (greater than 12-inch diameter at mid-point, greater than 8 feet long) average 3 logs per acre within the forested area of the landscape where available. Follow-up prescribed burns often create additional snags and future downed logs. Coarse woody debris, including downed logs, generally range from 3 to 10 tons per acre. In frequent fire mixed conifer stands, coarse woody debris (greater than 3-inch diameter), including down logs, is managed higher and generally ranges from 5 to 15 tons per acres to maintain long-term soil productivity and provide wildlife habitat.

Tree Densities

Thinning prescriptions specify basal area targets that are well within the desired conditions as described in the Forest Plan (Monitoring Question 5). Tree density within forested areas are generally reduced to ranges from 22 to 89 square feet of basal area per acre in the ponderosa pine ERU. Forest conditions exceed these densities in some areas, such as on steep slopes and in canyons. In addition, the density of larger trees and canopy cover is left higher in areas managed for Mexican spotted owl habitat. In mixed conifer stands, tree density within forested areas is left higher than ponderosa pine and generally range from 30 to 100 square feet basal area per acre. Forest conditions exceed these densities in some areas, such as on steep slopes and in canyons, where mechanical operations are not feasible.

Focal Species

On the Coconino, there are four focal species: Mexican spotted owl as an indicator of mature late-seral mixed conifer and ponderosa pine-Gambel oak forests; Grace's warbler for open, park-like, mature stands of pure ponderosa pine, and in pine-oak habitats, black-throated gray warbler

for mature pinyon component of pinyon-juniper habitats; and juniper titmouse for late seral pinyon-juniper habitats, particularly the snag component.

Monitoring Question 21.B. addresses habitat trends for the Mexican spotted owl. Plan components are helping to maintain late-seral ecological conditions , but it is too early to tell if those guiding components will contribute to a stable or increasing MSO population. The Coconino is currently implementing forest restoration treatments and monitoring that specifically treats MSO PACs. In the coming years, annual MSO monitoring surveys will reveal what kind of effects the treatments have on MSO population trends. To promote late-seral ecological conditions that maintain or contribute to the restoration of mature forest conditions, preference is generally given to the retention of pre-settlement trees, often the largest, oldest, and tallest trees onsite. In mixed conifer stands, the density of larger trees and canopy cover is left higher where needed and most often occurs in habitat managed for Mexican spotted owls.

To measure the trends for the three songbird focal species, occupancy (proportion of grid cells occupied across the forest) and density (birds per square kilometer) for each species is derived from Bird Conservatory of the Rockies (BCOR) Integrated Monitoring in Bird Conservation Regions (IMBCR) data collected annually across the Coconino. This data allows the forest to monitor local populations over time and infer changes resulting from implementation of restoration treatments. This is done by comparing surveyed areas that had restoration treatments to untreated areas.

Density and occupancy for the three songbird focal species remained relatively stable through FY 2022 with only minor fluctuations occurring (no more than a three percent change). Unfortunately, no restoration treatments occurred in the established survey areas during this time, so a comparison between treated and untreated areas was not possible. The differences observed for the three species are consistent with normal variation in precipitation, temperature, and other climatic conditions that affect the availability of food, water, and shelter needed for individuals to survive and reproduce.

Table 10. Activities for Habitat Improvement by Fiscal Year

Management Activity*	FY2021	FY2022	2-year Total
Number of springs improved or restored (Q 9).	1 spring	9 springs	**10 springs**
Miles of functional at-risk or nonfunctional stream riparian areas improved with threatened, endangered, and proposed species habitat (Q 19A).	17.3 miles	21.2 miles	**38.5 miles**
Acres mechanically treated, acres of prescribed fire, acres of wildfire for resource objectives (Q 21A).	74,468	6,813	**81,281 acres**
Acres of aspen protected or maintained (Q 22).	291	305	**N/A**
Acres of aspen protected by exclosure fencing	266	275	**N/A**
Acres of aspen planted	0	0	**0**

Management Activity*	FY2021	FY2022	2-year Total
Acres of oystershell scale treatments	0	16	**16**
Acres of aspen release (conifer weeding, maintenance treatments)	25	14	**39**

*Acre totals are approximate due to overlapping treatments in some areas (multiple treatments on the same acres).

Forest Leadership Team (FLT) Monitoring

One of the implementation projects that was monitored by the Coconino Leadership Team in FY 2022 was the Flagstaff Ranger District's ongoing Mexican Spotted Owl (MSO) Protected Activity Center (PAC) treatments for the 1st Four Forest Restoration Initiative (4FRI) Environmental Impact Statement (EIS).

As part of the 1st 4FRI EIS and related Biological Opinion, the Forest Service and the U.S. Fish and Wildlife Service worked together to develop a monitoring plan to understand the short-term effects of thinning and burning on Mexican spotted owls and their habitat that focuses on the years immediately before, during, and after treatment. The four PACs chosen for monitoring were Bonita Tank, Mayflower Tank, Archies, and Iris Tank. Lee Butte, Lake #1, Crawdad, and Bar M were chosen as "reference" PACs that will not be treated.

The leadership team and staff visited the Bonita Tank and Archies PACs to: 1) review MSO habitat requirements; 2) review the treatment and monitoring requirements for these PACs; 3) compare and contrast treatments in these treatment PACs; 4) compare and contrast the benefits and drawbacks of hand thinning vs. mechanical thinning in MSO PACs; 5) evaluate if treatments so far have maintained or improved MSO habitat conditions, making progress toward desired conditions for MSO PACs [Coconino Forest Plan Monitoring Question 21]; and 6) document this project review, contribute to forest plan monitoring requirements, and make recommendations applicable to PAC treatments and monitoring on the Coconino National Forest.

The team determined that the treatments in the Bonita Tank PAC have increased horizontal heterogeneity and reduced the basal area to approximately 70 square feet per acre. MSO habitat conditions are improved in pockets of the PAC; down logs, snags, and tree densities have moved toward desired conditions; and the risk of uncharacteristic fire has been reduced. Prescribed fire is needed for more improvement. In the Archies PAC, treatments so far have maintained, but not improved, MSO habitat conditions. Down logs, snags, and tree densities have been moved toward desired PAC conditions, but minimally. This PAC still needs to be burned. Partnerships have helped with removal of fuels from this PAC.

Overall conclusions and recommendations from this FLT monitoring fieldtrip include the following:

1. Prescribed fire is needed in conjunction with mechanical treatments in PACs to move MSO habitat further toward desired conditions.

2. Treatments in these PACs need to be prioritized to complete this monitoring effort and facilitate mechanical treatments in other PACs.

Partners in Species and Habitat Monitoring

- Bird Conservancy of the Rockies (BCOR) – songbird focal species, Mexican spotted owl
- Friends of the Forest – sensitive agaves, fungi, lichens; kestrel, peregrine falcons, nightjars, roosting bats, colonial nesting birds, amphibians, arundo wasps, monarch and milkweeds, land and aquatic snails, riparian exclosures, photo monitoring of vegetative changes, and annual butterfly counts
- Arizona Department of Game and Fish (AZGFD) – riparian birds, bald and golden eagle flights, Fossil springsnail, native fish, ranid frogs program (lowland leopard frog), marsh birds
- Bureau of Reclamation – fish barrier inspections
- U.S. Fish and Wildlife Service (FWS) – Mexican spotted owl, native fish, western yellow-billed cuckoo, southwestern willow flycatcher, Chiricahua leopard frog, listed species
- Northern Arizona Grotto Association – cave and karst features, bat guano DNA analysis, bat roosting and hibernating information
- Northern Arizona University (NAU) – narrow-headed gartersnake, black-hawk, western yellow-billed cuckoo, southwestern willow flycatcher, Chiricahua leopard frogs, springsnails
- Bat Conservation International (BCI) – acoustic monitoring recording echolocations
- Friends of the Verde River (FOVR) – southwestern willow flycatcher
- Desert Botanical Garden – Sensitive and domesticated Verde Valley agave species
- Northern Arizona Audubon Society - Christmas bird count, e-bird and rare bird sightings
- Friends of Northern Arizona Forests (FoNAF) – aspen exclosures, aspen browsing resistance

4FRI MPMB

Member organizations of the 4FRI MPMB are engaged in the following monitoring of wildlife resources in the Coconino National Forest:

Songbirds: The 4FRI MPMB, in particular the Rocky Mountain Research Station (RMRS), has contracted with the Bird Conservancy of the Rockies (BCR) since 2015 to conduct avian monitoring as part of the Integrated Monitoring in Bird Conservation Regions (IMBCR) program: a large, multi-scale avian monitoring program with a statistically rigorous sampling design (Pavlacky et al. 2017). BCR monitors avian density and occupancy, and estimates trends for native bird populations in different types of habitat, conducting surveys in both pre- and post-treatment areas.

In the 2022 field season, BCR conducted bird surveys in three pre-treatment areas and one

previously surveyed area in the Coconino and Kaibab National Forests. In these areas, they counted 4,600 individuals of 69 avian species. Two of the Coconino's songbird focal species, the Grace's warbler and the black-throated gray warbler were identified, Grace's warbler in every area surveyed, and black-throated gray warbler in the previously surveyed area.

Other Wildlife and Plant Monitoring

In addition to that required by the revised Coconino Forest Plan for these three fiscal years (required annually), wildlife and plant monitoring completed in FYs 2021 to 2022 included:

In fiscal year (FY) 2021:

- Mexican spotted owl – surveys of 63 Protected Activity Centers (PACs) (forest-wide) and recovery habitat (Flagstaff and Mogollon Rim RDs)
- Narrow-headed garter snake – multiple surveys, disease testing, captive breeding program with NAU (Red Rock RD)
- Chiricahua leopard frog – habitat monitoring (Red Rock RD), surveys (AZGFD, USFWS)
- Federally listed and sensitive fish – creek surveys by AZGFD (Mogollon Rim and Red Rock RDs)
- Bald eagle – winter survey routes (forest-wide)
- Golden eagle – nest monitoring (Flagstaff RD)
- Northern goshawk – surveys of 10 Post-fledging Family Areas (PFAs) and potential habitat (Flagstaff & Mogollon Rim RDs)
- Northern leopard frog – visual encounter surveys of 175 springs, lakes, and stock tanks (Flagstaff and Mogollon Rim RDs)
- Peregrine falcon – nest monitoring (sites on Flagstaff & Red Rock RDs)
- NABat – acoustical monitoring of seven cells (forest-wide)
- Bats – roost monitoring and white-nose syndrome monitoring (Red Rock RD)
- American kestrel – nest box monitoring (Red Rock RD)
- Osprey – nest monitoring (Flagstaff RD)
- Nightjar – route surveys (Red Rock and Flagstaff RDs)
- Colonial waterbird – nest monitoring (forest-wide)
- Marshbird – surveys (forest-wide)
- Christmas Bird Count (Red Rock RD)
- Arundo wasp (Red Rock RD)
- Aquatic snails – inventory/surveys (Red Rock RD, AZGFD)
- Arizona cliffrose – monitoring (Red Rock RD)
- San Francisco Peaks ragwort – surveys (Flagstaff RD)
- Special status agave – inventory (Red Rock RD)
- Lichen – inventory (Red Rock RD)
- Milkweed (Red Rock RD)
- Emory oak (Red Rock RD)

- Four-nerve daisy – habitat monitoring (Red Rock RD)

In FY 2022:

- Mexican spotted owl – surveys of 70 PACs (forest-wide) and recovery habitat (Flagstaff and Mogollon Rim RDs) with USFWS, Bird Conservancy of the Rockies (BCOR)
- Southwestern willow flycatcher – surveys by NAU (Red Rock RD)
- Western yellow-billed cuckoo – surveys by NAU (Red Rock RD)
- Narrow-headed garter snake – multiple surveys, disease testing, captive breeding program with NAU (Red Rock RD)
- Fossil springsnail – surveys of known populations by AZGFD (Red Rock RD)
- Federally listed and sensitive fish – creek surveys by AZGFD (Mogollon Rim and Red Rock RDs)
- Bald eagle – winter survey routes (forest-wide)
- Golden eagle – nest monitoring (Flagstaff RD)
- Northern goshawk – surveys of 17 PFAs and potential habitat (Flagstaff & Mogollon Rim RDs)
- Northern leopard frog – visual encounter surveys of 188 springs, lakes, and stock tanks (Flagstaff and Mogollon Rim RDs)
- Peregrine falcon – nest monitoring (sites on Flagstaff & Red Rock RDs)
- Common black-hawk – Fossil Creek surveys (Red Rock RD)
- Black-tailed prairie dog – town survey & mapping (Flagstaff RD)
- NABat – acoustical monitoring of seven cells (forest-wide)
- Bats – roost monitoring (Red Rock RD)
- American kestrel – nest box monitoring (Red Rock RD)
- Osprey – nest monitoring (Flagstaff RD)
- Nightjar – route surveys (Red Rock and Flagstaff RDs)
- Colonial waterbird – nest monitoring (forest-wide)
- Marshbird – surveys (forest-wide)
- Christmas Bird Count (Red Rock RD)
- Arundo wasp (Red Rock RD)
- Arizona cliffrose – monitoring (Red Rock RD)
- San Francisco Peaks ragwort – surveys (Flagstaff RD)
- Special status agave – inventory (Red Rock RD)
- Lichen – inventory (Red Rock RD)
- Fossil Creek fungi – inventory (Red Rock RD)
- Milkweed (Red Rock RD)

The management activities implemented in functional at-risk or nonfunctional stream riparian areas, the acres of aspen protected or maintained, and the springs improved or restored have moved these forest resources toward their desired conditions. They have improved habitat for

aquatic and riparian-dependent threatened, endangered, or proposed species, and contributed to habitat diversity and early seral stages in forest ERUs by:

- Maintaining or improving native riparian vegetation along streambanks and around springs.
- Reducing riparian fragmentation, the threat of excessive sedimentation, soil compaction, water quality concerns, and vegetation damage from dispersed recreation.
- Reducing the threat of uncharacteristic wildfire.
- Reducing invasive plants (see Invasives, Insects, and Disease section).
- Protecting springs, their sources, and their cultural values from degradation.
- Protecting aspen with fencing, planting aspen, releasing aspen with conifer weeding and maintenance treatments, and treating for oystershell scale.
- Making progress in meeting forest plan objectives for Riparian Forest Types, Wetlands, Springs, and Aspen and Maple (see the Plan Amendments/Objectives section).

In riparian and spring areas treated, protective vegetative ground cover is increasing, and soil productivity and function is improving. Compaction and erosion is reduced. Aspen restoration on the Flagstaff Ranger District is making great progress and on target to meet forest plan objectives.

Recommendations

Based on these results, the Coconino is not considering any changes to the management direction for aquatic and riparian-dependent threatened, endangered, and proposed species habitat, including springs and aspen stands, in the revised Coconino Forest Plan. The forest is making great progress on the wildlife, fish, and plant objectives in the Forest Plan, meeting or exceeding all but one of them in the first five years of this 10-year planning period.

Treatments in the 4FRI PACs need to be prioritized to complete this monitoring effort and facilitate mechanical treatments in other PACs. Prescribed fire is needed in conjunction with mechanical treatments in PACs to move MSO habitat further toward desired conditions.

The data for Monitoring Questions 4 and 5 related to snags, downed logs, and tree diversity need to be gathered and analyzed in a coordinated way in order to respond to these forest plan monitoring questions more precisely in the next BMER.

The Coconino is investigating ways to better address the comparisons between treated and untreated survey areas in monitoring for focal species. One source of information for changes in Grace's warbler population is through collaboration with the Four Forest Restoration Initiative Multi-Party Monitoring Board (4FRI MPMB) Wildlife Subgroup. They have an ongoing effort to look at trends in songbird species (including Grace's warbler) in a subset of forest restoration projects with pre- and post-treatment monitoring. Data collection is anticipated to be completed by FY 2025. To address potential changes in trends for the black-throated gray warbler and juniper titmouse, the Coconino is considering implementing a similar effort in pinyon-juniper habitats in the coming years.

Recreation Opportunities

Monitoring Questions 26 and 27 look at additions and improvements to the recreation opportunities on the Coconino National Forest.

Monitoring looks at the number of new facilities, and the number of miles and types of new trails provided. It also looks at the number of facilities and dispersed recreation sites that have been improved, relocated, or decommissioned to protect forest resources.

26. How many new recreation opportunities have been added to the system?

Monitoring Question 26 looks at the number of new facilities and the number of miles and type of new trail provided, as recorded in the INFRA database.

27. How many recreation sites or locations have been improved, relocated, or decommissioned in response to known resource damage?

Monitoring Question 27 addresses the need to change recreation sites where resource damage is occurring. It looks at the number of facilities and dispersed sites that have been modified to protect forest resources, as recorded in the INFRA and Planning, Appeals, Litigation System (PALS) project databases.

Monitoring Results

The following table reflects the number of new facilities and the number of miles and type of new trail, as well as the number of recreation sites or dispersed recreation sites that were improved, relocated, or decommissioned in response to known resource damage, in FYs 2021 and 2022.

Table 11. Number and Miles of New or Modified Recreation Opportunities

Recreation Opportunities	FY2021	FY2022	2-year Total
Number of new facilities	0	1	**1**
New trails			
Non-motorized (miles)	2.5	9.6	**12.1**
Motorized (miles)	0	0	**0**
Number of facilities/dispersed sites			
Improved	0	16	**16**
Relocated	0	0	**0**
Temporarily Closed	0	1	**1**
Decommissioned	0	0	**0**

*Acre totals are approximate due to overlapping treatments in some areas (multiple treatments on the same acres).

Table 12. Recreation Projects in FYs 2021 and 2022

Project Title	Description	Results
Mescal Trailhead (New Facility)	Constructed new trailhead near the junction of FSR 152B and FSR152C to provide additional parking and trail access in the Dry Creek Road area. The trailhead includes a parking lot for at least 40 vehicles, including two oversize spots and an accessible parking spot; restroom facility; two picnic areas; a scenic vista point; trash receptacles; and a shuttle stop for city of Sedona operated buses to provide public transit.	Safe parking opportunities to reduce the number of vehicles parked along Dry Creek Road which posed a public safety concern; new accessible parking; new bus stop provides for off-site parking and public transit to the site, resulting in reduced vehicle congestion; new restrooms mitigate human waste in the area; and dedicated picnic areas with trash receptacles reduce litter in the area and negative impacts on wildlife from litter consumption.
West Sedona Designated Dispersed Camping & Day-Use (New Designated Dispersed Campsites)	Designated eight main areas for dispersed camping in the west Sedona area, five of which are adjacent to FSR 525. The project accommodates up to 200 campsites.	This system will protect natural resources, keep the landscape from being dotted by the creation of dispersed campsites, and will still provide many places for visitors to camp and enjoy the beauty of west Sedona.
Replace Toilets at Developed Rec. Sites	As part of a Great American Outdoor Act (GAOA) project, the forest replaced 16 toilets at various campgrounds and day-use sites. All of these toilets were identified in INFRA for replacement.	Replacing aged toilets with new toilets to address deferred maintenance concerns. The locations of toilets replaced include Clear Creek CG, Little Elden Springs Horse Camp CG, Double Springs CG; Forked Pine CG, Ashurst Lake CG, Kinnikinick Day-Use,

Project Title	Description	Results
		Weatherford TH, Lockett Meadow CG, Kendrick Cabin, Mormon Lake GS, Dairy Springs CG, Halfway Day-Use, and Apache Maid Lookout.
Visitor Center Improvements (Improved Site)	As part of a Great American Outdoor Act (GAOA) this project addresses some of the deferred maintenance at the RRRD Visitor Center – including new exterior paint, new carpet, new concrete staining, repairs to automatic doors, plumbing, and the potable water filling areas and drip irrigation system.	An improved visitor use experience at the RRRD visitor center.
Banjo Bill Day-Use Site (Temporarily Closed)	This site was closed on March 30, 2022, due to a rock fall in the area. Two large boulders caused damage at the site and there was an obvious public health and safety concern. It remains closed to this date for further monitoring/evaluation to determine if the site is safe to re-open OR if rock mitigation work is needed in the area.	Mitigation of public health and safety concern due to rock fall.
Cinder Hills OHV Project	The Cinder Hills Off-highway Vehicle area has sizeable outstanding maintenance needs. As part of a Great American Outdoor Act (GAOA), this project addressed elements of the deferred maintenance needs at the Cinder Hills OHV area including the construction of a new boundary fence and trailhead improvements, with visitor etiquette info at new kiosks.	Provided a new boundary fence to reduce unauthorized intrusion into the area which caused negative resource impacts on vegetation and soils. The new kiosks provide visitors with proper OHV etiquette and safety messaging provided by Treadlightly!
New Trail Construction (includes reroutes)	• Lower Moto Trail / Reroute / 1.5 mi. / 2021 • Arizona National Scenic Trail Equestrian Bypass / Reroute / 1 mi. / 2021 • Arizona National Scenic Trail Walnut Canyon / Reroute /1 mi. / 2022 • Big Bang Trail / New Construction / 4.4 mi. / 2022 • Afterglow Trail / New Construction / 0.4 mi. / 2022 • Brookbank Trail / Reroute / 2 mi. / 2022 • Down Under Trail / New Construction / 0.5 mi. / 2022 • Oldham (middle) / New Construction / 0.5 mi. / 2022 • Schultz Creek / Reroute(s) / 0.6 mi / 2022 • Big Park Loop Trail / Reroute / 0.1 mi. / 2022 • Llama Trail / Reroute / 0.1 mi. / 2022	New trail construction and trail reroutes to provide improved and sustainable trail design, layout, and construction, while enhancing the user experience. Also addressed erosion issues and other resource concerns, such as moving the trails out of intermittent waterways (e.g., Shultz Creek Trail reroute).

Forest Leadership Team (FLT) Monitoring

In addition to the monitoring reported above, one of the projects monitored by the Coconino FLT in 2022 was the Oak Creek Watershed Restoration Project (OC WRAP). The purpose of the OC WRAP is to protect the watershed while managing visitor behavior along Oak Creek. It includes essential projects to remove unauthorized parking areas, remove or harden social trails, decommission unauthorized motorized routes, develop recreation sites to minimize high-use impacts, and improve aquatic organism passage by installing a new road crossing structure at Spring Creek.

Partners in this multi-year project are the Arizona Department of Transportation (ADOT), the Arizona Department of Environmental Quality (ADEQ), the National Forest Foundation, Arizona State Parks and Trails, Conservation Legacy, the Oak Creek Watershed Council, and Natural Channel Design. Implemented activities in 2020, 2021, and 2022 include:

- Closure of 27 unauthorized parking areas (guardrail installation by Arizona Department of Transportation (ADOT).
- Rehabilitation of approximately 320 unauthorized inventoried social trails (low-impact engineering techniques by Natural Channel Design, and Conservation Legacy crews).
- Installation of pet-waste stations.
- Installation of fencing and rehabilitation of social trails to limit access to essential riparian habitat for narrow-headed gartersnakes.

The goals of this monitoring visit were to: 1) look at the effectiveness of the implementation in meeting the objectives for the OC WRAP; 2) and evaluate how well implemented activities are maintaining or making progress toward desired conditions for riparian health, soil stability, watershed protection, wildlife habitat, scenic resources, and recreation management (including trails and trailheads) in the Oak Creek Canyon Management Area.

The review team made three stops in Oak Creek to view and discuss restoration treatments: the rehabilitated pathway at West Fork, a pullout close to Manzanita Campground, and a pullout next to the entrance to Slide Rock State Park. The team found that the different methods, techniques, and activities implemented so far are meeting the purpose and objectives of the OC WRAP, are improving watershed conditions, and are moving toward desired conditions in the Oak Creek Canyon Management Area and the Middle and Lower Oak Creek priority watersheds. The work is moving toward desired conditions for riparian health, soil stability, watershed protection, wildlife habitat, scenic resources, and recreation management. This project helps improve the entire Verde River system as it reduces *E.coli* inputs and erosion and downstream sediment transport.

Overall conclusions and recommendations from this FLT monitoring fieldtrip include the following:

1. The areas visited and observed are responding as expected and most project objectives have been met; other project objectives will take time for habitat and species to respond. Project implementation will continue in Oak Creek Canyon.

2. Vegetation is re-growing on the rehabilitated social trails, controlled access is improving narrow-headed gartersnake riparian habitat throughout Oak Creek Canyon and reducing snake\people interactions, and recreational safety has been improved on 75 hardened trails. The effects of management activities on some species and habitat take time for trends to be observed; gartersnake and macroinvertebrate monitoring will continue into the future.
3. Additional unauthorized parking areas need to be closed. Long-term maintenance of pet waste stations is needed. Federal funding through the Bipartisan Infrastructure Law is available through 2026, with additional funding from partners. Funding will be needed in the future to continue the many OC WRAP efforts, including decommissioning of roads, improving recreation sites, and installing an aquatic organism passage-approved bridge across Spring Creek.

Partners in Recreation Monitoring

- Oak Creek Watershed Council – recreational trail photo points

In summary, in FYs 2021 and 2022, the Coconino constructed a new trailhead, replaced 16 toilets at various campgrounds and day-use sites, made improvements at a visitor center to address deferred maintenance concerns, constructed and designated eight new dispersed camping areas, temporarily closed a day-use site for public health and safety purposes, made improvements at an OHV area, and constructed 12.1 new miles of trail.

These new recreation opportunities and improvements were funded with various grants and Great American Outdoors Act funds. The Coconino anticipates further improvements at campgrounds, day-use sites, and trail systems across the forest in FYs 2023 thru 2025.

Recommendations

Based on these results, the Coconino is not considering any changes to the management direction for Recreation Management in the revised Coconino Forest Plan. However, the forest should consider developing a recreation monitoring program to inform future management decisions. This could include monitoring of motorized and non-motorized trails, wilderness management, developed and dispersed recreation sites, and winter sports.

The forest will continue to provide recreational opportunities that do not damage other forest resources. Additional improvements of campgrounds, day-use sites, and trail systems across the Coconino in FYs 2023 and 2024 will be reported in the FY 2025 BMER.

Scenic Integrity

Monitoring Question 28 looks at the progress toward scenic integrity desired conditions in areas identified as needing rehabilitation.

Monitoring looks at the acres of fire and vegetation treatments in the Scenic Integrity Objectives rehabilitation areas, as well as the percentage of acres in them that have been thinned and burned and that improved by at least one level.

28. How much have management activities contributed to progress toward scenic integrity desired conditions in areas identified as needing rehabilitation?

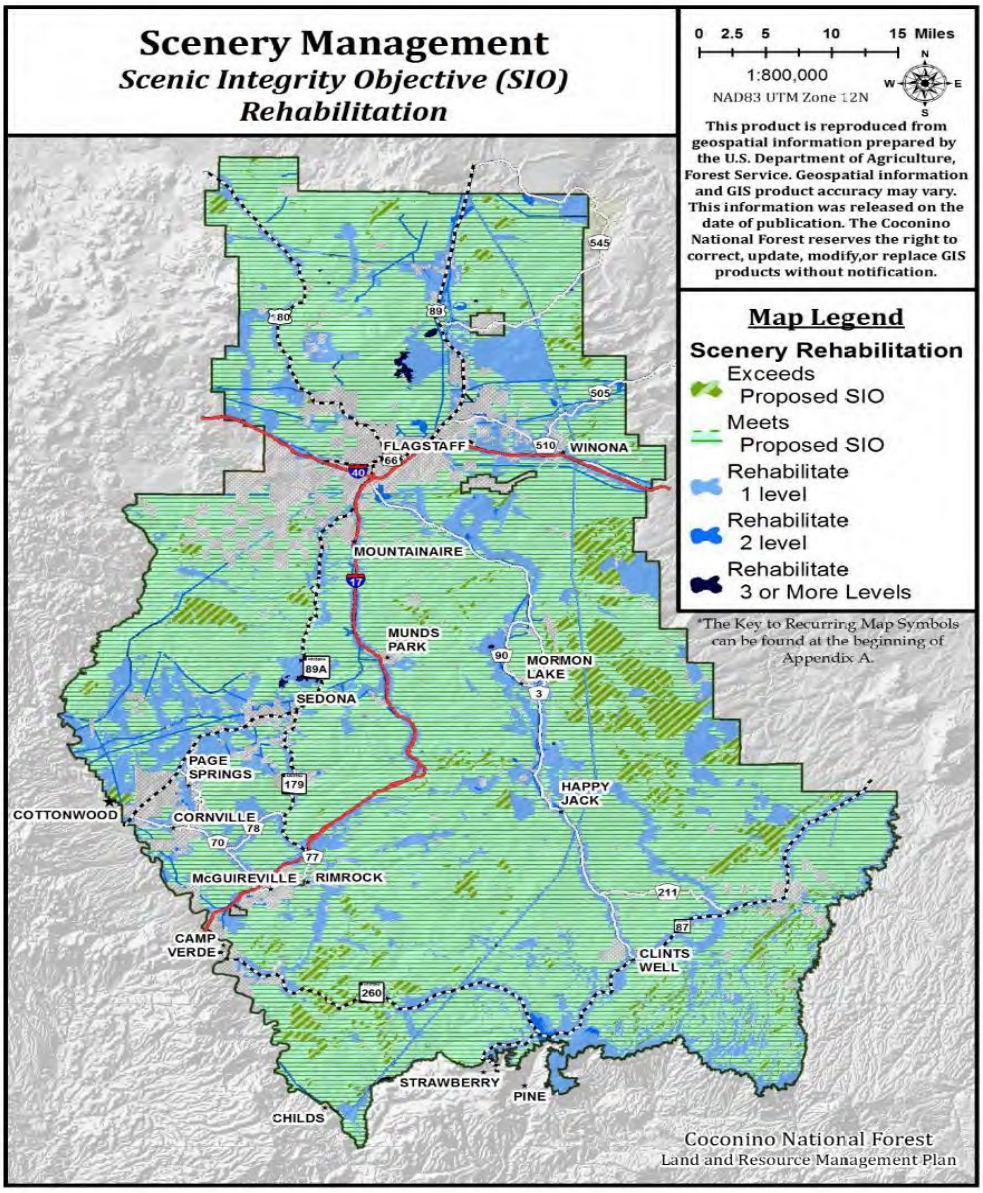
The Coconino NF is divided into four levels of desired scenic integrity: very high, high, moderate, and low. These levels set objectives for the amount of variation from the desired landscape character that is permissible within the scenic integrity level.

Table 54, Scenery Rehabilitation Acreage, in the forest plan's Final Environmental Impact Statement (FEIS, Vol. I, p. 305) shows the acreage exceeding and meeting desired conditions for scenery and those acres identified for rehabilitation.

Table 13. Acres and Percent of Forest Exceeding or Meeting SIOs or Needing Rehabilitation352810

Summary	Acres	Percent of Forest
Exceeds scenic integrity objective (desired condition)	188,109	6
Meets scenic integrity objective (desired condition)	1,322,194	72
Rehabilitate (1 level to meet scenic integrity objective)	352,810	19
Rehabilitate (2 levels to meet scenic integrity objective)	39,138	2
Rehabilitate (3 or more levels to meet scenic integrity objective)	4,065	<1

Map 14 in Appendix A (Maps) to the revised Coconino Forest Plan displays those areas identified as needing rehabilitation to meet proposed Scenic Integrity Objectives (SIOs). This map shows what areas on the forest already exceed or meet the proposed SIOs, as well as those areas that have been identified as needing one, tw39138o, or three or more levels of rehabilitation.



In areas identified for rehabilitation, existing visual impacts may be managed through site-specific projects, such as vegetation treatments, fuels reduction, prescribed fire, etc., to improve the scenic integrity in the long term. Any of the areas identified for rehabilitation, if improved by one scenic integrity objective, would meet the objective. Areas identified to be rehabilitated by two or more levels may not realize the overall desired scenic integrity for several planning cycles.

For vegetation treatments, guidelines for all scenic resources include reducing the visibility of management-created debris such as slash, slash piles, and stumps. These guidelines, along with

the proposed SIOs, would manage for natural-appearing scenery and reduce negative effects from vegetation management activities on scenery viewed in concern level 1 and 2 travel corridors.

In regard to fire management, fire would play a more natural role on the landscape. By implementing the scenery management system, the effects of fire, burning in the natural disturbance regime of fire-adapted ecosystems, would be part of the desired condition of the landscape character. Typically, when fire burns with low intensity and severity or in a mosaic pattern, the valued landscape character attributes would be intact or mostly intact.

Monitoring Results

The following table reflects the acres of both fire and vegetation treatments completed in areas identified for SIO rehabilitation, as well as the percentage of acres in each SIO rehabilitation level that have been thinned and burned, in FYs 2021 and 2022.

Table 14. Acres of Treatments in Forest Plan SIO Rehabilitation Levels

SIO Rehabilitation Level[1]/ Management Activity*	FY2021	FY2022	2-year Total
Rehabilitate 1 Level			
Prescribed Fire	1,518	715	**2,233**
Wildfire for Resource Objectives	4,918	-	**4,918**
Mechanical Treatments	411	611	**1,022**
% of Rehabilitation Level	1.9 %	0.4 %	**2.3 %**
Rehabilitate 2 Levels			
Prescribed Fire	342	9	**351**
Wildfire for Resource Objectives	1,155	-	**1,155**
Mechanical Treatments	16	325	**341**
% of Rehabilitation Level	3.9 %	0.8 %	**4.7 %**
Rehabilitate 3 Levels			
Prescribed Fire	11	-	**11**
Wildfire for Resource Objectives	414	-	**414**
Mechanical Treatments	-	-	**-**
% of Rehabilitation Level	10.4 %	0 %	**10.4 %**
Total Acres by Year	**75,003**	**8,453**	**83,456**

*Acre totals are approximate due to overlapping treatments in some areas (multiple treatments on the same acres).
[1] SIO Rehabilitation Level = the number of levels of rehabilitation needed in an area to reach its des5red SIO.

The projects in which these mechanical treatments were implemented include the Arizona Snowbowl Agassiz Lift Replacement, North Forest Grassland Restoration, Hart Prairie Fuels Reduction and Forest Health, Elk Park Fuels Reduction and Forest Health, Flagstaff Watershed

Protection, Railroad Forest Health and Fuel Reduction, Four Forest Restoration Initiative (4FRI), and Clints Well Forest Restoration Projects.

The fire treatments include those for the Bar T Bar and Anderson Springs Range Allotment Management, Clints Well Forest Restoration, Flagstaff Watershed Protection, and 4FRI Projects. Parts of the Backbone and Rafael wildfires added to these treatments in the scenic rehabilitation areas.

These site-specific vegetation and fire treatments in these areas identified for rehabilitation were designed and implemented to maintain or move toward the desired SIOs. The standards and guidelines for scenic resources and design features and BMPs for visuals and scenery were followed per forest plan direction, and visual inspections were required to assess compliance with Forest Plan desired conditions. This is documented in contract administration documents, sale contract provisions, plan-in-hand documents, resource reviews of task orders, silvicultural prescriptions, and quality control plans in project stewardship agreements. Design features include “feathering” of mechanical treatments, using directional marking, retaining particular trees for scenic value, keeping stump heights to six inches or lower, requiring treatment of or removal of slash from mechanical treatments, and creating irregularly-shaped regeneration openings of small size (less than one acre).

In areas identified for rehabilitation, existing visual impacts were managed through these site-specific vegetation and fire treatments. These management activities, though adding to scenery impacts in the short term during and immediately after treatment, meet the objective of improving the scenic integrity objective by at least one level over the long term. Evidence of fire and vegetation treatments was removed and the treatment area restored in a timely manner, except where evidence of fire was within the natural range of variability. For example, pile burning removed the piles of slash from mechanical treatments. Stands treated with prescribed burning or wildfire for resource objectives looked burned and blackened for the short term, but reduced ground and ladder fuels and prompted fresh new forb and grass growth in the next growing season. This not only reduced the risk of uncharacteristic fire, but improved the healthy open park-like appearance of the treated stands.

Recommendations

Based on these results, the Coconino is not considering any changes to the direction for Scenery Management in the revised Coconino Forest Plan. The forest will continue treatments in those parts of the forest identified as needing rehabilitation to meet the SIO, monitoring the use of scenery standards and guidelines and BMPs. The forest does not currently have a scenery management specialist or landscape architect.

Plan Amendments, Objectives

Monitoring Questions 29 and 30 look at any unforeseen issues that require plan amendments, and the progress made toward meeting the objectives laid out in the revised Coconino Forest Plan.

29. Have there been changes that have resulted in unforeseen issues requiring plan amendments? (sec. 219.12(k))

30. How do actual accomplishments compare with plan objectives? (sec. 219.12(k)(1))

Plan Amendments

In FYs 2021 and 2022, no amendments were made to the revised Forest Plan. Two (2) plan amendments are foreseen in the next two fiscal years: the Fossil Creek Wild and Scenic River Comprehensive River Management Plan approved in October 2021, and new management direction for the San Francisco Peaks Tradition Cultural Property.

Plan Objectives

The revised Coconino Forest Plan includes the following objectives related to the monitoring questions addressed in this 2023 Biennial Monitoring Evaluation Report. The amount of these objectives fulfilled in FYs 2021 and 2022 (in addition to the first three years of the planning period) is described as follows:

Objectives for Grassland ERUs

FW-TerrERU-Grass-O

1 Restore or improve at least 3,500 acres of Semi-desert Grasslands during each 10-year period over the life of the plan.

2 Restore or improve 10,800 to 12,400 acres of Great Basin Grasslands during each 10-year period over the life of the plan.

3 Restore or improve 7,600 to 11,400 acres of Montane/Subalpine Grasslands during each 10-year period over the life of the plan.

In FYs 2021 and 2022, approximately 5,090 acres of Semi-desert Grasslands were treated as a

result of wildfire or for invasives reduction; 2,050 acres of Great Basin Grasslands were treated mechanically, with fire, or for invasives reduction; and 820 acres of Montane/Subalpine Grasslands had mechanical, fire, and invasives treatments. Adding the 110, 2,150, and 2,470 acres treated in these grassland ERUs, respectively, in the first three years of this 10-year planning period (FYs 2018-2020), the forest has met:

- more than 100% (5,200 acres) of the objective for Semi-desert Grasslands.
- almost 39% (4,200 acres) of the objective for Great Basin Grasslands.
- more than 43% (3,300 acres) of the objective for Montane/Subalpine Grasslands.

In order to fully meet the objectives for these grasslands, approximately 6,600 acres of Great Basin Grasslands, and 4,300 acres of Montane/Subalpine Grasslands, need to be restored or improved in FYs 2023 to 2028, the remaining five years of this planning period.

Objectives for Pinyon Juniper ERUs

FW-TerrERU-PJ-O

1 Mechanically treat between 1,000 and 10,000 acres of Pinyon Juniper with Grass during each 10-year period over the life of the plan.

2 Use naturally ignited wildfires (lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres of Pinyon Juniper with Grass within the natural fire regime during each 10-year period over the life of the plan.

3 Use naturally ignited wildfires (lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres in Pinyon Juniper Evergreen Shrub within the natural fire regime during each 10-year period over the life of the plan.

Approximately 5,200 acres of the Pinyon Juniper with Grass ERU were treated mechanically, with wildfire, or for invasives reduction in FYs 2021 and 2022. Adding the 760 acres of this ERU treated in the first three years of this planning period, the forest has already met more than 100% (5,960 acres) of the minimum acres and almost 60% of the maximum acres for the 1st Pinyon Juniper ERUs objective in this first five years.

Approximately 4,840 acres of naturally-ignited wildfire were managed for resource objectives in the Pinyon Juniper with Grass ERU in FYs 2021 and 2022. Adding the 2,770 acres of this ERU treated with wildfire in the first three years of this planning period, the Coconino has already met more than 100% (over 7,600 acres) of the objective for the current 10-year period of the Forest Plan.

Approximately 30,740 acres of naturally-ignited wildfire were managed for resource objectives in the Pinyon Juniper with Evergreen Shrub ERU in FYs 2021 and 2022. Thus the forest has already treated more than the 3,750 acres objective in the first five years of this first 10-year planning period.

Objective for Aspen and Maple

FW-TerrERU-AspMpl-O

1 Restore at least 1,000 acres of aspen and maple during each 10-year period over the life of the plan. Restoration could include, but is not limited to, activities that promote regeneration, remove competing vegetation, or remove disturbances that could negatively impact aspen or maple.

From 290 to 310 acres of aspen were protected or maintained in each of FYs 2021 and 2022 with fencing, aspen release, and oystershell scale treatments. Adding the 290 to 420 acres of aspen treated in the first three years of this planning period, the Coconino has already restored up to 730 acres (almost 73%) of the objective for aspen and maple for this 10-year planning period. Aspen restoration on the Flagstaff Ranger District is making great progress and on target to meet forest plan objectives.

Though silviculture prescriptions specify that maples are not to be damaged or cut, there is no record of any specific maple restoration activities taking place during these two fiscal years.

In order to fully meet the objective for aspen and maple, about 270 more acres of these species need to be restored in FYs 2023 to 2028, the remaining five years of this planning period.

Objectives for Ponderosa Pine

FW-TerrERU-PP-O

1 Use prescribed cutting to treat 50,000 to 260,500 acres of Ponderosa Pine during each 10-year period over the life of the plan.

2 Use prescribed fire to underburn 150,000 to 200,000 acres of Ponderosa Pine within the natural fire regime during each 10-year period over the life of the plan.

3 Use naturally ignited wildfires (lightning-caused fires that are managed for resource objectives) to treat at least 135,000 acres of Ponderosa Pine within the natural fire regime during each 10-year period over the life of the plan.

In FYs 2021 and 2022, approximately 13,640 acres of Ponderosa Pine were treated with some type of cutting. Adding the 12,340 acres treated in FYs 2018 to 2020 in the Ponderosa Pine ERU, the forest has met about 52% (25,980 acres) of the minimum acres and almost 10% of the maximum acres for the 1st Ponderosa Pine ERU objective in this first five years. In order to meet the minimum for this objective, about 24,020 acres of the Ponderosa Pine ERU needs to be mechanically treated in FYs 2023 to 2028, the remaining five years of this planning period.

Approximately 7,400 acres were treated with prescribed fire, and 16,800 acres were burned with naturally-ignited wildfire, in FYs 2021 and 2022. Adding the 59,630 acres of prescribed fire and 13, 820 acres of wildfire treatments in the previous three FYs, the Coconino has met almost 45% (67,030 acres) of the minimum acres for prescribed fire and almost 23% (30,620 acres) percent of the acres for naturally-ignited wildfire in the Ponderosa Pine ERU, for the current 10-year period of the Forest Plan. Meeting the objective for managing naturally-ignited wildfires for

resource objectives will be dependent upon the occurrence of lightning-caused fires in the Ponderosa Pine ERU. In order to meet the objective for prescribed fire in this ERU, approximately 82,970 acres need to be underburned with prescribed fire in the remaining five years of this planning period (FYs 2023 to 2028).

Objectives for Mixed Conifer ERUs

FW-TerrERU-MC-MCFF-O

1 Use prescribed cutting to treat 2,900 to 15,000 acres of Mixed Conifer with Frequent Fire during each 10-year period over the life of the plan.

2 Use prescribed fire on at least 8,000 acres of Mixed Conifer with Frequent Fire within the natural fire regime during each 10-year period over the life of the plan.

3 Use naturally ignited wildfires (lightning-caused fires managed for resource objectives) to treat at least 7,500 acres of Mixed Conifer with Frequent Fire within the natural fire regime, during each 10-year period over the life of the plan.

Approximately 810 acres of mechanical treatments were completed in Mixed Conifer ERUs in FYs 2021 and 2022. With almost 1,000 acres treated with some type of cutting in FYs 2018 to 2020, the forest met a little more than 62% (1,810 acres) of the minimum acres for the 1st Mixed Conifer ERUs objective in this first five years. In order to meet the minimum for this objective, about 1,090 acres needs to be mechanically treated in FYs 2023 to 2028, the remaining five years of this planning period.

Approximately 60 acres of these ERUs were treated with prescribed fire, and 200 acres were burned with naturally-ignited wildfire, in FYs 2021 and 2022. Adding the 660 acres of prescribed fire and 4,580 acres of wildfire treatments in the previous three FYs, the Coconino has met almost 9% (720 acres) of the minimum acres for prescribed fire and about 64% (4,780 acres) of the acres for naturally-ignited wildfire in the Ponderosa Pine ERU, for the current 10-year period of the Forest Plan. Meeting the objective for managing naturally-ignited wildfires for resource objectives will be dependent upon the occurrence of lightning-caused fires in the Mixed Conifer ERUs. In order to meet the objective for prescribed fire in these ERUs, approximately 7,280 acres need to be underburned with prescribed fire in the remaining five years of this planning period (FYs 2023 to 2028).

Objectives for Riparian Forest Types

FW-Rip-RipType-O

1 Restore the function of 200 to 500 acres of nonfunctioning and functioning-at-risk riparian areas during each 10-year period over the life of the plan, with emphasis on priority 6th code watersheds, so that they are in or moving toward proper functioning condition.

In FYs 2021 and 2022, approximately 15 acres of Montane Willow Riparian Forest had prescribed cutting, almost 1 acre of Montane Willow Riparian Forest was treated with prescribed fire, and about 560 acres of Cottonwood Willow and Mixed Broadleaf Montane Riparian Forest were treated with naturally-ignited wildfire for resource objectives.

As the Watershed Improvement Tracking (WIT) database reports, and as displayed in the Watershed and Soils section above, 10 acres of functional-at-risk or nonfunctional stream riparian areas and wetlands were improved in FY2021, and close to 160 acres were improved in FY2022. Adding the 300 acres of prescribed treatments and wildfire conducted in FYs 2018 to 2020, the Coconino has met 100% of the maximum acres in this objective. These treatments to meet resource objectives were used to aid in restoring the function of riparian areas.

Objectives for Scenic Resources

FW-Scenic-O

1 Rehabilitate[12] at least 25,000 acres that do not meet the desired SIO by at least one level within 10 years of plan approval.

[12] In the context of scenery management, rehabilitation is a short-term management action used to return a landscape to a desired level of scenic quality formerly found in the natural landscape. While the rehabilitation action may be completed in the short term, the scenic rehabilitation may only be achievable in the long term as a result of the short-term management action.

Approximately 8,170 acres (2.3%) of Rehabilitate 1 Level, 1,850 acres (4.7%) of Rehabilitate 2 Levels, and 430 acres (10.4%) of Rehabilitate 3 Levels identified for the forest received treatments in FYs 2021 and 2022. The total acres treated in these SIO Rehabilitation Levels during the first three years was approximately 16,390 acres. The total number of acres in this first five years of the current 10-year period for the Forest Plan (26,840 acres) constitutes more than 100 percent of the acres to be restored in this objective.

Objectives for Wetlands

FW-Rip-Wtlnds-O

1 Restore 5 to 10 wetlands currently not in proper functioning condition so that they are in, or are trending toward, proper functioning condition during each 10-year period over the life of the plan.

Almost 90 acres of wetland or cienega were treated with prescribed fire in FYs 2018 to 2020, about 10 acres with naturally-ignited wildfire for resource objectives and three acres with prescribed cutting. These 100 acres of prescribed treatments and wildfire to meet resource objectives were used to aid in restoring the function of riparian areas in Long Valley and Houston Draw.

As the Watershed Improvement Tracking (WIT) database reports, and as displayed in the Watershed and Soils section above, 10 acres of functional-at-risk or nonfunctional stream riparian areas and wetlands were improved in FY 2021, and close to 160 acres were improved in FY 2022. Restoration activities in Lockwood Draw, Long Valley, and Houston Draw included loose rock structures and other gully stabilization treatments to address channel incision and de-watering of adjacent slope wetlands. These treatments effectively increased the wetted area adjacent to the stream channels. This work in three forest wetlands in the first five years of the current 10-year period for the Forest Plan represents 60 percent of the minimum number to be restored to meet this plan objective. In order to meet the Wetlands objective fully during this

period, restoration activities need to be implemented in at least two more forest wetlands in FYs 2023 to 2028.

Objectives for Springs

FW-Rip-Spr-O

1 Restore riparian function to at least 25 springs identified as not in proper functioning condition to provide water quantity and aquatic habitat for the recovery of plant and animal species during each 10-year period during the life of the plan.

Ten springs identified as not in proper functioning condition were improved or restored in FYs 2021 and 2022 (as displayed in the Watershed and Soils section above). Adding the three (3) springs restored in FYs 2018 to 2020, the Coconino has now improved or restored 13 springs (52%) in the first five years of the current 10-year planning period for the Forest Plan. In order to meet this objective fully during this period, at least 12 additional springs need to have their riparian function restored in FYs 2023 to 2028.

Objective for Soils

FW-Soil-O

1 Maintain satisfactory soil conditions and/or improve impaired and unsatisfactory soil conditions on 100,000 to 350,000 acres during each 10-year period over the life of the plan. Maintenance and improvement would occur as a result of some management actions in other resources. For example, re-locating a road in a grassland could improve impaired soil conditions.

Monitoring Question 15 looks at the maintenance of long-term soil productivity. Soil condition assessments, looking at the effects on soils from implemented projects, are intended to be conducted every three to five years. There was a lack of BMP monitoring in FYs 2021 and 2022. The Coconino recognizes the need to address this monitoring requirement and the Watershed Program is committed to resuming BMP monitoring in the FY 2023 and 2024 monitoring cycles, planning to complete 14 BMP evaluations.

Objectives for Wildlife, Fish, and Plants

FW-WFP-O

1 Implement at least 20 activities that contribute to the recovery for federally listed species during each 10-year period over the life of the plan. An example of an activity could be thinning a Mexican spotted owl protected activity center to reduce the risk of uncharacteristic fire and to improve habitat conditions for prey species.

2 Implement at least 10 activities to benefit sensitive species that contribute to positive trends to avoid the need for listing during each 10-year period over the life of the plan.

3 Restore or enhance at least 60,000 acres of terrestrial wildlife habitat during each 10-year period over the life of the plan.

4 Restore or enhance at least 70 miles of stream habitat during each 10-year period over the life of the plan.

5 Complete at least 30 products or activities that educate the public about wildlife, fish, and plant

resources during each 10-year period over the life of the plan. Examples of products include educational signs and brochures, website pages, species checklists, presentations, and field trips.

The number of activities (27) implemented in FYs 2018 to 2020 contributing to the recovery of federally-listed species already exceeded that needed to meet this first plan objective for wildlife, fish, and plants. Eight additional activities were completed in FY 2021 and eight in FY 2022, bringing the total in the first five years of this 10-year planning period to 43 activities.

The number of activities (15) implemented in FYs 2018 to 2020 to benefit sensitive species that contribute to positive trends to avoid the need for listing already exceeded that needed to meet this second plan objective for wildlife, fish, and plants. Four additional activities were completed in FY 2021 and six in FY 2022, bringing the total in the first five years of this 10-year planning period to 25 activities.

The number of acres (152,260 acres) of terrestrial wildlife habitat restored or enhanced in FYs 2018 to 2020 already far exceeded that needed to meet this third plan objective for wildlife, fish, and plants. In FYs 2021 and 2022, almost 43, 410 additional acres of terrestrial habitat were improved, bringing the total in the first five years of this 10-year planning period to almost 195,670 acres.

Approximately 39 miles of streams and 170 acres of stream riparian areas were improved in FYs 2021 and 2022. Adding the 29 miles and 80 acres of stream habitat improved in FYs 2018 to 2020, the Coconino met 97% (68 miles) of the miles of stream habitat to be restored or enhanced to meet this fourth plan objective for wildlife, fish, and plants. In order to fully meet this objective during this 10-year planning period, another two miles of stream habitat needs to be restored in FYs 2023 to 2028.

The number of activities (30) conducted in FYs 2018 to 2020 to educate the public about wildlife, fish, and plant resources already met the number needed to meet this fifth plan objective for wildlife, fish, and plants. In FYs 2021 and 2022, another 23 (11 and 12, respectively) of these activities were conducted, bringing the total in the first five years of this 10-year planning period to 53.

Recommendations

Amendments

Fossil Creek Wild and Scenic River Comprehensive River Management Plan (Fossil Creek CRMP) Amendment

The Fossil Creek CRMP and Final Environmental Impact Statement (FEIS) were updated after the Backbone Fire in the summer of 2021. After a Burned Area Emergency Response (BAER) survey and report, a Supplemental Information Report (SIR) was completed. The SIR documented whether or not effects from the fire would result in new effects from implementation of the CRMP not already disclosed in the Fossil Creek FEIS. The SIR concluded that they would not. The Fossil Creek CRMP was updated to recognize and share information about the

Backbone Fire and its effects on the Fossil Creek Wild and Scenic River corridor, and the Record of Decision was signed in October 2021.

The Fossil Creek CRMP and its decision analyzed and approved an amendment to the revised Coconino Forest Plan to:

- Decrease the area of the Fossil Creek Designated Wild and Scenic River Special Area by four acres at T21N, R7E, E 1/2 Section 21 in order to comply with the requirements of Section 3(b) of the Wild and Scenic Rivers Act, which states, "boundaries shall include an average of not more than 320 acres of land per mile.…"
- Include the management direction provided in Chapter 3 of the Fossil Creek CRMP. This management direction would apply to the 2,892 acres within the Fossil Creek Designated Wild and Scenic River Special Area on the Coconino National Forest.
- Recommend an 11.6-acre addition to the Designated Fossil Springs Botanical Area in order to better incorporate the diverse vegetation community in the vicinity of Fossil Springs.

San Francisco Peaks Traditional Cultural Property

The Coconino reinitiated consultation with Tribes and concurring signatories under Section 106 of the National Historic Preservation Act to develop a Memorandum of Agreement (MOA) addressing adverse effects on the San Francisco Peaks Traditional Cultural Property (SFTCP). These effects are disclosed in the Record of Decision for the 2005 Final Environmental Impact Statement for Arizona Snowbowl Facilities Improvements. By engaging in multi-tribal government-to-government consultations to discuss future management of the San Francisco Peaks, the forest has begun updating documentation for the SFTCP. The SFTCP was determined eligible for the National Register of Historic Places in 2000, because of its association with events making a significant contribution to the broad patterns of American history. The SFTCP is associated with the cultural practices and beliefs of Native American communities that are rooted in their history and are important in maintaining the continuing cultural identity of their community.

Informed by updated SFTCP documentation, continued engagement with Tribal nations, and broad public engagement, a plan amendment will be evaluated to refine the desired conditions and management direction (standards and guidelines) for the area in the Coconino Forest Plan. A proposed action for amending the revised Forest Plan will be developed through robust community engagement.

Objectives

Based on the current progress toward meeting plan objectives, the Coconino is not considering any changes to the objectives currently in the revised Coconino Forest Plan. However, in order to fully meet plan objectives in the first 10-year planning period, we need to consider the following:

- In order to fully meet the objectives for grasslands, approximately 6,600 acres of Great Basin Grasslands, and 4,300 acres of Montane/Subalpine Grasslands need to be restored

or improved in FYs 2023 to 2028.

- In order to fully meet the objective for Aspen and Maple, about 270 more acres of these species need to be restored in FYs 2023 to 2028, the remaining five years of this planning period. Consider restoration activities that promote regeneration, remove competing vegetation, or remove disturbances that could negatively impact maple habitat in FYs 2023 to 2028. Continue the great progress being made to restore aspen on the forest.
- In order to meet the minimum objective for prescribed cutting in the Ponderosa Pine ERU, about 24,020 acres of the Ponderosa Pine ERU needs to be mechanically treated in FYs 2023 to 2028, the remaining five years of this planning period.
- In order to meet the objective for prescribed fire in the Ponderosa Pine ERU, approximately 82,970 acres need to be underburned with prescribed fire in the remaining five years of this planning period (FYs 2023 to 2028).
- In order to meet the minimum objective for mechanical treatments in Mixed Conifer ERUs, about 1,090 acres needs to be mechanically treated in FYs 2023 to 2028, the remaining five years of this planning period.
- In order to meet the objective for prescribed fire in Mixed Conifer ERUs, approximately 7,280 acres need to be underburned with prescribed fire in the remaining five years of this planning period (FYs 2023 to 2028).
- In order to fully meet the objective for Wetlands, restoration activities need to be implemented in at least two more forest wetlands in FYs 2023 to 2028.
- In order to fully meet the objective for Springs, restore the riparian function of 12 springs in FYs 2023 to 2028.
- There was a lack of BMP monitoring in FYs 2021 and 2022. The Coconino Watershed Program is committed to resuming BMP monitoring in the FY 2023 and 2024 monitoring cycles, planning to complete 14 BMP evaluations.