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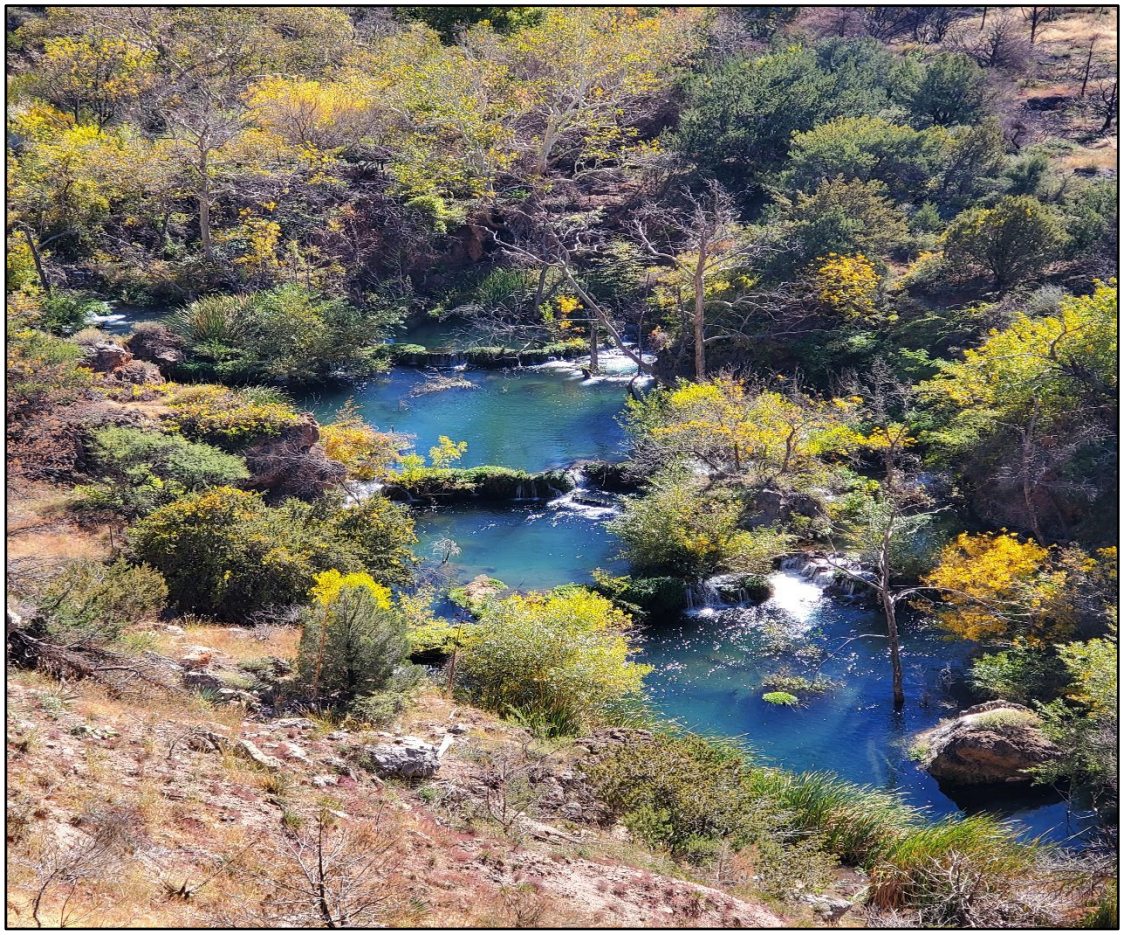
2024 Monitoring Report

Fossil Creek Comprehensive River Management Plan

Coconino & Tonto National Forests



Forest Service

May, 2025

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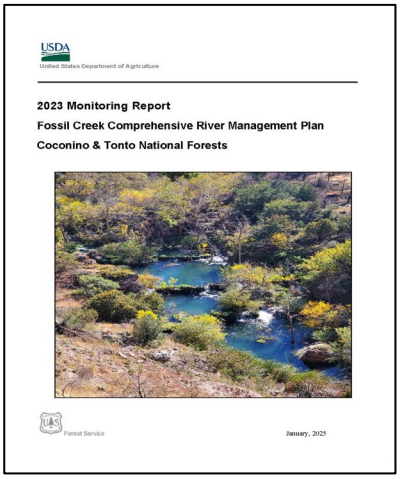
About the Fossil Creek CRMP Monitoring Plan

Purpose

The purpose of this 2024 Fossil Creek Comprehensive River Management Plan (CRMP) Monitoring Report is to inform the tribes, public, partners, stakeholders, and other government agencies of the current status of the monitoring prescribed in the Fossil Creek CRMP monitoring plan, as well as other ongoing monitoring in the drainage.



In the Fossil Creek CRMP, monitoring and adaptive management is related to multiple river values (water, biological, geology, recreation, and cultural values). Monitoring is intended to protect river values, inform CRMP implementation, and highlight the need for adaptive management actions.

If assessment of monitoring data indicates adverse impacts attributable to management actions or visitor use may be occurring, adaptive management actions that are anticipated to lessen these impacts will be implemented. Reaching a soft threshold indicates adverse impacts may be occurring.

The monitoring results presented in this report help the district ranger and forest supervisor assess monitoring results, and recommend and implement adaptive management actions where needed. Partners, community members, and subject matter experts can lend valuable expertise and institutional knowledge to this process, which can increase capacity, promote innovation, develop a shared sense of stewardship, and build trust in the management of Fossil Creek.

The Fossil Creek CRMP monitoring and adaptive management plan (Fossil Creek CRMP, pp. 115-145) addresses the following monitoring topics. These topics are grouped in this report as follows.

- ❖ Bare soil/Potential for delivery of sediment or fecal matter to Fossil Creek
- ❖ Stream flow
- ❖ Common black-hawk occupied territories
- ❖ Fossil springsnail habitat and populations
- ❖ Aquatic macroinvertebrate index of biological integrity (IBI)
- ❖ Non-native plant species
- ❖ Travertine dams
- ❖ Visitor use data/Opportunity for river-based recreation
- ❖ Visitor satisfaction
- ❖ Traditional cultural use

Objectives

- Track monitoring and adaptive management plan implementation.
- Evaluate monitoring data for indicators of adverse impacts attributable to management actions or visitor use (reaching a threshold), and implement adaptive management actions that are anticipated to lessen these impacts.
- Document and report the results of completed monitoring. Document monitoring that has not been completed and the reasons and rationale why. Determine if updates to the monitoring plan are needed to increase the CRMP's efficiency or effectiveness.
- Present recommendations to responsible officials.

Summary

Some monitoring was conducted in 2024 to address the following monitoring topics in the Fossil Creek CRMP Monitoring and Adaptive Management Plan.

- Bare soil/Potential for delivery of sediment or fecal matter to Fossil Creek
- Stream flow
- Aquatic macroinvertebrate index of biological integrity (IBI)
- Non-native plant species
- Visitor use data/Opportunity for river-based recreation
- Visitor satisfaction

Monitoring for the following topics was not conducted in Fossil Creek in 2024, due to adjustments to monitoring protocols, additional collection needed, lack of capacity, or that monitoring for a topic was not planned or needed in 2024. Monitoring for these topics will be reported in subsequent years as monitoring methods are finalized and capacity increased.

- Common black-hawk occupied territories
- Fossil springsnail habitat and populations
- Travertine dams
- Traditional cultural use practitioners/Cultural sites

The monitoring results that we do have for 2024 show that, in general, monitoring conducted per the Fossil Creek CRMP monitoring plan has not shown any resource topics approaching either their soft or hard thresholds. However, in the Bare soil/Potential for delivery of sediment or fecal matter to Fossil Creek monitoring, user- created trails were observed by surveyors in the "refugia" area between the waterfall and Fossil Springs. This should be followed up on with monitoring in 2025.

Table 1 summarizes the findings of the monitoring in 2024 for each of the Fossil Creek CRMP monitoring topics and its identified thresholds.

Table 1. Summary of Findings by Fossil Creek CRMP Monitoring Topics

Monitoring Topic	Progress Implementing CRMP?	Thresholds Reached?		Recommendation/Adaptive Actions Needed
		Soft	Hard	
Bare soil/Potential for delivery of sediment or fecal matter to Fossil Creek	**Yes.** In March and October 2024, data were collected showing bare areas that persisted or expanded after Backbone Fire closures around Fossil springs and from the waterfall to the Mazatzal dispersed recreation area. Water quality was monitored at five locations along Fossil Creek.	**Yes**. Although not recorded, user-created trails were observed by surveyors in the "refugia" area between the waterfall and Fossil Springs.	**No**	Survey bare areas after the recreation permit season but before fall when leaves obscure the bare areas. Maintain a calendar for this monitoring requirement (district hydrologist). Update the bare soil monitoring protocol as needed as data are collected. Decommission unauthorized access routes that are hydrologically connected to Fossil Creek. Work with IDT members when bare area monitoring reveals user-created routes in refugia areas outside of developed recreation polygons and the corresponding dispersed recreation polygons. Report on water quality monitoring completed in 2025.
Stream flow	**Yes.** In 2024, mean annual flows were collected and recorded, then compared to the five-year flow data (2019-2023).	No	No	Provide updated flow data next year, comparing 2020-2024 to 2025.

Common black-hawk occupied territories	**Yes.** Although monitoring was not required in 2022, it was completed, so no monitoring occurred in 2023 or 2024. Some observations were made during other monitoring.	No	No	Conduct surveys for black-hawks in Fossil Creek between 2025 and 2027 for occupied territories and the presence of any user-created trails within 300 yards of nesting areas. Consider relaxing requirements for Common black-hawk monitoring or using the bare soil monitoring as an indicator for Common black-hawk habitat degradation. Actively restore unauthorized trails or other bare soil areas in refugia areas.
Fossil springsnail habitat and populations	**No.** Several meetings were held with Arizona Game and Fish Department (AZGFD), and data management was improved, but no monitoring occurred. Monitoring will restart in January 2025.	Unknown	Unknown	Consider thinning/treating non-native plants enveloping the spring at known springsnail sites to allow solar radiation to reach open water and enhance aquatic vegetation growth. Resume monitoring in 2025.
Aquatic macroinvertebrate index of biological integrity (IBI)	**Yes.** In 2024, 11 samples were taken at five sites for macroinvertebrate testing.	No	No	Identify funding sources for aquatic macroinvertebrate sample analysis. Determine the feasibility of ADEQ monitoring macroinvertebrates in Fossil Creek.

Non-native plant species	**Yes.** In 2024, Friends of the Verde and American Conservation Experience monitored vegetation in the Fossil Springs, Irvine, and Flume Trail area, as well as in lower Fossil Creek between Stehr Lake and the Fossil Creek and Verde River confluence. Monitoring efforts focused on the inventory and treatment of Class A and E invasives including Himalayan blackberry and invasive plant species in the Fossil Springs Botanical Area.	No	No	Per the Fossil Creek CRMP, continue to monitor one-third of the Fossil Creek corridor each year. Compare monitoring results in future years to the 2021 baseline for lower Fossil Creek. Continue monitoring in areas where sacred datura has replaced Himalayan blackberry, such as in the pilot treatment area near Fossil Springs, to see if the blackberry reestablishes. Monitor Arizona dewberry populations that are adjacent to invasive Himalayan blackberry populations, specifically near the Fossil Springs. In areas where Himalayan blackberry is established, cut and treat plants with an aquatic-approved glyphosate in 2025. Coordinate with Friends of the Verde River staff to determine which stands of blackberry to prioritize. Arizona dewberry stands should be buffered and protected from Himalayan blackberry encroachment when possible. Monitor the population of yellow bluestem near Irving in 2025. Treat the small stands of salt cedar and giant reed above Stehr Lake between Mazatzal and Irving, and between the Narrows and the confluence of Fossil Creek and the Verde River. Monitor for new occurrences of Class A species, including mulberry, in 2025. . If 2025 monitoring shows an increase in relative vegetation cover or establishment of new populations of invasive species, management actions should be considered.

Travertine dams	**No.** No progress has been made in identifying a travertine contact to advise on photo point development. One travertine dam above the waterfall was visited and photos taken.	Unknown	Unknown	Consider reducing the travertine dam monitoring to occasional observations, with an increase in frequency if impacts are seen. Visit dams occasionally to determine if impacts are occurring from recreationists and if more frequent official monitoring is needed.
Visitor use data/Opportunity for river-based recreation	**Yes**. Visitor use data was collected in 2024.	No	No	Address the number of no-shows in 2024. Securing permits so far in advance led to a high no-show rate. The permit system will be changing next year in how permits are released. In 2025, release permits in two different ways to decrease mass purchasing by groups over multiple dates, and guide users to purchase permits closer to the actual permit date. Release 80% of permits on a one-month, daily rolling basis. Release 20% of permits three days in advance. Renew discussions on charging a cancellation fee. This topic has been tabled until 2025 discussions. Work on better planning and data collection strategies for 2025. The Fossil Creek work coordinator/supervisor will be responsible for improved data collection direction. Set up an administrative camp along Fossil or Towel Creek to decrease the number of trips needed in and out of the canyon and to lessen wear on vehicles. Address this in the budget to provide MI&E for personnel. Continue conversations surrounding YAN Tribal Access Permits, and continue to move forward in providing amicable options for this user group. Consider a fee system for visitation to Fossil Creek to cover management expenses.

Visitor satisfaction	**Yes.** The baseline dataset was established from a survey in 2024. Another survey is not required until 2029.	Unknown, only baseline monitoring completed.	Unknown, only baseline monitoring completed.	Finalize the survey instrument and sampling plan. Initiate the required Office of Management and Budget review. Recruit survey administrators, administer survey, and analyze results.
Traditional cultural use practitioners/ Cultural sites	**No.** No impacts to cultural resource were observed in 2023, so no monitoring was done in 2024.	No	No	Continue monitoring the Fossil Creek CRMP cultural sites in 2025.

Forest Supervisors' Certification

This report documents the status of monitoring activities in the Fossil Creek drainage in 2024 per the Fossil Creek Comprehensive River Management Plan (CRMP). It includes both the status of the monitoring required by the Fossil Creek CRMP and other monitoring also performed in the Fossil Creek subwatershed.

We have evaluated the status of Fossil Creek monitoring, the results of completed monitoring, and the recommendations presented in this report and endorse them. We recommended minor changes to the Fossil Creek CRMP monitoring plan to be considered in the future. The recommendations contained in this report will be carried forward by the Coconino and Tonto National Forests, and a deeper examination of them conducted with district and forest leadership and resource specialists.

The Fossil Creek CRMP monitoring plan may be modified in the future if more effective or efficient monitoring methodologies become available; if changes to objectives, indicators, metrics, measurement and assessment frequencies, thresholds, or adaptive management actions are needed as understanding of the river values improves; to answer monitoring questions more effectively; or to better ensure protection of river values (Fossil Creek CRMP, p. 120).

This 2024 Fossil Creek CRMP Monitoring Report is posted on the forest website and available for public review here: https://www.fs.usda.gov/goto/coconino/planning

AARON MAYVILLE
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8/26/2025

Aaron Mayville
Forest Supervisor
Coconino National Forest

Date

ROBERT TRUJILLO
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08/25/2025

Robert Trujillo
Forest Supervisor
Tonto National Forest

Date

Bare Soil/Potential for Delivery of Sediment or Fecal Matter to Fossil Creek

The monitoring topics of Bare Soil and Potential for Delivery of Sediment or Fecal Matter to Fossil Creek are combined in this report.

These two topics are to be monitored together annually with the Fossil Creek Bare Soil app, designed with ArcGIS Online for use with the ESRI mobile application, Field Maps. Per the CRMP Monitoring Plan, "Bare soil monitoring should be completed in conjunction with dispersed recreation BMP monitoring to provide additional information about potential water quality impacts" (p. 121). The application is used by FS employees, interns, volunteers, and other stakeholders to map bare soil around developed and dispersed recreation areas within the Fossil Creek Wild and Scenic River corridor. Detecting areas of bare soil such as unauthorized trails outside of locations of planned visitor use may indicate a need to adjust management of visitor use in the WSR corridor to protect river values. The location (upland, floodplain, or stream bank, as well as hydrological connectivity to Fossil Creek), type (e.g., unauthorized trails and roads or other denuded areas), and amount of bare soil caused by visitor use outside of recreation sites, roads, and trails within the Fossil Creek WSR corridor are monitored.

Potential impacts on water quality will be measured with bare soil monitoring and dispersed recreation best management practice (BMP) monitoring. Indicators have been chosen because of their ability to directly detect impacts such as erosion and fecal matter that may affect water quality before water quality is affected, rather than water-borne sediment and fecal bacteria that show pollution is already occurring and not related to visitor use. The dispersed recreation BMP protocol will be implemented in conjunction with bare soil monitoring. Bare soil monitoring will support detecting streambank impacts that may influence the findings of the dispersed recreation BMP monitoring. This protocol looks for evidence of bank trampling or instability (streambank alteration); erosion and sediment input to the stream; and trash, domestic animal, and human waste (human-related waste deposition), and chemical spills or leaks.

Thresholds for which adaptive management actions have been identified based on bare soil monitoring results are when:

- Black-hawk – There is evidence of increased bare soil caused by visitor use within 300 yards of a nest site within those territories (soft threshold). Unauthorized trails or other areas of bare soil caused by visitor use within 300 yards of a nest site are

expanding despite implementation of adaptive management actions (hard threshold).

- Bare soil – New unauthorized trails or other areas of bare soil caused by visitor use are detected in refugia areas (soft threshold). Unauthorized trails or other areas of bare soil in refugia areas caused by visitor use are expanding despite implementation of adaptive management actions, or recreation sites at the segment-wide scale are connected by unauthorized trails (hard threshold) (CRMP, p. 122).
- Water quality – Evidence of sediment transport or visitor use-related waste within the AMZ but not reaching Fossil Creek (soft threshold). Evidence of sediment from erosion or waste caused by visitor use reaching Fossil Creek (hard threshold).

Monitoring Results

A baseline dataset was collected in November 2022, covering all developed areas off of Forest Roads 708 and 502 along Fossil Creek, as well as the areas adjacent to the Dixon-Lewis Trail up to the waterfall.

No bare soil area monitoring took place in 2023 due to a lack of trained personnel. However, bare soil area monitoring did occur in March and April 2024, before the recreation permit season, and and in October 2024, covering the post-permit season. The surveyed area started from below Mazatzal and continued upstream to Fossil Springs. The Flume Trail was included. No monitoring was done in the area between the water fall and Fossil Springs, since no official dispersed recreation is designated there. The monitoring crew did observe impacts in this area. Comparison with data collected in 2022 and 2024 shows persistence of those original bare soil areas detected in that baseline data.

During the 2024 pre-permit season (February to March), approximately 0.8 acre of bare soil area and 2.4 miles of social trails were mapped. During the 2024 post-permit season, about 0.7 acres of bare soil and 2.5 miles of social trails were mapped. This does not represent a significant change in bare soil area or social trails during the permit season of 2024.

Recommendations

- Survey bare areas after the recreation permit season but before fall when leaves obscure the bare areas. Maintain a calendar for this monitoring requirement (district hydrologist).
- Update the bare soil monitoring protocol as needed as data are collected.
- Decommission unauthorized access routes that are hydrologically connected to Fossil Creek.
- Work with interdisciplinary team members when bare area monitoring reveals user-created routes in refugia areas outside of developed recreation polygons and the corresponding dispersed recreation polygons.
- Report on water quality monitoring completed in 2025.

Stream Flow

The monitoring topic of Stream Flow in the Fossil Creek CRMP is intended to support detection of conditions that may adversely impact flows within Fossil Creek, and other key components of Fossil Creek's water, a specific river value.

Flow data from the USGS stream gage located at the Fossil Creek Bridge is assessed to track changes in flow and provide context for assessing other monitoring data (such as to help determine whether conditions have been influenced by flood events). This gage is upstream of perennial tributaries and therefore serves as an indicator for spring discharge.

Because Fossil Creek's base flow is comprised of groundwater discharge from springs, flow data collected at this gage serves as an indicator for spring discharge. Continued operation of this gage is essential to understanding resource conditions in Fossil Creek.

No thresholds for adaptive management actions have been identified for this monitoring topic.

Monitoring Results

A five-year average of the mean annual flow in cubic feet per second (cfs) is used in lieu of just the prior year in order to remove interannual variability. The time frame used is based on the USGS "water year" which begins on October 1st and ends on September 30th of the next year.

During the 2024 water year, mean annual flows were 7.4 cfs below the previous five-year average.

Table 2. Five year (2019-2023) and 2024 Mean Annual Flow Comparison

Mean Annual Flow 2019-2023 (in cfs)	Mean Annual Flow 2024 (in cfs)	Difference 5-year average – 2024 (in cfs)
66.6	59.2	7.4

Water quality was monitored at seven sites in the Fossil Creek permit area on a monthly basis during the permit period of May through October 2024. Volunteers from Friends of the Forest worked with the Arizona Department of Environmental Quality (ADEQ), who collected and processed samples. Concentrations of E. coli were not indicative of a threshold being reached.

ADEQ notified the Coconino National Forest that they have submitted a recommendation to the Environmental Protection Agency that Fossil Creek be removed from 303d (impaired water) status in their 2026 review.

Recommendations

- Provide updated flow data next year, comparing 2020-2024 to 2025, and report on water quality monitoring completed in 2025.

Common Black-hawk Occupied Territories

The monitoring topic of Common Black-hawk Occupied Territories is one of three (3) topics geared to address the Biological Outstandingly Remarkable Value (ORV) for the Fossil Creek Wild and Scenic River. Common black-hawks in Fossil Creek are used as an indicator for the biological ORV because they are an indicator for other canopy-nesting, riparian-obligate bird species. They are susceptible to disturbance that may result from high levels of recreational use.

Black-hawk monitoring has occurred during nine field seasons (2005-2009, 2011, 2019, 2020, and 2022) in Fossil Creek (Johnson et al. 2012, Johnson and Calvo 2012, Johnson and Calvo 2020). Data collected through this monitoring informed soft and hard thresholds, as well as where monitoring is likely needed.

A rapid assessment monitoring effort for black-hawks is being employed and focuses on nests or regular territories that occur in refugia and within 300 yards of high-use recreation sites (which currently are Fossil Springs, Waterfall, and Irving), or when unplanned trails in refugia are detected within 300 yards of black-hawk nest territory (if nest location is unknown). The intent is early detection of increasing recreation use within refugia in close proximity to a regular territory or a known nest.

Monitoring will be completed in black-hawk territories once every three to five years or in the nesting season after unauthorized trails are detected in refugia within 300 yards of a territory or nest. However, if adaptive management actions are needed, monitoring will be conducted in the breeding season following implementation of the adaptive management action for those specific nest sites.

Thresholds for which adaptive management actions have been identified for common black-hawk occupied territories are when:

- Black-hawks abandon a regular territory near a high use site and/or there is evidence of increased bare soil caused by visitor use within 300 yards of a nest site within those territories (soft threshold).
- Black-hawks abandon two or more regular territories near high use sites and/or unauthorized trails, or other areas of bare soil caused by visitor use within 300 yards of a nest site are expanding despite implementation of adaptive management actions (hard threshold) (CRMP, pp. 127-128).

Monitoring Results

In 2024, no surveys for Common Black-hawks (*Buteogallus anthracinus*) were conducted, but known nest sites were visited. During invertebrate sampling at the Boulder Canyon Confluence site, an adult black-hawk was observed carrying a dead rodent to a nearby nest. There was one fledgling and a second adult in the nest. This nest was not previously documented during 2022 black-hawk nest monitoring.

The nest north of Fossil Bridge that was documented in 2022 was located and found to be active. Another possible nest was located but appeared to be either abandoned or unfinished.

At the Purple Mountain recreation site, the nest previously documented in 2022 could not be located, but another nest was found nearby. There was no sign of any adult black-hawks; at the base of the nest tree, there appeared to be a deceased fledgling.

The nest found in 2022 between the Irving and Tonto Bench recreation sites, as well as the nest south of the Mazatzal recreation site, could not be located. However, an adult black-hawk was heard near the Mazatzal parking lot, and pieces of crayfish pieces were scattered along the bank of the creek there.

Other Biological ORV Monitoring

Reptiles and Amphibians

On July 12, 2024, a Visual Encounter Survey (VES) was conducted along the Dixon Lewis/Waterfall Trail. Observed herpetofauna included three greater earless lizards (*Cophosaurus texanus*), four whiptail lizards (*Aspidoscelis* sp.), and 14 ornate tree lizards (*Urosaurus ornatus*). Among the ornate tree lizards, one was found dead in the pool close to the waterfall. A suspected whiptail lizard (*Aspidoscelis* sp.) was found in a burrow, with only its tail protruding. It could not be removed or captured for identification.

Another VES survey was conducted at the Irving recreation site that same day. One adult, one juvenile, and one tadpole lowland leopard frogs (*Rana yavapaiensis*) were observed at the creek crossing along the trail. The adult was seen basking in the sun before jumping into cattails and evading capture for photo identification. The tadpole was captured and photographed before release. Two juvenile ornate tree lizards (*Urosaurus ornatus*) were also observed. Many native fish were observed in the creek, especially in the pool near the lowland leopard frogs (*Rana yavapaiensis*).

Birds and Fish

Bird species heard or seen in 2024 include the yellow-breasted chat, canyon wren, turkey vulture, and black Phoebe. Many native fish were observed in the creek.

Recommendations

- Conduct surveys for black-hawks in Fossil Creek between 2025 and 2027 for occupied territories and the presence of any user-created trails within 300 yards of nesting areas.
- Consider relaxing requirements for Common black-hawk monitoring or using the bare soil monitoring as an indicator for Common black-hawk habitat degradation.
- Actively restore unauthorized trails or other bare soil areas in refugia areas.

Fossil Springsnail Habitat Condition/Populations

Fossil springsnails are a species of interest in Fossil Creek because 1) they are a Forest Service sensitive species; 2) they are only known to occur in the Fossil Creek corridor (they are endemic to Fossil Creek); 3) there are only a few small populations isolated to specialized ecological niches within a narrow geographic range, so they are vulnerable to population die-offs and risk of extinction; and 4) they can be indicators of spring health.

The habitat assessment rating protocol developed by AZGFD is used to assess the condition of riparian areas occupied by Fossil springsnails, and Fossil springsnail population counts are used to assess the abundance of springsnails at key locations in Fossil Creek. Collaboration with the U.S. Fish and Wildlife Service and AZGFD facilitate monitoring Fossil springsnail populations and habitat. Springs that support suitable habitat for the Fossil springsnail are surveyed to protocol in order to determine occupancy. The numerous springs that occur on steep slopes and where access is difficult are a lower priority for inventory.

Thresholds for which adaptive management actions have been identified for Fossil springsnail habitat and populations are when:

- Monitoring shows the habitat rating of occupied springs is trending downward as a result of visitor use. Monitoring shows a reduction of 25-50% of the mean cumulative Catch-Per-Unit-Effort (CPUE) estimates (soft thresholds).
- Visitor use interferes with occupied springs' ability to attain and maintain high or moderate habitat condition in the long term. Monitoring shows a reduction of >50% of the mean cumulative CPUE estimates (hard thresholds) (CRMP, pp. 128-130).

Monitoring Results

No springsnail surveys were conducted in 2024.

Forest Service and AZGFD bios met to clarifying historic locations and names and set a survey schedule. Due to scheduling conflicts, surveys were not resumed until January 2025.

Recommendations

- Consider thinning/treating non-native plants enveloping the spring at known springsnail sites to allow solar radiation to reach open water and enhance aquatic vegetation growth.
- Resume monitoring in 2025.

Aquatic Macroinvertebrate Index of Biological Integrity

Macroinvertebrate populations are a common indicator that integrate many aquatic impacts over time, and macroinvertebrate studies are used as a safety check that aquatic resources are indeed being protected. Negative results indicate the potential that there is a problem and that more analysis is needed to identify the cause.

Fossil Creek CRMP monitoring of macroinvertebrate populations is conducted annually during the spring index period (April – May), and uses the warm and cold-water criteria and protocols developed by the Arizona Department of Environmental Quality (ADEQ). These use benthic macroinvertebrate abundance and diversity to calculate an Index of Biological Integrity (IBI) score that is then used to monitor the "health" of aquatic systems (ADEQ 2015).

The five sites sampled are: 1) near Fossil Springs; 2) about ¼ mi above the waterfall; 3) less than ¼ mile below the waterfall; 4) near the Irving power plant; 5) below Sally May Wash. Because travertine may affect the diversity and density of aquatic invertebrates, ADEQ does not sample Fossil Creek below the Fossil Creek springs (avoiding any area with travertine deposition), so it is important to establish baseline collections and identify appropriate methods and metrics for future monitoring.

Thresholds for which adaptive management actions have been identified for aquatic macroinvertebrate monitoring are when:

- An Index of Biological Integrity (IBI) score that falls between the 10th and 25th percentile of reference score (score of 40-49 for warm water streams), which is inconclusive and requires a repeat test (soft threshold).
- An IBI score that falls below the 10th percentile of reference score violates the biocriterion (less than or equal to 39 for warm water streams) or a repeat test that falls below the 25th percentile (hard threshold) (CRMP, p. 131).

Monitoring Results

In July 2024, aquatic macroinvertebrates were sampled near Fossil Springs and at Tonto Bench, Boulder Canyon, Sally May, Purple Mountain, and Mazatzal. All of the samples except those collected near Fossil Springs were sent for processing. Due to current budget constraints, funding is not adequate for the processing of data.

Recommendations

- Identify funding sources for aquatic macroinvertebrate sample analysis.
- Determine the feasibility of ADEQ monitoring macroinvertebrates in Fossil Creek.

Class A or E Non-native Plant Species

Class A species are defined as those that are newly established or have the potential to become established and pose unacceptable threat to watershed condition. Yellow bluestem and Malta star-thistle are Class A invasives found along Fossil Creek.

Class E (for extreme) species have wide distribution within a particular area and pose an unacceptable, extreme hazard to watershed condition. Class E species that have been detected in the Fossil CRMP corridor include tamarisk, tree of heaven, Siberian elm, giant reed, and Himalayan blackberry. Of these, the only Class E species detected in lower Fossil Creek are tamarisk, giant reed, and Himalayan blackberry. While mulberry, Johnson grass, and red brome are invasive plants, they are not considered Class A or E non-native invasive plants.

Thresholds for which adaptive management actions have been identified for Class A or E Non-native Plant Species are when:

- Existing class A or E non-native invasive plant populations increase in size or new populations become established (soft threshold).
- Non-native invasive plant species pose a risk to ecosystem function, including displacing or diminishing native plant and animal species (hard threshold) (CRMP, p. 133).

Monitoring Results

The Friends of the Verde River, through an agreement with the Coconino National Forest, conducted invasive species mapping and treatment along Lower and Middle Fossil Creek for two non-native invasive species: giant reed (*Arundo donax*) and salt cedar (*Tamarix spp.*). Giant reed populations exist in small clusters above Stehr Lake. Below the Narrows, some giant reed stands were reclassified as common reed, which has lowered the number of known giant reed populations along Lower Fossil Creek.

Friends of the Verde River continued to treat invasive Himalayan blackberry populations around Fossil Sprngs, focusing on potential Fossil springsnail habitat and protecting Arizona dewberry populations. An American Conservation Experience crew was mobilized for two work trips to maintain and expand the footprint of the Himalayan blackberry treatments within the Fossil Springs area.

Recommendations

- Per the Fossil Creek CRMP, continue to monitor one third of the Fossil Creek corridor each year. Compare monitoring results in future years to the 2021 baseline for lower Fossil Creek.
- Continue monitoring in areas where sacred datura has replaced Himalayan blackberry, such as in the pilot treatment area near Fossil Springs, to see if the blackberry reestablishes.
- Monitor Arizona dewberry (*Rubus arizonensis*) populations that are adjacent to invasive Himalayan blackberry populations, specifically near the Fossil Springs Botanical Area.
- In areas where Himalayan blackberry is established, cut and treat plants with an aquatically-approved glyphosate in 2025.
- Coordinate with Friends of the Verde River staff to determine which stands of blackberry to prioritize. Arizona dewberry populations should be buffered and protected from Himalayan blackberry encroachment when possible.
- Monitor the population of yellow bluestem near Irving in 2025.
- Treat the small stands of salt cedar and giant reed above Stehr Lake between Mazatzal and Irving, and between the Narrows and the confluence of Fossil Creek and the Verde River.
- Monitor for new occurrences of Class A species, including mulberry, in Fossil Creek in 2025. If 2025 monitoring shows an increase in relative vegetation cover or establishment of new populations of invasive species, management actions should be considered.

Impacts to Travertine Dams Attributable to Visitor Use

The presence, extent, and high deposition rate of calcium carbonate forming travertine in Fossil Creek are the key elements of Fossil Creek's geology ORV. In particular, the formation of travertine dams in certain reaches of Fossil Creek contributes to an extraordinary stream channel morphology, creating a complex aquatic habitat. Human impacts to these dams, such as persistent notching from repeated boat passage, may alter the flow of water and indirectly affect travertine deposition, dam formation, and aquatic habitat. Monitoring is focused on impacts to travertine dams that, if found to occur, may indicate a need for management changes to ensure that human activities do not risk adversely impacting the geology ORV.

The focus of monitoring is on physical impacts to travertine due to ease of detection and corresponding ability to adjust management relatively quickly. Monitoring is being performed on the reach of Fossil Creek from 1/4-mile upstream of the waterfall upstream to the historic diversion dam. Photo points are being established in this reach to detect notching or other human impacts to travertine dams. Repeat photography will be performed at least annually, at each established photo point, more often if a significant flood event occurs. The protocols for these photo points follow those detailed in Hall 2002. Ocular monitoring and informal photo documentation will likely supplement photo point monitoring.

Thresholds for which adaptive management actions have been identified for impacts to travertine dams are when:

- Travertine dams in the reach of Fossil Creek from 1/4-mile upstream of the waterfall upstream to the historic diversion dam display new (as of implementation of the CRMP) evidence of impacts resulting from visitor use (soft threshold).
- A series of spatially-connected travertine features in the reach of Fossil Creek from approximately 1/4-mile upstream of the waterfall upstream to the historic diversion dam display measurable evidence of human impacts (hard threshold) (CRMP, p. 136).

Monitoring Results

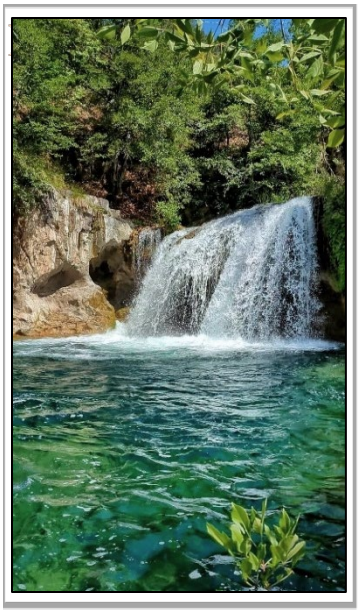
Due to the difficulty in accessing the creek in the travertine reach, and concerns about future repeatability, photos were taken of only one travertine dam in 2024.

While the official protocol was not followed, one dam about one-half mile upstream of the waterfall was visited and photos were taken. The travertine looks completely undisturbed by recreational activities. It has begun expanding, creating new complex habitats of small and big waterfalls, pools, runs, and side channels.

Recommendations

- Explore additional ways to monitor travertine formations over time.
- Consider reducing the monitoring of travertine dams to occasional observations, with an increase in frequency if impacts are seen.

Visitor Use Data/Opportunity for River-based Recreation



Forest Service employees collect a variety of visitor use data each year, including the number of visitors, number of vehicles, patterns of use (including the distribution of visitor use), pounds of trash, and number of law enforcement incidents and other emergencies. This information is used to evaluate the effectiveness of current management practices, determine if adjustments are needed, and provide context for assessing other monitoring data. Assessment of these data include whether user capacity established by the CRMP is exceeded and, if so, what actions, such as adjusting the kinds, locations, and amounts of use, could be taken to ensure capacity is not exceeded.

The recreation ORV includes protecting and enhancing outstanding opportunities for river-based recreation in Fossil Creek. The recreation opportunity monitoring indicator uses the total number of people who can access Fossil Creek during the limited entry period (April 1 – October 1) as a proxy for river-based recreation opportunities in the wild and scenic river corridor.

Thresholds for which adaptive management actions have been identified for visitor use and recreation opportunity (river-based opportunity) are when:

- Visitor use – User capacity is exceeded; an increasing trend in incidents is observed.
- Recreation opportunity – Ten (10) percent decline from the 2009 baseline in the number of people who may access Fossil Creek due to management restrictions other than temporary closures for public safety due to extreme fire danger, monsoon storms, or similar hazards (soft threshold). Twenty-five (25) percent decline from 2009 baseline condition in the number of people who may access Fossil Creek due to management restrictions other than temporary closures for public safety due to extreme fire danger, monsoon storms, or similar hazards (hard threshold) (CRMP, pp. 137, 140).

Monitoring Results

The 2024 permit season began on April 1st. Estimated permit system demand, which is the total number of people turned away added to the total number of people let into Fossil Creek, was 39,323 in 2024 compared to 22,798 in 2023. There was a slight decrease in the no-show rate for 2024. The number of unpermitted vehicles which were turned away in 2024 constituted 0.06

percent of all vehicles which came to Fossil Creek, as opposed to 2.5 percent in 2023. The average number of people per vehicle decreased from 3.9 in 2023 to 3.7 in 2024. In 2024, 255 Yavapai Apache Nation (YAN) tribal members visited Fossil Creek, and in 2023, 267 tribal visitors accessed the creek.

In 2024, 595 bags of trash were collected, a sharp increase from 2023 when only 178 bags of trash were gathered.

There were eight days of wet-weather road closures in 2024, due to monsoons from April 1 to April 3, June 26, July 1 to July 2, July 15, and July 18. This was less than in 2023, with 10 days of wet-weather road closures.

There was an increase in parking warnings between 2023 and 2024, with 154 issued in 2023 and 258 in 2024.

Table 3. Comparison between 2023 and 2024 Visitor Use Metrics

Metric	2023	2024
Length of season (in days)	98	184
Total number of permits reserved	9,235	15,771
Total number of permit cancellations	919	1,487
Total number of permitted vehicles	5,608	10,071
Total number of permitted users	21,954	37,723
Average group size	3.9	3.7
Total number of no-show permits	3,267	5,700
Total number of unpermitted vehicles	383	603
Total number of users turned away	844	1600
Total amount of garbage collected	178 large garbage bags	595 large garbage bags
Total number of YAN tribal vehicles	48	58
Total number of YAN tribal users	267	255
Total number of warnings issued	154	258

Recommendations

- Address the number of no-shows in 2024. Securing permits so far in advance led to a high no-show rate. The permit system will be changing next year in how permits are released.
- In 2025, release permits in two different ways to decrease mass purchasing by groups over multiple dates, and guide users to purchase permits closer to the actual permit date.
- Release 80% of permits on a one-month, daily rolling basis. Release 20% of permits three days in advance.
- Renew discussions on charging a cancellation fee. This topic has been tabled until 2025 discussions.

- Work on better planning and data collection strategies for 2025. The Fossil Creek work coordinator/supervisor will be responsible for improved data collection direction.
- Set up an administrative camp along Fossil or Towel Creek to decrease the number of trips needed in and out of the canyon and to lessen wear on vehicles. Address this in the budget to provide MI&E for personnel.
- Continue conversations surrounding YAN Tribal Access Permits, and continue to move forward in providing amicable options for this user group.
- Consider a fee system for visitation to Fossil Creek to cover management expenses.

Visitor Satisfaction

The recreation ORV is comprised of outstanding opportunities for a variety of river-related recreational activities. Recreation ORV monitoring addresses the quality of the recreation experience and the variety of recreational activities available.

The quality of the recreation experience in Fossil Creek can be assessed by asking a representative sample of visitors a set of questions that focuses on the key setting attributes, activities, and other relevant topics. Results can then be compared to a 2011 survey conducted by Northern Arizona University. The principal setting attributes Reported by participants in the 2011 study were trash, crowding, current regulations, and facilities. Taken together, these four attributes as well as other topics can provide an indication of change in the quality of the visitor experience.

Thresholds for which adaptive management actions have been identified for recreation experience (visitor satisfaction) are when:

- Five (5) percent decline in satisfaction index (soft threshold). Fifteen (15) percent decline in satisfaction index (hard threshold) (CRMP, pp. 138-139).

Monitoring Results

The Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station, Forest Service, University of Montana, and managers on the Coconino and Tonto National Forests developed a survey instrument and sampling design to monitor visitor experience/satisfaction with Fossil Creek. The survey was piloted from June to mid-November 2024 with the help of an Arizona Conservation Corps member. Once the initial data are recorded and analyzed, survey methodology, findings, and considerations for future survey implementation will be reported and presented to the Forest Service, other agency partners, and affiliated Tribes.

Recommendations

- Finalize the survey instrument and sampling plan
- Initiate the required Office of Management and Budget review
- Recruit survey administrators

Satisfaction of Traditional Cultural Practitioners/Impacts at Specific Cultural Sites

Monitoring of the cultural values ORV for Fossil Creek will consist of consulting with the affected Western Apache and Yavapai tribes annually, preferably with traditional practitioners or elders who are recognized as experts by those tribes, to determine the condition and trend of traditional cultural resources within the corridor. It is important to maintain open communication with concerned Western Apache and Yavapai tribes to receive feedback in real time on resource conditions and other cultural concerns.

Two indicators for the condition of this ORV have been developed: monitoring of traditional and contemporary cultural values through consultation with tribes associated with the ORV and monitoring of culturally sensitive sites in the Fossil Creek area. The goals are to: (1) ensure that the Fossil Creek area retains its traditional cultural value for the affected tribes, and (2) ensure specific areas considered to be of the greatest sensitivity are not negatively affected by visitor use.

Thresholds for which adaptive management actions have been identified for tribal consultation (satisfaction of traditional cultural practitioners) and culturally sensitive sites (impacts at specific cultural sites) are when:

- Tribal consultation – Results of consultation indicate the Outstandingly Remarkable Value (ORV) condition has trended downward for two consecutive years (soft threshold). Results of consultation indicate that the Fossil Creek area does not look, sound, and feel natural and untrammeled. Examples include widespread occurrences of overcrowding, numerous recreationists off of system trails and away from established recreation sites, presence of trash and human/pet waste, or vegetation or soil impacts (hard threshold).
- Culturally sensitive sites – Indication of new visitor use (faint indications of unauthorized trails or new ground disturbance) within site boundaries (soft threshold). Development (or continued use) of one unauthorized trail, presence of additional bare soil areas, evidence of ground disturbance, evidence of the removal of artifacts, or evidence of feature disturbance within site boundaries (hard threshold) (CRMP, pp. 142-144).
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Monitoring Results

Due to a lack of capacity for tribal representatives and no observed impacts on cultural sites in 2023, Fossil Creek CRMP cultural sites were not monitored in 2024.

Recommendations

- Continue monitoring the Fossil Creek CRMP cultural sites in 2025.

Partnerships

Partners working with the Coconino National Forest on monitoring and data collection in the Fossil Creek drainage include, but are not limited to:

- Tribes
  - San Carlos, Tonto, Yavapai, and White Mountain Apache – Emory oak
  - Arizona Tribes with Northern Arizona University (NAU) – Identification and mapping of traditional use plants
  - Yavapai Apache Nation – traditional use, cultural sites
- U.S. Geological Survey (USGS)
- Arizona Department of Environmental Quality (ADEQ)
  - Aquatic macroinvertebrates
- Oak Creek Watershed Council – recreational trail photo points, trail rehabilitation monitoring, analysis of trail BMPs
- Arizona Department of Game and Fish (AZGFD)
  - Riparian birds
  - Bald and golden eagle flights
  - Fossil springsnail
  - Native fish
  - Ranid frogs program (lowland leopard frog)
- Bat Conservation International
- Bureau of Reclamation – fish barrier inspections
- U.S. Fish and Wildlife Service (FWS)
  - Native fish
  - Western yellow-billed cuckoo, southwestern willow flycatcher
- Northern Arizona University (NAU)
  - Black hawk, western yellow-billed cuckoo, southwestern willow flycatcher
- Bat Conservation International (BCI) – acoustic monitoring recording echolocations
- Friends of the Verde River (FOVR)
  - Inventory, mapping, and treatment of non-native plants
  - Southwestern willow flycatcher