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Fossil Creek Wild and Scenic River

Comprehensive River Management Plan

Forest Service
Coconino and Tonto National Forests
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Coconino and Tonto National Forests
Gila and Yavapai Counties, Arizona

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Summary

On March 30, 2009, Congress designated Fossil Creek as a Wild and Scenic River. Fossil Creek, which flows for 17 miles from springs that comprise its headwaters to the Verde River, is located within the administrative boundaries of the Coconino and Tonto national forests in central Arizona.

The Wild and Scenic Rivers Act of 1968 (Public Law 90-542) requires the agency responsible for administration of a designated wild and scenic river to develop a comprehensive river management plan (CRMP) that provides for the protection and enhancement of the river's water quality, free-flowing condition, and "outstandingly remarkable values," collectively referred to as "river values," for the benefit and enjoyment of present and future generations. The USDA Forest Service, under the direction of the Secretary of Agriculture, is the agency responsible for the administration of congressionally designated Wild and Scenic Rivers on the Coconino and Tonto national forests.

This CRMP for the Fossil Creek Wild and Scenic River supplements the Coconino and Tonto national forests' land and resource management plans by providing desired conditions, management standards, guidelines, objectives, and monitoring and adaptive management that will be applied to protect and enhance Fossil Creek's river values. The plan also addresses resource protection, development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of the Wild and Scenic River Act (WSRA, Sec. 3(d)(1)).

The CRMP contains the following chapters:

Chapter 1. River Setting and Planning Process – Describes the river setting, planning process, wild and scenic river boundary and classifications, and history, and summarizes existing uses and development.

Chapter 2. River Corridor Resources – Describes Fossil Creek's river values and other components of the river system.

Chapter 3. Management Direction – Provides desired conditions, standards, guidelines, objectives, and management approaches that promote protection and enhancement of Fossil Creek's river values.

Chapter 4. Visitor Use and User Capacity – Describes the current kinds and amounts of use Fossil Creek receives and the future kinds and amounts of use Fossil Creek can accommodate while protecting river values.

Chapter 5. Management Actions – Describes actions to implement the CRMP.

Chapter 6. Monitoring and Adaptive Management – Outlines a monitoring plan to ensure Fossil Creek's river values are protected and adaptive management actions that could be implemented if monitoring indicates adverse impacts or degradation are at risk of occurring.

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Chapter 1. River Setting and Planning Process

In 2009, the U.S. Congress designated Fossil Creek as a wild and scenic river (WSR) under the Wild and Scenic Rivers Act (WSRA) of 1968 (Public Law 90-542) through the Omnibus Public Lands Management Act of 2009 (Public Law 111-11). As of late 2019, Fossil Creek was one of 226 rivers across 41 states and Puerto Rico with such a designation.[1] The Wild and Scenic Rivers Act states:

> "It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."[2]

Congress established WSRA to counterbalance decades of dam building and river-related development by establishing a nation-wide system of outstanding free-flowing rivers. Rivers may be added to the National Wild and Scenic Rivers System either by an act of Congress or by the Secretary of the Interior upon official request by a state governor. The primary purpose of the Act is to balance river development with river protection and conservation. The act specifically prohibits designated rivers from future hydroelectric power development.

The USDA Forest Service is the managing agency for Fossil Creek. Fossil Creek is located within the Coconino and Tonto national forests in central Arizona (figure 1-1). The creek is designated in its 16.8-mile entirety from the confluence of Sand Rock and Calf Pen canyons above Fossil Springs to its confluence with the Verde River.

Figure 1-1. Fossil Creek Wild and Scenic River vicinity map

[1] Per the National Wild and Scenic Rivers System website: https://www.rivers.gov/.

[2] Section 1(b) of the Wild and Scenic Rivers Act.

Under WSRA Section 3(d)(1), the Forest Service has developed this comprehensive river management plan (CRMP) in consultation with state, local, and tribal governments and the public to guide long-term management and public use in a wild and scenic river corridor. The CRMP is designed to protect and enhance the values that led to the river's designation and to specify public and administrative uses of the river corridor that are consistent with protection of the river's values. The Forest Service expects this plan, made up of both programmatic and project-specific actions, to have a lifespan of at least 20 years.

The Forest Service has developed this CRMP in accordance with the mandates of WSRA, the National Environmental Policy Act (NEPA), and other relevant law, regulation, and policy. Development of this CRMP was accompanied by environmental analysis in a separate environmental impact statement (EIS); this environmental analysis informed the content of the final CRMP.

A wild and scenic river has outstandingly remarkable values (ORVs) that make it worthy of special protection for the benefit and enjoyment of present and future generations. Federal land managers must protect and enhance these values. River designation does not supersede existing, valid water rights, but can affect future water development projects, depending upon the impacts of a new proposal on the river's flow-dependent values.

Today, WSRA protects a select number of U.S. rivers and creeks as units of the National Wild and Scenic Rivers System — only a little more than one-quarter of one percent of the nation's rivers carry a wild and scenic river designation. In Arizona, the only other wild and scenic river is a 41-mile portion of the Verde River, set aside in 1984 and managed by the Coconino, the Prescott, and the Tonto national forests. The Verde River's CRMP was finalized in June 2004.

For nearly a century, Fossil Creek's waters were diverted for electricity generation through the Childs-Irving hydroelectric power project. Through a collaborative effort involving Arizona Public Service (APS) and numerous agencies and other organizations, the Childs-Irving system was decommissioned in the early 2000s, returning full water flows to Fossil Creek in 2005.

> Fossil Creek is a beloved place to many people, and many have shared their perspectives throughout the development of the CRMP, such as through tribal consultation and comment periods. These perspectives provide valuable context and have been instrumental in shaping this plan. In several places, the CRMP includes quotes in text boxes like this to illustrate these perspectives in their own words.

River Setting

The Fossil Creek WSR is located in a 1,600 foot-deep canyon in the Mazatzal Mountains of central Arizona within Yavapai and Gila counties (figure 1-2). Fossil Creek is remote and only accessible by primitive roads or hiking trails. On the Coconino National Forest, the Fossil Creek area is approximately 22 miles from the town of Camp Verde and accessed from State Route 260 and then Forest Road (FR) 708. The 14-mile FR 708 is a rough dirt road. On the Tonto National Forest, Fossil Creek is either accessed by hiking four miles from the Bob Bear (formerly Fossil Springs) Trailhead off of FR 708 five miles west of the town of Strawberry or by a 45-mile drive via state routes 87 and 260 and FR 708. Though FR 708 passes through the Fossil Creek WSR corridor, connecting the Camp Verde side to the Strawberry side, a 4-mile section of FR 708 near Strawberry was closed in 2011 to protect public safety because of damage to the road, making it unsafe for use. This section of road may be repaired and reopened in the future. The most-visited portion of the creek is divided into Middle Fossil,[3] which includes the Waterfall destination, and the Fossil Springs area. Generally those traveling from Camp Verde enter Middle Fossil while those traveling from Strawberry enter the Fossil Springs area.

[3] "Middle Fossil" consists of the reach of Fossil Creek between the Mazatzal recreation site upstream to 1/4-mile above the Waterfall at the end of the Dixon Lewis (formerly Waterfall) Trail.

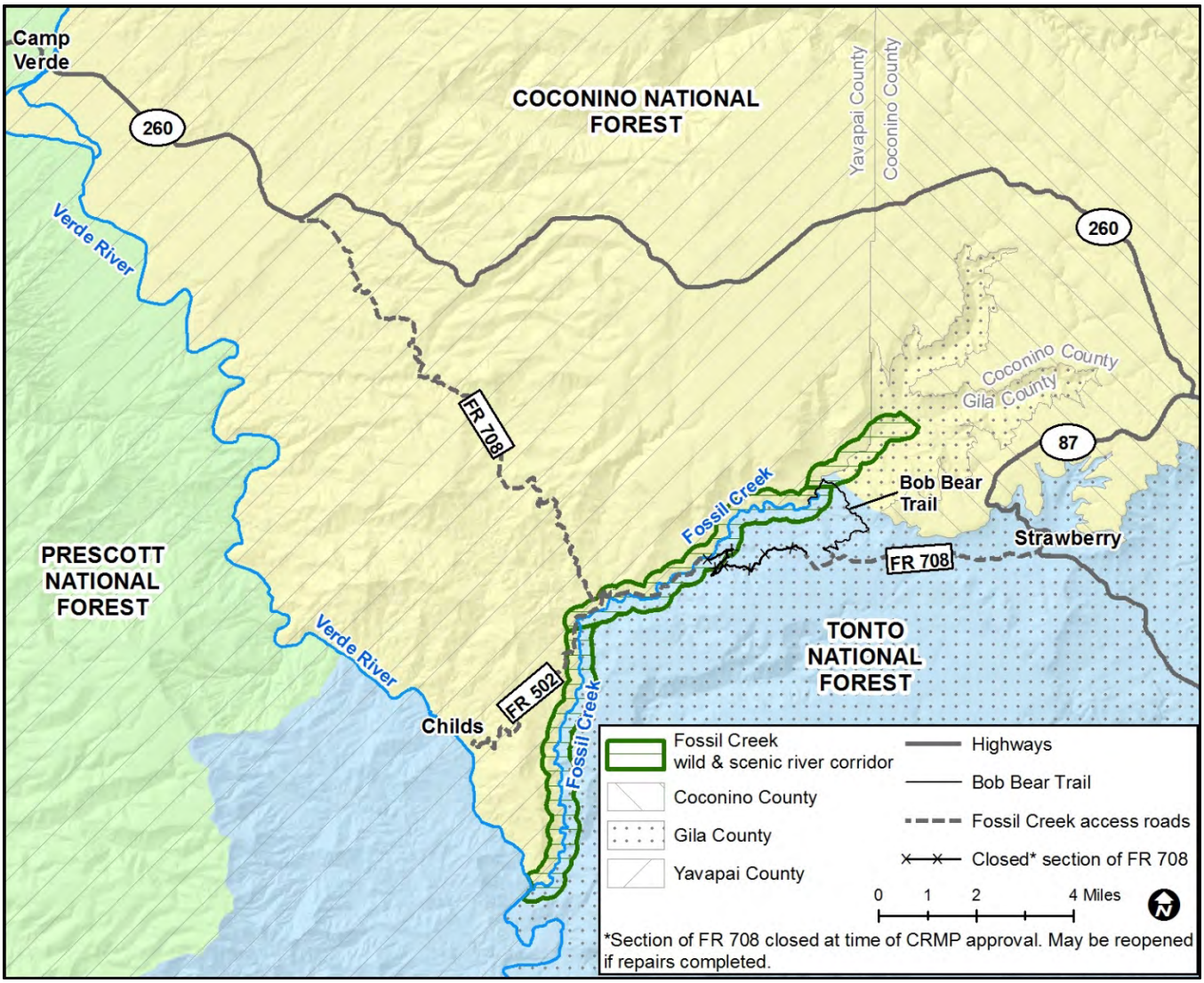

Figure 1-2. Access to Fossil Creek Wild and Scenic River

Fossil Creek is one of Arizona's rare warm water perennial streams, originating in a complex of springs approximately three miles downstream of the confluence of Sand Rock and Calf Pen canyons. Its water is a constant 72 degrees Fahrenheit at the springs, which discharge 20,000 gallons per minute. The creek flows in a southwesterly direction through a deep, isolated and rugged canyon for approximately 14 miles before entering the Verde River, three miles below the historic Childs Power Plant. Along the way, Fossil Creek flows through the designated Fossil Springs and Mazatzal Wildernesses.

Fossil Creek is prized for its interrelated parts, including its length, continuous and abundant flow, elevation gradient, unfragmented nature, and presence of extensive travertine deposits. Fossil Creek is the only intact perennial system with continuous flow without any water diversions in Arizona, and is the only uninterrupted system between the Verde River and the Mogollon Rim, spanning and connecting a number of biotic communities. High in calcium carbonate, the waters continually create large deposits of travertine. This travertine encases whatever happens to fall into the streambed, creating the fossil-like formations for which the area is named. The water also forms spectacular clear pools that range from aquamarine to deep blue.

The creek's headwaters lie within a ponderosa pine forest at an elevation of 7,260 feet, and it flows through multiple vegetation communities as it descends to its confluence with the Verde River at an elevation of about 2,250 feet. The extensive riparian landscape allows Fossil Creek to provide habitat for a high diversity of wildlife and fish species, and represents one of the only pure warm water native fisheries in Arizona. Approximately 80

special-status species inhabit the area along and around Fossil Creek. Approximately 23 bat species occur in the area, as do numerous bird species, including common black-hawks, peregrine falcons, bald eagles, Bell's vireos, Lucy's warblers and verdins. The stream supports native fish species including razorback sucker, spikedace, loach minnow, Gila topminnow (all endangered), roundtail chub, desert sucker, and Sonora sucker. As habitat for these fish, the creek holds national significance.

In recognition of the highly diverse riparian deciduous forest associated with Fossil Springs and Fossil Creek's riparian geology, the Fossil Springs Botanical Area was designated on the Coconino National Forest in the vicinity of Fossil Springs. The Proposed Fossil Springs Natural Area is on the Tonto National Forest adjacent to the botanical area. At time of writing, approximately 187 plant species are recorded in the Botanical Area.

Throughout the creek, natural features come together to create an opportunity for river-based recreation and education that is rare in the desert Southwest. Much of the recreational value of the stream is derived from the presence of flowing water and from the shade provided by the adjacent riparian vegetation. Fossil Creek draws visitors from around the world.

Fossil Creek is unique culturally, as well. The creek is a sacred site that is considered to be a holy place for the Apache and Yavapai. *Tu'dotłiz* (TOO DOE CLIZ), or "blue water" is the Apache word for Fossil Creek and the name embodies its blue waterfalls, lush vegetation, and rare riparian species.

> *"Tu'dotłiz… provided all the food, shelter, clothing, medicine, and tools necessary for the survival of our ancestors to live, pray, and raise families… Through our oral traditions, the flowing waters of Fossil Creek connect our people to the beginning/origin of this world."* –Yavapai-Apache Nation[4]

Planning Process

Purpose and Goals of the Fossil Creek Plan

The purpose of this CRMP is to provide for public use and enjoyment of the Fossil Creek WSR while protecting and enhancing the values for which Fossil Creek was designated.

Land management planning guides the Forest Service in fulfilling its responsibilities for the stewardship of the forest and to best meet the needs of the American people. The CRMP is intended to provide additional direction not already provided by existing law, regulation, or policy and strategic guidance and information for project and activity decision making. This plan provides both programmatic and site-specific project and activity decisions. All future project and activity decisions not mentioned here must comply with the guidance provided by this plan unless the plan is amended to allow for deviation. The plan integrates sustainable recreation; forest restoration; watershed protection; resilience in a changing climate; wildlife conservation; and social and economic values, goods, and services. The plan honors the continuing validity of private, statutory, or pre-existing rights. Related planning efforts subject to other legal authorities and/or best practices, including creating an interpretive plan, site design, fee determinations, and outfitter and guide allowances, will be completed separately from the CRMP.

The CRMP provides management direction, actions, and monitoring that will be applied to protect and enhance the river values. River values, which are the core of the CRMP, refer to free-flowing condition, water quality, and ORVs. Fossil Creek's river values are described in detail in Chapter 2, River Corridor Resources.

The goals of the Fossil Creek CRMP are to:

- Protect and enhance ecological, natural resource, and cultural river values: Promote the ability of Fossil Creek to shape the landscape by protecting its free flow, improving geologic/hydrologic processes,

[4] Resolution No. 81-11 of the Governing Body of the Yavapai-Apache Nation, April 21, 2011

restoring the riparian environment, and protecting water quality; promote local American Indian tribes' connection to and use of Fossil Creek.

- Provide opportunities for direct connection to river values: Support opportunities for a diversity of people to experience and develop direct connections to Fossil Creek and its unique values as a place of cultural association, education, recreation, reflection, and inspiration.
- Institute a visitor-use management program that provides for high-quality, river-related recreational opportunities in the river corridor while protecting and enhancing natural and cultural river values today and into the future.
- Provide clear direction on land uses and associated developments in the river corridor, allowing for the infrastructure necessary to support sustainable visitor use and the protection and enhancement of river values.

Specifically, the CRMP: (1) identifies changes to the default 1/4-mile wild and scenic river corridor on either side of Fossil Creek; (2) describes existing resource conditions, with a focus on the river values; (3) defines goals and desired conditions for protecting river values; (4) addresses development of lands and facilities; (5) addresses user capacities; (6) addresses water quality and sets the stage for determining flow requirements for the river values; (7) reflects a collaborative approach with stakeholders; (8) identifies regulatory authorities of other governmental agencies that assist in protecting river values; and (9) includes a monitoring and adaptive management strategy to maintain or make progress toward desired conditions.

Pairing the CRMP with the EIS

To accompany this CRMP and meet the requirements of the National Environmental Policy Act (NEPA), an Environmental Impact Statement (EIS) was developed along with the CRMP. The EIS evaluated the potential environmental effects of six alternative management scenarios (one no action and five action alternatives) for the Fossil Creek WSR. This CRMP is the outcome of these alternatives and the Forest Service's consideration of the analysis in the EIS and public feedback. The alternatives were the result of years of public and partner engagement and experience managing the Fossil Creek Wild and Scenic River corridor.

The alternatives varied in the types of recreation experiences emphasized, the amount of visitor use provided, the amount of recreation facility development, and the extent and arrangement of roads and trails. Common components included finalizing descriptions of the river values, formally designating the WSR corridor boundary, establishing programmatic management direction, and providing a monitoring and adaptive management plan to ensure river values are protected. These alternatives that were considered for the CRMP are described in detail in Chapter 2 of the EIS. This CRMP reflects a modified version of Alternative E. The separate Record of Decision document describes the rationale for selection of this alternative.

Fossil Creek River Corridor Boundaries and Classifications

WSRA requires the Forest Service to establish a detailed corridor boundary for Fossil Creek. Pending the establishment of detailed river boundaries, WSRA specifies that the interim boundary is one-quarter mile on each side of the river as measured from the ordinary high water mark and parallel to the river.

Prior to its designation by Congress as a wild and scenic river in 2009, Fossil Creek had been identified in a statewide inventory of potentially eligible rivers for inclusion in the National Wild and Scenic Rivers System in January 1993 by the Forest Service; the 1993 report (USDA 1993a) evaluated segments determined eligible by the Forest Service and segments proposed by the Arizona Rivers Coalition but determined not eligible. Restoration of full flows in 2005 changed conditions in Fossil Creek; therefore, when Congress designated Fossil Creek in 2009, it added to Fossil Creek's original eligibility determination, including the Fossil Springs Wilderness area above the historic dam. Three segments of Fossil Creek were designated a Wild and Scenic River: two wild segments and one recreational segment, totaling 16.8 miles. Figure 1-3 displays these segments, recreation sites, and road access in the river corridor.

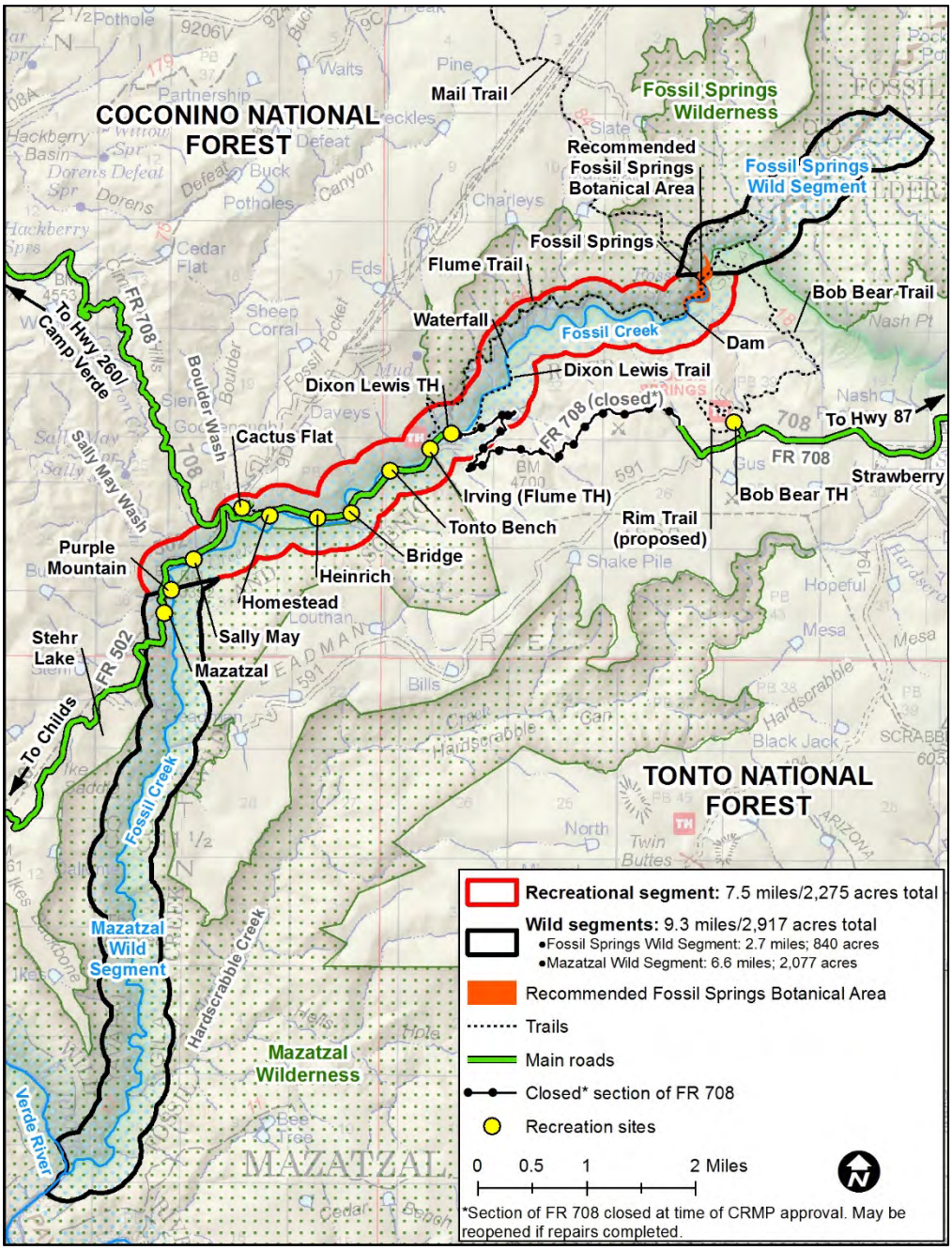

Figure 1-3. Fossil Creek Wild and Scenic River boundaries and classification

River Corridor Boundaries

The wild and scenic river corridor establishes the area that will receive management focus in the CRMP. For federally administered rivers, the designated boundaries generally average one-quarter mile on either bank in the lower 48 states. In accordance with WSRA (Section 3(b)), boundaries may include an average of not more than 320 acres of land per mile, measured from the ordinary high-water mark[5] on both sides of the river.

[5] The U.S. Army Corps of Engineers defines the ordinary high water mark as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

With the exception of one minor change (described below), the Fossil Creek CRMP adopts the river corridor boundary established by Congress, encompassing a quarter-mile of land measured from each side of the river's ordinary high-water mark throughout all segments of the river.

River Segment Classification

The Wild and Scenic Rivers System has three river classifications: wild, scenic, and recreational. A single river or river segment may be divided into different classifications, depending on the type and intensity of the development and access present along the river at the time of designation (WSRA Section 2 (b)):

- ***Wild:*** Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- ***Scenic:*** Rivers or sections that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- ***Recreational:*** Those rivers or sections that are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past.

Fossil Creek's Segments

The Fossil Creek WSR is divided into three segments, as established through the Congressional designation: one recreational and two wild (figure 1-3). No scenic segments exist within the Fossil Creek river corridor. Where appropriate, this CRMP specifies distinct management approaches for the different segments. Acreages (listed below) of segments within the river corridor do not limit the protection of river values, as river values must be protected whether they are inside or outside the corridor boundaries.

The **Recreational Segment**[6] of the corridor includes 7.5 miles of the creek from where the creek exits the Fossil Springs Wilderness to the boundary of the Mazatzal Wilderness, encompassing 2,280 acres.

The **Fossil Springs Wild Segment** includes 2.7 miles of the creek from the confluence of Sand Rock and Calf Pen canyons to the point where the creek exits the Fossil Springs Wilderness, encompassing 840 acres.

The **Mazatzal Wild Segment** includes 6.6 miles of the creek from the boundary of the Mazatzal Wilderness downstream to the confluence with the Verde River, encompassing 2,080 acres.

Although wild segments are typically free of impoundments and generally inaccessible except by trail, the Forest Service acknowledges that the upstream portion of the Mazatzal wild segment includes some development—a portion of Forest Road 502, the Mazatzal recreation site, a portion of the Purple Mountain recreation site, and a 0.4-mile segment of the Western Area Power Administration (WAPA) Flagstaff-Pinnacle Peak 345-kV transmission line. Facilities at Mazatzal include a parking lot, vault toilet, creek access trails, and a sign kiosk. Facilities at Purple Mountain include a parking lot, portable toilet, creek access trails, and a sign kiosk. Despite this infrastructure, as a whole, the Mazatzal Wild Segment is generally inaccessible by road and most of the segment is primitive in nature. The majority of the wild segments fall within the Fossil Springs and Mazatzal wilderness areas.

[6] Recreational River Segment vs. Recreation ORV: Throughout the Fossil Creek CRMP, references are made to a recreational river classification and a recreation outstandingly remarkable value (ORV). Fossil Creek Wild and Scenic River has both. A recreational river segment is a portion of a river classified as readily accessible by road or railroad, may have some development along the shorelines, and may have had some impoundment or diversion in the past. The Recreation ORV refers to the rare and exemplary, river-related recreational opportunities—including sightseeing, interpretation, wildlife observation, camping, photography, hiking, fishing, hunting, and boating—and warrants special protection.

River Corridor Boundary Change

The CRMP includes one change to the river corridor boundary established by Congress. The interim boundary described in Fossil Creek's designation is retained, except a small portion of the river corridor boundary on the southeast side of the recreational segment (SW 1/4 S22, T12N, R7E) is adjusted outward approximately 0.1 miles (encompassing approximately 16.5 acres) to incorporate a spring, thereby protecting Fossil springsnail habitat; and the boundary on the opposite side of the corridor immediately across from the spring (E 1/2 S21, T12N, R7E) is reduced by approximately 16.5 acres (figure 1-4).

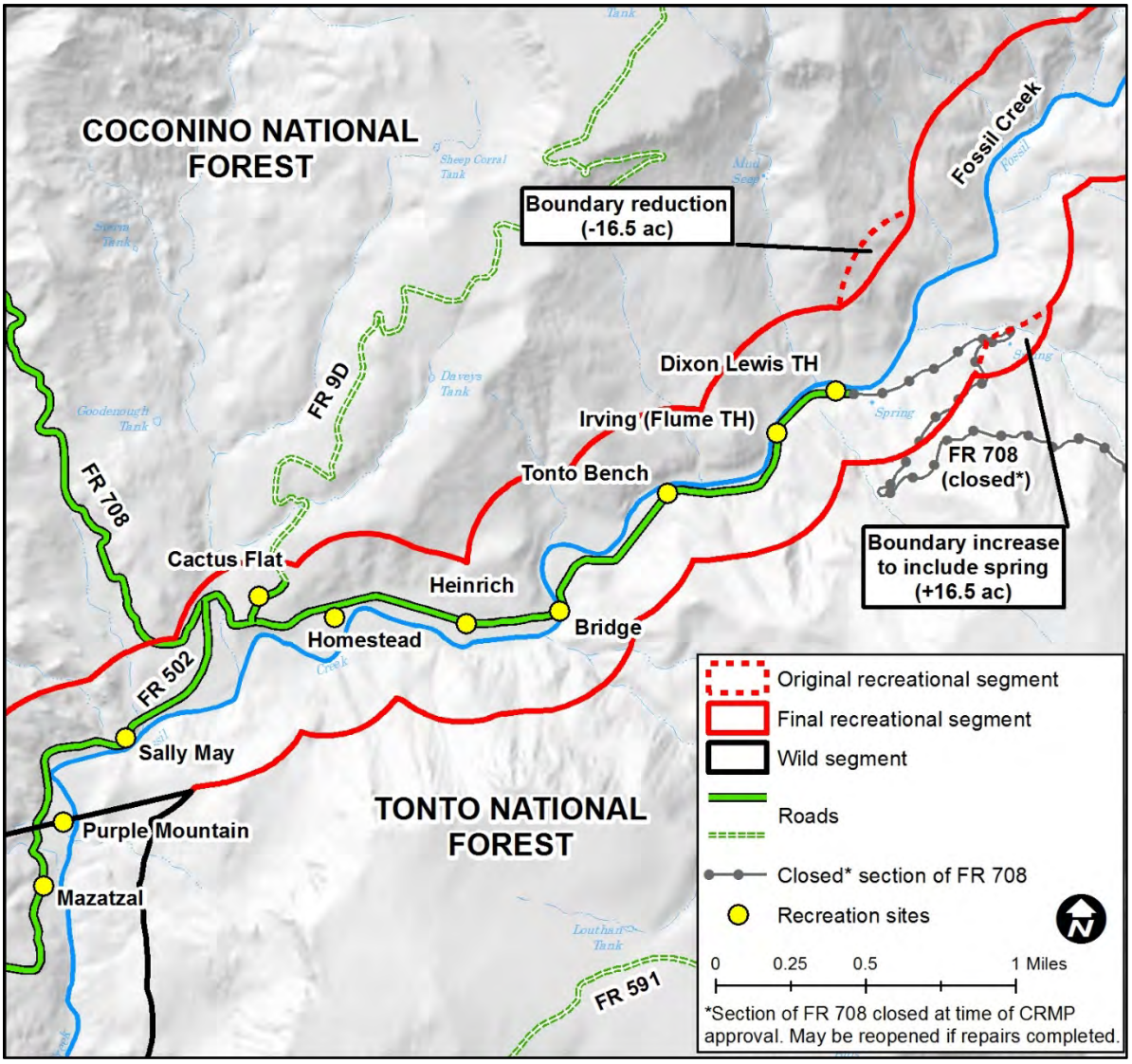

Figure 1-4. Adjusted Fossil Creek WSR corridor boundary within the recreational segment

Fossil Creek History

Human use of Fossil Creek has occurred since prehistoric times. There is evidence in the area of use as long as 10,000 to 12,000 years ago, and various groups of native peoples have lived in the area over the centuries. Fossil Creek is a traditional territory for the Western Apache and Yavapai, and was critical in maintaining cultural continuity in these groups through the period of forced relocation in the late 19th and early 20th centuries (see Chapter 2). More recently, concurrent occupations of Fossil Creek by the indigenous Apache and Yavapai and Anglo engineers and workers occurred in association with the Childs-Irving hydroelectric power system, Arizona's first such system.

> *"Ancestors of the Yavapai-Apache Nation remained in Fossil Creek during the exile to San Carlos between the years of 1875 through 1899, and thereafter continually remained in Fossil Creek while working for entities like the Arizona Electric Company and Arizona Public Service all throughout the twentieth century thereby establishing a personal cultural continuum in Fossil Creek that is unbroken from time immemorial."* –Yavapai-Apache Nation[7]

The rough topography of Fossil Creek has always made Fossil Creek an isolated place, even to this day, but the construction of the Childs-Irving hydropower system brought with it a bustle of activity. The first water rights claim in Fossil Creek was filed in 1900, which led to the development of the hydropower system and diverted Fossil Creek's waters from 1909 to 2005. This system facilitated development of mines in the Prescott, Jerome, and Humboldt areas and power delivery to Phoenix.

Fossil Creek is said to represent one of the largest river recovery efforts in the Southwest, with federal and state agencies and other organizations embarkeing on a restoration effort in 1999. The Federal Energy Regulatory Energy Commission (FERC) authorized the decommissioning of the Childs-Irving hydropower system, operated by Arizona Public Service (APS), in its 2004 Environmental Assessment for Surrender of License-Childs Irving Project-FERC Project No. 2069-007 and associated orders. Decommissioning and restoration actions began in 2004 and continued until the project's completion in 2010. Within that timeframe, multiple actions occurred:

- 2004: Installation of a permanent fish barrier in the Mazatzal Wilderness and removal of non-native fish.
- 2005: Fossil Creek waters were no longer re-directed into flume, which resulted in full flows restored to Fossil Creek. A ceremony on June 18, 2005 recognized the free-flowing waters.
- 2009: Completion of dam lowering, which began in 2008.
- 2010: Completion of Childs-Irving power plant infrastructure removal, except at Childs and a few remnants along the corridor, including foundations at Irving and segments of the flume.
- 2010: The Flume Road, an administrative road driven by APS and the Forest Service, was decommissioned and narrowed, as part of APS decommissioning efforts. This included the removal of multiple side drainage crossings, including a trestle bridge, and converting the route to a non-motorized trail.
- 2010: By 2010, Stehr Lake was completely dry and re-shaped, with its dam removed by 2010. Previously, in 2006, salvaged razorback suckers were relocated to the Verde River followed by piscicide application in Stehr Lake to exterminate the non-native fish that threatened Fossil Creek.

Restoration and maintenance actions continued after decommissioning of the Childs-Irving system. After non-native fish were discovered above the permanent barrier, a temporary fish barrier was installed in 2011 upstream of the permanent barrier. Repairs to the permanent fish barrier were completed in two stages in 2012. Throughout this time, piscicide treatments were used to eliminate the non-native fish. The temporary barrier was removed in 2013 after repair of the permanent barrier. Additionally, restoration of sensitive areas impacted by parking and recreational use in the riparian area have occurred since 2011.

These restoration actions enhanced Fossil Creek's attractiveness to recreationists to swim, boat, hike, birdwatch, and fish, resulting in a dramatic increase in public use, as described in the *Existing Uses* section below.

In 2011, a four-mile portion of FR 708 between the Waterfall Trailhead and Strawberry was closed to public motor vehicle use because of safety concerns caused by rock falls and landslides. This closure eliminated direct public access to Fossil Creek from the town of Strawberry. Prior to the partial FR 708 closure, recreational motor

[7] Resolution No. 81-11 of the Governing Body of the Yavapai-Apache Nation, April 21, 2011

vehicle use on FR 708 between Strawberry and Fossil Creek was fairly common, although similar rock falls and landslides forced closure of the road in the past (Sergent, Hauskins, & Beckwith 1988).

In September 2016, the Western Rivers Conservancy conveyed a 19-acre private land parcel within Fossil Creek's recreational segment, referred to as Heinrich, to the Forest Service. Acquisition of this parcel resulted in contiguous federal land ownership in the river corridor, ensuring the Forest Service's ability to manage the entire river corridor under the CRMP.

Existing Uses

At time of plan approval, within the Fossil Creek WSR corridor, recreation occurs as the prime use; however, a variety of Forest Service and permitted uses also occur, especially throughout the larger Fossil Creek watershed. Additionally, tribal groups, primarily the Western Apache and Yavapai, use the area for recreational and ceremonial activities. Chapter 4, *Visitor Use and User Capacity*, provides additional detail about the kinds and amounts of use Fossil Creek receives. This section details management activities, other permitted uses, and facilities and infrastructure existing at time of plan approval.

Recreational Use and Management

> *"I have lived in the Camp Verde area for 15 yrs and have been visiting Fossil Creek for all of those years. During that time I have witnessed countless families, countless teen, countless hikers, and people in general who have used this area as their escape from the pressures and problems of life and used their time at Fossil Creek to reconnect to each other, reconnect to nature, and thoroughly enjoy the beauty of their surroundings… I see Fossil Creek as a nurturing, healing area for the souls of all who visit there. I know that anytime I visit the area, it is a wonderful, relaxing, invigorating experience - one in which nothing else can duplicate. There are so few places in today's world and society where you can go to enjoy beautiful, crystal clear sparkling water. This is the first and foremost reason I love it so much."* – Michelle A.[8]

Fossil Creek receives a variety of recreational uses, particularly in Middle Fossil where visitors are able to easily access the creek from adjacent parking lots. Recreational activities include swimming, hiking, backpacking, boating, wildlife viewing, bird watching, photography, picnicking, and learning about natural and cultural resources. Opportunities for fishing and hunting also exist and are managed by Arizona Game and Fish Department (AGFD). A four-mile reach of Fossil Creek from the waterfall downstream to immediately below Sally May Wash is open seasonally to catch-and-release fishing for roundtail chub. Hunters pursue various species in the vicinity of Fossil Creek, with hunting typically occurring in the fall, winter, and spring.

Within the Fossil Creek corridor, designated wilderness areas are accessible to those seeking a more primitive experience. Northeast of the recreational segment is the Fossil Springs Wilderness, which overlaps with the Fossil Springs wild segment, and south of the recreational is the Mazatzal Wilderness, which overlaps with the Mazatzal wild segment.[9] The most common access into the Mazatzal Wilderness is via the Mazatzal recreation site, but visitor use of this wilderness is fairly light. Most visitors access the Fossil Springs Wilderness via the Bob Bear (Fossil Springs) Trail. It is also possible to access the Fossil Springs Wilderness via the Mail Trail.

Visitor use studies over the past decade have attempted to document participation in recreational activities. Sightseeing was noted as the primary activity, followed by walking, swimming, hiking, wading, and watching wildlife, amongst others, according to a multi-year visitor survey by Northern Arizona University (NAU) in 2007.

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[8] Letter from Michelle A. to Coconino National Forest, April 9, 2011

[9] Wilderness areas vs. wild segments: Designated wilderness is present in the Fossil Creek river corridor and in some places overlaps with the WSR's wild segments. Although both land designations are made by Congress, WSRA's wild segments are not the same as designated wilderness. There is no express prohibition of motorized or mechanized equipment in wild segments, among other distinctions. Wild segments are "rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted."

Following the NAU study, the Forest Service collected information on recreational use from 2009-2013, with the most popular activities during the high-use season being swimming, camping, and hiking.

Visitor use increased dramatically after restoration of full flows. Social media and television and magazine articles encouraged visitors to seek out this unique Arizona environment, likely resulting in escalated use. Further, rapid population growth in Arizona likely contributed to increasing visitation. Demand for access during the summer season increased from an estimated 20,000 visitors in 2006 to 130,000 in 2015. As visitation to Fossil Creek first began to increase, recreational use was generally unmanaged in that access to the river corridor was unrestricted and few amenities such as toilets or designated parking areas were present.[10] In particular, visitation demand on holidays and weekends began to overwhelm the entrances, far exceed available parking, and create gridlock on the narrow FR 708. On the July 4 holiday weekend in 2015, for example, approximately 1,000 people were in the river corridor per day and almost 3,000 people were turned away at the entrance barricade over a three-day period.

Additionally, impacts to natural, cultural, and social values resulted from uncontrolled dispersed camping, creation of unplanned trails, excessive littering, and human and pet waste near the creek. The amount of area in the river corridor denuded by camping, unplanned trails, and vehicle parking increased from 2002 to 2011 (Rotert 2014). These impacts necessitated implementation of measures to manage visitor use and protect river values prior to the CRMP's completion. Measures included visitor capacity management, gates, delineated parking areas, improved signage, armored creek access, stabilization and rehabilitation of impacted areas, and targeted restrictions, such as of camping in certain areas, to reduce soil and vegetation disturbance (table 1-1). Monitoring indicated a decrease in denuded area beginning in 2012 (Rotert 2014).

Table 1-1. Interim management actions implemented in the Fossil Creek corridor, 2011-2017

Year	Activity
2011	Homestead: Installed gate on FR 708 near Homestead to begin capacity control.
2011	Irving: Placed creek access signs, an information kiosk, and trailhead identification sign; moved large boulders to create more space for existing parking and further define the parking lot.
2011	Purple Mountain: Delineated multiple creek access points. Defined the parking area to prevent vehicle intrusion into the vegetation and blocked spur roads with boulders.
2011	Old Corral: Closed eastern end of road leading to the creek access point to vehicles.
2011	Sally May: Placed barriers to prevent off-road driving beyond the parking area and bouldered off a nearby parking area along the road to prevent use.
2011	Mazatzal: Installed a fence along FR 502 to prevent vehicle intrusions into the wilderness and decommissioned the first 100 feet of a closed road while leaving a footpath.
2012	Mazatzal: Placed rocks and erosion control wattles in locations on the closed road to assist with seeding within the wilderness.
2012	Purple Mountain: Decommissioned half of the roads present at this site to improve watershed function and prevent vehicle intrusion into the Mazatzal Wilderness.
2012	Waterfall Trailhead: Implemented capacity control for the Waterfall Trailhead parking area based on the amount of parking available.
2013	Fossil Springs Trailhead: Implemented capacity control based on amount of parking available, which included installing a gate on FR 708.
2013	Waterfall Trailhead: Implemented erosion control and rehabilitation to reduce water running off the parking lot. Efforts included including seeding the area and installing rock structures and wattles.
2013	Homestead: Installed erosion control rock structures.
2013	Purple Mountain: Seeded an old road closed off with boulders in 2009.
2014	Homestead: Improved road surface for water runoff and erosion control.
2016	Throughout River Corridor: Seasonal permit system begins during high-use months.
2017	Throughout River Corridor: Eight vault toilets installed (to replace numerous portable toilets).

Visitor capacity management evolved in response to changing use. In 2012, Forest Service staff would drive into Fossil Creek at 6 a.m. or camp overnight to allow for assessment of parking lots early in the morning. Staff often

[10] The field of recreation ecology (e.g. Marion 2016; Marion et al. 2016) suggests that the impacts of recreational use can be mitigated through careful management and the provision of recreation infrastructure; therefore, high recreational use in a relatively unmanaged setting has greater potential to result in greater impacts to natural, cultural, and social values.

found nearly full parking lots because of overnight campers.[11] When parking lots were full, a gate on FR 708 near Homestead would be closed. Day use visitors began arriving earlier and earlier in the morning to beat the potential closure of the Homestead gate; others arriving later in the day would not be allowed to enter if parking spaces were full. Once the gate at Homestead closed, Forest Service personnel encountered numerous visitors who were angry or confrontational upon learning they drove 14 miles down FR 708 but could not park where they wanted. This resulted in moving the checkpoint gate to near the intersection of FR 708 and Highway 260 from 2013-2015. Still, visitors waited at the gate hoping for access to Fossil Creek, and it was common for people to drink alcohol and become increasingly confrontational while waiting, especially in extremely hot weather.

On the Strawberry side, an entrance gate was installed on FR 708 in 2013, and capacity management started on weekends and holidays in June 2013 to control use at the Fossil Springs Trailhead parking lot. Prior to this, in this 30-car lot, more than 100 vehicles would park during peak season, equating to up to 400 people on the Fossil Springs Trail. Forest Service staff began closing the lot once all 30 parking spaces were taken.

Challenges with the capacity management practices, particularly safety concerns for Forest Service personnel and the public, as well as a need to further address impacts to natural and cultural values, led to implementation of a seasonal parking permit reservation system through www.recreation.gov in 2016. The permit system established a capacity of 148 vehicles (approximately 740 people) per day between April 1 and October 1 within the permit area (figure 1-5). During the permit season the permit area was closed to camping. Outside of the permit season no permit was required to park at Fossil Creek and dispersed camping was allowed in the corridor upstream of the dam and downstream of the bridge. After the start of the permit system, fewer people were been turned away, the amount of litter removed from the river corridor decreased, and fewer emergency calls occurred (table 1-2). Chapter 4, *Visitor Use and User Capacity*, describes kinds and amounts of visitor use in Fossil Creek in greater detail. This CRMP provides for continuation of a permit system or similar tool as a method of capacity management.

Table 1-2. Changes in people turned away, litter, emergency response calls, and other incidents since implementation of the permit system in 2016

	2015	2016	2017	2018
Number of vehicles/ people turned away	11,113 vehicles/ 43,229 people	3,872 vehicles/ 13,238 people	2,067 vehicles/ 5,079 people	422 vehicles/ 1,154 people
Amount of litter removed	11,511 lbs	4,463 lbs	2,490 lbs	2,308 lbs
Number of search and rescue calls[1]	20	9	12	6
Number of other incidents[2]	55	26	26	9

[1]Search and rescue calls are based on 911 calls recorded by county sheriff's offices.

[2]Other incident classifications include dehydration/unprepared, lost or missing, major accidents, minor injuries, and "other."

[11] As many as 25 camps (360 people) were observed at Homestead, with 100-150 cars in the canyon overnight.

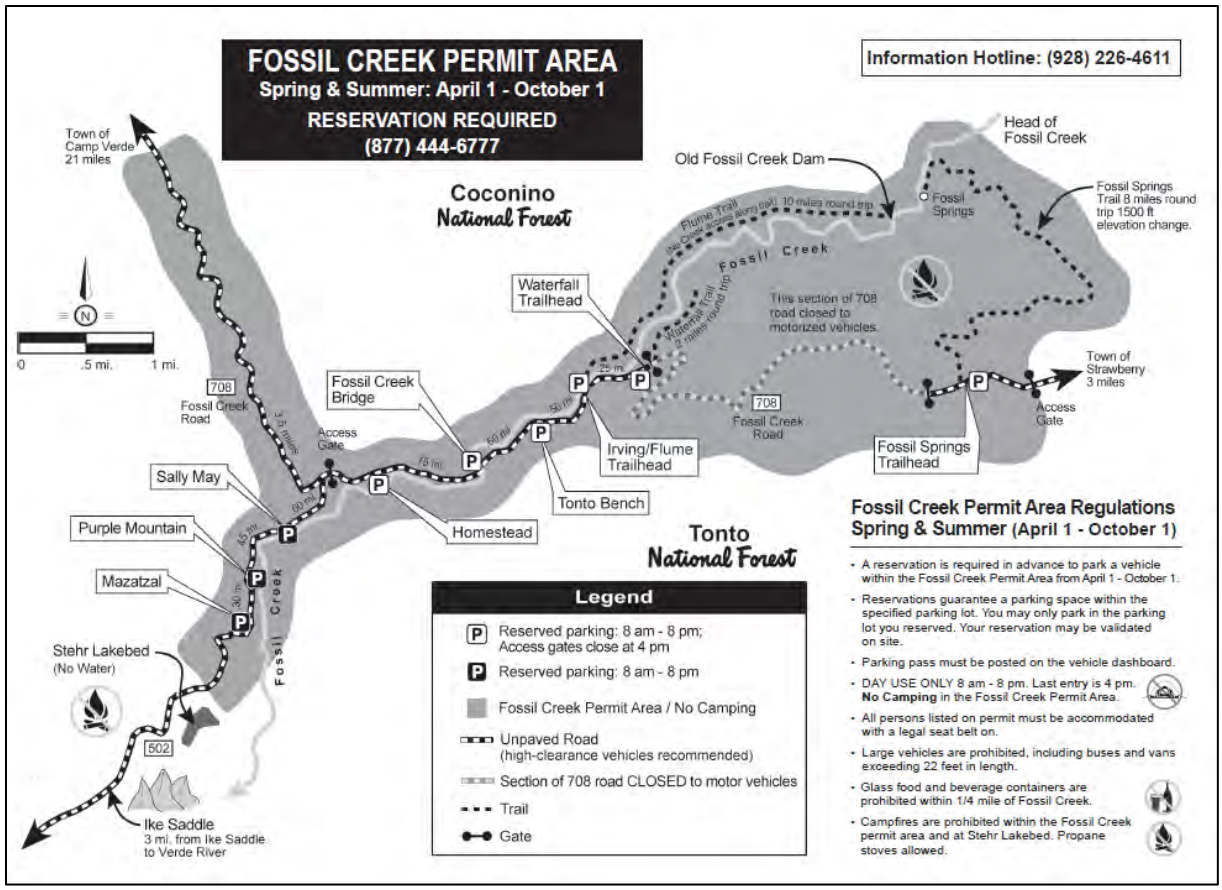

Figure 1-5. Fossil Creek permit area under the permit system implemented in 2016

Numerous injuries, and even some deaths, in Fossil Creek have required emergency response from local fire and law enforcement authorities. Most of these incidents occur along the strenuous Bob Bear (Fossil Springs) Trail or in the vicinity of Fossil Springs, and a lesser (but often severe) number occur at the Waterfall in Middle Fossil. Rescues along the Bob Bear (Fossil Springs) Trail can take many hours because access is by foot.

Permitted and Other Uses

Within the Fossil Creek area, additional uses include grazing; special uses, including permitted utilities and personal uses; and administrative uses, including research. Additional detail about administrative and other uses can be found in Chapter 4, “Visitor Use and User Capacity.”

Facilities and Other Infrastructure

At time of designation, few facilities were present in the Fossil Creek corridor. As a result, visitors parked, camped, and accessed the creek at numerous convenient locations. As described in the “Recreational Use and Management” section above, some facilities and infrastructure have been improved since designation to facilitate sustainable visitor use. The developed recreation footprint within the Fossil Creek project area at time of plan approval consists of limited infrastructure to primarily support parking lots—gravel surfaced with parking spaces delineated by fire hose and boulders and posts. These recreation sites total approximately 11 acres. Table 1-3 lists recreation sites with associated infrastructure and facilities existing at time of plan approval.

Table 1-3. Existing Fossil Creek facilities

Recreation Site	Existing Facilities
Mazatzal	4 parking spaces; vault toilet; kiosk.
Purple Mountain	6 parking spaces; portable toilet; kiosk.
Sally May	10 parking spaces; portable toilet; kiosk.

Recreation Site	Existing Facilities
FR 708/502 Junction	Temporary parking; vault toilet; kiosk; visitor contact station with gate.
Homestead	25 parking spaces; 2 vault toilets; kiosks; picnic tables.
Fossil Creek Bridge	10 parking spaces; vault toilet; kiosk.
Tonto Bench	21 parking spaces; vault toilet; kiosk.
Irving	18 parking spaces, vault toilet, and kiosks on southwest side of creek. Pedestrian access to northwest side via low water crossing. Flume Trailhead and kiosks on northeast side of creek.
Dixon Lewis (Waterfall) Trailhead	21 parking spaces; vault toilet; kiosks.
Bob Bear (Fossil Springs) Trailhead	30 parking spaces, plus 3 stock trailer spaces with corrals; vault toilet; kiosks; trash receptacles.
Historic Dam and Fossil Springs area	Accessible via foot trails. No facilities.
East Welcome Station on FR 708	Visitor contact station with gate.

Other infrastructure and facilities in the Fossil Creek corridor include:

Dam: As part of the decommissioning of the Childs-Irving hydropower system, APS removed the top 14 feet of the Fossil Springs dam by April 2009. The remainder of the dam is present in the stream channel approximately 0.4 miles downstream of the start of perennial flow in Fossil Creek, with water flowing over the top.

Roads: Forest roads 708 and 502 are the main routes into the WSR corridor. FR 9D also accesses the corridor; however, it is extremely rough and receives little use. A total of approximately 6.3 miles of these roads exists in the corridor. All roads are natural surface. FR 502 runs southwesterly from the junction with FR 708 to the Verde River at Childs. FR 708 travels east, crosses the creek at the Fossil Creek Bridge and, after paralleling the creek for approximately 2.5 miles, winds its way back out the canyon to the town of Strawberry and Highway 87.

- **Partial FR 708 Closure:** In November 2011, an administrative closure to public motor vehicle use of approximately four miles of FR 708 occurred west of Strawberry to protect public health and safety due to road issues. More than half of the closed section is prone to rock fall and landslides due to very steep and unstable slopes.[12] A series of two-year closures have maintained the closure to time of plan approval. From 2011 through 2016, the Forest Service performed minimal maintenance on the closed section of FR 708.[13] Rock fall in February 2016 swept away the outer 3-5 feet of a portion of the road and a small retaining wall. The rock was removed, revealing a remnant road of approximately 8 feet in width, with an outer edge of unknown stability. Additional rock fall in early 2017 and 2018 at the same location further deteriorated the road. The Forest Service has told emergency response agencies that they are not prohibited from driving on the road, but that the Forest Service does not currently perform road maintenance like rock clearing due to safety concerns for its employees. This CRMP provides potential for future repair and reopening of this section of road.

Entrance Gates: Two gates and associated traffic spikes are installed on FR 708 at the junction of FR 502 and FR 708 and in the vicinity of the Fossil Springs (Bob Bear) Trailhead to prevent after-hours entry during the high-use season. A third gate at the Homestead site exists to prevent vehicle access east of the area, if needed, while allowing pedestrian access. Outside of the high-use season, traffic spikes are removed.

[12] Maintenance and safety issues related to this section of FR 708 are not new. As documented in the 1988 *Fossil Creek Landslide Investigation* report (Sergent, Hauskins, & Beckwith 1988), the Forest Service closed this section of road in 1988 following a landslide that blocked a section of the road because of the landslide and "numerous hazards" along this section of road. Between 1978 and 1988, approximately five rock slides were known to have occurred.

[13] The Forest Service has been involved in maintenance of FR 708 since at least the 1980s. Leading up to 1988, road maintenance was completed by Gila County with 25 percent of maintenance costs covered by the Forest Service. However, in 1988, Gila County ceased further maintenance of the road "due to the risk of liability and to limited resources" (Sergent, Hauskins, & Beckwith 1988, p. 4).

Parking: Approximately 148 designated parking spaces exist within the permit area at time of plan approval. Recreation sites that include parking are Bob Bear (Fossil Springs) Trailhead, Dixon Lewis (Waterfall) Trailhead, Irving, Tonto Bench, Fossil Creek Bridge, Homestead, Sally May, Purple Mountain, and Mazatzal.

Corrals: Corrals for horse trailer parking are located at the Bob Bear (Fossil Springs) Trailhead.

Toilets: Eight pre-cast concrete vault toilets, installed in May 2017, exist within the river corridor at time of plan approval. Locations include Mazatzal, the junction of forest roads 502/708, Homestead upper and lower loops, Fossil Creek Bridge, Tonto Bench, Irving, and Dixon Lewis (Waterfall) Trailhead. One vault toilet has been in place at the Bob Bear (Fossil Springs) Trailhead since before 2017. During the high-use season, portable toilets are added at sites where a vault toilet cannot be installed because of overhead powerlines, such as Sally May and Purple Mountain.

Trails: A number of trails exist around Fossil Creek. This trail network totals approximately 23 miles, approximately 10 miles of which are within the WSR corridor.

- The Dixon Lewis (Waterfall) Trail is a 0.9-mile trail within the river corridor that is easily accessed and the most hiked trail in the Fossil Creek WSR corridor because it leads to the waterfall. Through the CRMP, this Middle Fossil trail is formally designated as part of the Forest Service trail system.
- The Bob Bear (Fossil Springs) Trail is a 4-mile trail from the trailhead west of Strawberry into the Fossil Springs Wilderness and Fossil Springs area that provides a challenging hiking experience, especially due to its exposed terrain in hot conditions. Many hikers come unprepared, lacking proper footing and sufficient water, to complete this popular hike. Approximately one mile of this trail is within the WSR corridor.
- The Flume Trail is a 4.5-mile trail open to hikers and equestrians from Irving to the historic dam and Fossil Springs area. The non-motorized trail historically was a road used by APS to maintain elements of the Childs-Irving hydropower system. The Flume Trail is essentially entirely within the WSR corridor.
- The Mail Trail is an 8.5-mile trail, with approximately 1.5 miles within the WSR corridor. This little-used trail routes from Highway 260 across the Fossil Springs Wilderness to join the Fossil Springs Trail in the Fossil Springs Wild Segment.
- The Deadman Mesa Trail is a 5.1-mile trail, with approximately 1.8 miles within the river corridor. The trail begins at the end of the Deadman Mesa Road (FR 591) on the Tonto National Forest. This little-used trail, which is difficult to find, enters the Mazatzal Wilderness and the Mazatzal Wild Segment approximately two miles upstream of the confluence with the Verde River.

Interpretive Signage: A number of signage kiosks exist at trailheads and in parking lots to help visitors navigate throughout the river corridor and to provide environmental education, especially regarding the significance of the wild and scenic river designation and the Childs-Irving hydropower system history.

Gabion: A wire basket, rock-filled gabion is present between FR 502 and Fossil Creek between the Purple Mountain and Sally May recreation sites to prevent erosion of FR 502 by high flows in Fossil Creek.

Bridge: A vehicle bridge exists where FR 708 crosses Fossil Creek, which is also the dividing line between the Coconino and Tonto national forests. The bridge is listed on the National Register of Historic Places as a unique engineering example of an earth-filled arch bridge.

Utilities: Several utility lines exist within the Fossil Creek WSR corridor. These include a 69-kV APS power line, a section of the 345-kV Western Area Power Administration (WAPA) Flagstaff-Pinnacle Peak transmission line, and a buried Century Link fiber optic line along FR 708.

USGS Stream Gage: A United States Geological Survey (USGS) stream gage (No. 09507480) has been present on the Fossil Creek Bridge since September 2010. This gage collects continuous flow data for Fossil Creek.

Fish Barrier: A permanent fish barrier was constructed in the Mazatzal Wild Segment in 2004 to protect native fisheries in Fossil Creek above the barrier. This barrier is key to protecting the fisheries component of the biological ORV.

Childs-Irving Remnants: Remnants of the Childs-Irving hydropower system include elements of the flume, penstocks, and siphons; a low water road crossing and remnants of the Irving power plant at the Irving recreation site; and a portion of the diversion dam downstream of Fossil Springs. These features do not adversely impact Fossil Creek's free flow, and are a component of Fossil Creek's cultural landscape.

Planning Context

While developing and implementing the Fossil Creek CRMP, the Forest Service is obligated to adhere to law, regulation and policy; to be consistent with forest plans, including amendments; to follow government-to-government consultation protocols; and to coordinate with individuals and groups interested in the planning and implementation of Fossil Creek actions.

Relevant Law, Regulation, and Policy

This section highlights applicable laws, regulations and policy. Needs with respect to cultural resources are addressed in the "Relationship to Local Tribes" section below.

Wild and Scenic Rivers

To meet the requirements of the Wild and Scenic Rivers Act, this CRMP develops management direction and proposes management actions to provide for the protection and enhancement of Fossil Creek's river values. Future management of Fossil Creek must adhere to WSRA's requirements, including, for proposed water resources projects, Section 7. More detail on the Section 7 process can be found in Chapter 5.

The secretaries of the departments of the Interior and Agriculture jointly provided guidelines for implementing WSRA in the 1982 interagency *Guidelines for Eligibility, Classification, and Management of River Areas*.[14] The guidelines contain guidance for eligibility, classification, and management of wild and scenic rivers. Much of this guidance has been incorporated directly into Forest Service handbooks and manuals, described below. Additionally, the Interagency Wild and Scenic Rivers Coordinating Council provides a variety of guidance documents to assist river managers in meeting the requirements of WSRA.

National Environmental Policy Act of 1969

NEPA established procedures for decision making, disclosure of effects, and public involvement on all major federal actions. Forest Service Manual 1950.2 requires consideration of the impacts of Forest Service proposed actions on the physical, biological, social, and economic aspects of the human environment (40 CFR § 1508.14). To follow NEPA procedures, several Fossil Creek planning efforts have taken place.

In the early 2000s, prior to the decommissioning of the Childs-Irving hydropower system, the Forest Service solicited public feedback through a planning effort initiated but never finished, focusing on how to manage visitor use after the hydropower system decommissioning. A 2003 notice of intent (NOI) in the *Federal Register* formally began the planning effort meant to restore and better protect Fossil Creek's sensitive and unique resources, while continuing to offer access to outdoor recreation opportunities.

Following Fossil Creek's 2009 designation as a wild and scenic river, the Forest Service began a multi-year CRMP development effort with public comment periods, workshops, and meetings critical to collecting feedback on river values and developing management alternatives. The environmental analysis, required by NEPA for the Fossil Creek CRMP, initially was to be an environmental assessment (EA) but was elevated in 2016 to a detailed

[14] *Federal Register* 47(173): 39454-39461, 1982

environmental impact statement (EIS) to more fully analyze potential effects. The management alternatives analyzed in the EIS are the outcome of public feedback before and after 2009.

Future actions in Fossil Creek not considered in the NEPA analysis for this CRMP are subject to separate NEPA analysis.

National Forest Management Act of 1976

The National Forest Management Act (NFMA) of 1976 requires the Secretary of Agriculture to develop guidelines for land management planning with the individual forest being the planning unit or area. NFMA presents regulations and other guidance to develop forest plans that, in detail, provide direction for managing the land and resources of the Coconino and Tonto national forests.

Wilderness Act of 1964

The Wilderness Act guides management of congressionally designated wilderness areas. The designated Fossil Springs and Mazatzal wilderness areas are partially located within the Fossil Creek WSR corridor.

Areas of wilderness are “undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.” Motorized and mechanical transport (vehicles, motorbikes, or bicycles, for example) are not allowed in areas designated as wilderness.

Overlapping wilderness and wild and scenic river designations are possible wherever a designated wilderness area also contains a designated wild and scenic river. In Fossil Creek, the Fossil Spring Wilderness overlaps with the Fossil Springs wild segment, and the Mazatzal Wilderness overlaps with the Mazatzal wild segment.

The Wild and Scenic Rivers Act includes language specific for situations where wilderness and wild and scenic river designations occur. It states: “Any portion of a component of the National Wild and Scenic Rivers System that is within the national wilderness preservation system… shall be subject to the provisions of both the Wilderness Act and this [WSRA] chapter with respect to preservation of such river and its immediate environment, and in case of conflict between the provisions of the Wilderness Act and this chapter the more restrictive provisions shall apply” (16 U.S.C. § 1281(b)).

Wildlife

Several laws, regulations, and policies apply to protect and manage wildlife within the Fossil Creek WSR corridor. These include the Endangered Species Act, Bald and Golden Eagle Protection Act, Migratory Bird Act, Forest Service Sensitive Species, and Arizona Revised Statutes Title 17.

Endangered Species Act: The Endangered Species Act (ESA) of 1973 requires that federal lands are managed for endangered, threatened and proposed species and their recovery. The ESA states that all federal departments and agencies shall seek to conserve federally listed species. Forest Service Manual 2670 directs forests to manage National Forest System habitats to achieve recovery of listed species and to avoid the need to implement special protection measures under the ESA.

Federally listed or proposed wildlife species that occur or have existing or potential habitat in Fossil Creek are the Mexican spotted owl, southwestern willow flycatcher, western yellow-billed cuckoo, northern Mexican gartersnake, narrow-headed gartersnake, and Chiricahua leopard frog. Federally listed or candidate fish species that occur or have existing or potential habitat include the razorback sucker, loach minnow, spikedace, Gila topminnow, roundtail chub, desert sucker, and Sonora sucker.

ESA's Section 7 directs federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats. Whenever an action authorized by a federal agency is likely to affect a species listed as threatened or endangered or to affect its critical habitat, federal agencies must consult with the U.S. Fish and Wildlife Service (USFWS).

Bald and Golden Eagle Protection Act (Eagle Act): The Eagle Act, originally passed in 1940, prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export, or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. Bald and golden eagles exist within the Fossil Creek WSR corridor.

Migratory Birds: Executive Order 13186 directs agencies to identify potential impacts to migratory birds and their habitats, avoid or minimize adverse impacts, restore and enhance habitats, and evaluate the effects of actions on migratory birds.

Forest Service Sensitive Species: Sensitive species are defined as those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by:

a) significant current or predicted downward trends in population numbers or density, or

b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution [Forest Service Manual 2670.5(19)].

Several Forest Service sensitive species included on the USFS Southwestern Region's 2013 Regional Forester's List exist in Fossil Creek.

Per Forest Service Manual 2621.2, the Forest Service is to display findings under the various management alternatives considered for individual projects. This assessment is based on the current geographic range of sensitive species on the Coconino and Tonto national forests and the area affected by the project. This assessment considers, as appropriate for the species and area, factors that may affect the current trend for the species population.

Arizona Revised Statutes Title 17: Defines wildlife as property of the state; specifies that laws related to wildlife shall be administered by the Arizona Game and Fish Department; and outlines regulations related to the taking and handling of wildlife and wildlife conservation projects, among other wildlife management considerations.

Executive Order 13112 on Invasive Species

Executive Order 13112 directs all federal agencies to ensure that their actions do not promote the introduction or spread of invasive species. The intent of the order is to enhance the response and coordination of federal agencies in dealing with invasive species. The order defines an invasive species as a species not native to the region or area whose introduction (by humans) causes or is likely to cause harm to the economy or the environment, or harms animal or human health. This definition encompasses all types of invasive species—plants, animals, and microorganisms. The Forest Service follows the 2005 Integrated Treatment of Noxious or Invasive Weeds for the Coconino, Kaibab, and Prescott National Forests and the 2012 Environmental Assessment for Integrated Treatment of Noxious or Invasive Weeds on the Tonto National Forest to guide inventory and treatment of areas within Fossil Creek for a variety of invasive plants.

Forest Service Manual 2354, River Recreation Management

Provides specific guidance as to what elements should be included in a river management plan.

Forest Service Handbook 1909.12 (Chapter 80), Wild and Scenic Rivers

Describes the process for identifying and evaluating potential additions to the National Wild and Scenic Rivers System on National Forest System lands pursuant to the Wild and Scenic Rivers Act.

Forest Plan Consistency and Amendments

Actions proposed under the CRMP would be consistent with the land and resource management plans for the Coconino and Tonto national forests, amended as described below. At time of CRMP approval, the 2018 Coconino National Forest plan and 1985 Tonto National Forest plan were in effect. Revision of the Tonto forest plan was ongoing at time of CRMP approval. Future actions proposed in Fossil Creek must be assessed for Forest Plan consistency. Actions that are not consistent with the current forest plans must either be modified to ensure consistency or amend the forest plans. Within each of the forest plans, management areas (MAs) and other designated areas, such as wilderness, are delineated to provide plan direction for areas to meet specific management needs. Management areas and designated areas have a corresponding set of plan components that differ from the general forest.

Several forest plan management areas (MAs) overlap with the WSR corridor. On the Coconino NF these MAs consist of the Verde Valley and Pine Belt, and on the Tonto NF these consist of the Mazatzal Wilderness (4A), Verde Wild River (4B), Proposed Fossil Springs Natural Area (4E), and Payson Ranger District General Management Area (4F).

Various other designated areas overlap with the WSR corridor. Most (92%) of the Fossil Springs Wild Segment is contained within the Fossil Springs Wilderness and most (97%) of the Mazatzal Wild Segment is contained within the Mazatzal Wilderness. Portions of both wilderness areas extend into the recreational segment, with approximately 29% of this segment overlapping with designated wilderness. On the Coconino National Forest, a 221-acre portion of the Davey's Recommended Wilderness Area overlaps with the recreational segment; 66 acres of the Hackberry and 9 acres of the Boulder Canyon inventoried roadless areas overlap with the river corridor; and the 12-acre designated Fossil Springs Botanical Area is located in the vicinity of Fossil Springs at the boundary of the Fossil Springs Wild Segment and recreational segment and is contained entirely within the WSR corridor. On the Tonto National Forest, the Proposed Fossil Springs Natural Area is adjacent to the Fossil Springs Botanical Area; 132 acres of this area is located within the WSR corridor.

Forest Plan Amendments

There is a need to amend the forest plans for the Coconino and Tonto national forests to finalize the management boundary for the Fossil Creek Wild and Scenic River and incorporate the management direction provided by the CRMP to ensure protection and enhancement of river values. Additionally, there is a need to recommend modifications to the Fossil Springs Botanical Area in order to better encompass the riparian community this area was designated to protect. The following programmatic forest plan amendments, which were completed pursuant to the 2012 Planning Rule at 36 CFR 219.13, were made as part of approval of this CRMP.

The Land and Resource Management Plan (LRMP) for the Coconino National Forest (USDA 2018) was amended 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.

The LRMP for the Tonto National Forest (USDA 1985) was amended to:

- Establish Management Area 4G, Payson Ranger District Fossil Creek Wild and Scenic River Management Area. This area would encompass approximately 2,233 acres and consist of the Wild and Scenic River Corridor established by Congress and modified by the CRMP to include a spring in the vicinity of Forest

Road 708. Establishing this new Management Area would reduce the area of Management Area 4E (Proposed Fossil Springs Natural Area on page 137) by approximately 132 acres and Management Area 4F (Payson Ranger District General Management Area on replacement page 138) by approximately 592 acres. Where overlap between Management Area 4G (Payson Ranger District Fossil Creek Wild and Scenic River) and Management Area 4A (Mazatzal Wilderness) occurs, the more restrictive plan direction prevails.

- Incorporate (by reference) the management direction provided in Chapter 3 of the Fossil Creek CRMP. This management direction would apply to the Fossil Creek Wild and Scenic River Management Area mentioned above.
- Recommend designation of 9.4 acres of the Fossil Springs Botanical Area adjacent to and part of the Fossil Springs Botanical Area on the Coconino National Forest within the Fossil Creek Wild and Scenic River corridor.

Heritage Resources and Relationship to Local Tribes

Federal agencies, including the Forest Service, have a responsibility to consult with American Indian tribes regarding the eligibility of affiliated historic and cultural properties for nomination to the National Register of Historic Places and on determinations of effect to those properties from federal undertakings and management decisions. Further, various laws and policies guide the agency on how to fulfill those obligations and highlight the importance of sacred sites and the need to manage these places in a manner that does not degrade their traditional value to Indian tribes.

The Fossil Creek corridor holds exceptional cultural value to local tribes, as described in Chapter 2, and these tribes have played an important role throughout the planning process. Today, through consultation with the Forest Service, the Yavapai-Apache Nation and other tribes have provided oral and written evidence that Fossil Creek has in the past and continues to play an important role in their traditional practices and spiritual wellbeing. The Yavapai-Apache Nation has requested that a portion of the Fossil Creek river corridor be nominated to the National Register of Historic Places as a Traditional Cultural Property. Both the Yavapai and Apache peoples continue to conduct ritual visits to Fossil Creek.

Existing Coordination and Regulatory Authorities

Fossil Creek benefits from partnerships supporting research, monitoring, planning, and management operations within the WSR corridor. Coordination includes input from tribal and government entities, including county, state, and federal. The CRMP is designed to be compatible with local and statewide planning goals of all agencies with jurisdiction over Fossil Creek's resources. In addition, a number of volunteer efforts occur by groups such as the Friends of the Forest and school groups completing citizen science projects.

Fossil Creek has received substantial public interest for many years because of its exceptional natural and cultural resources and recreation opportunities, and public feedback has played a key role in the Forest Service planning for and managing the riparian area. In the early 2000s, prior to Fossil Creek's designation as a wild and scenic river, the Forest Service solicited public feedback through a planning effort (that was not completed) focused on how to manage visitor use after the decommissioning of the Childs-Irving hydropower system. Following the 2009 designation as a wild and scenic river, multiple public comment periods, workshops, and meetings have occurred, informing river values and developing management alternatives. Specific details on public involvement can be found in the EIS in Chapter 2, "Alternatives," and Chapter 4, "Consultation and Coordination."

Numerous non-Forest Service entities, often with disparate views on what constitutes appropriate management of the Fossil Creek WSR corridor, have been actively engaged in the planning process in their individual capacities and through the Fossil Creek Working Group, which is part of the Verde Front regional collaborative.

Yavapai-Apache Nation and other tribes: Representing Yavapai and Western Apache people in and around the Verde Valley, the Yavapai-Apache Nation consults regularly with the Forest Service regarding CRMP

development with regard to traditional and contemporary cultural values and culturally sensitive sites. Other tribes with an interest in Fossil Creek have been consulted throughout development of the CRMP and consultation will continue as needed. Other tribes have generally referred to the Yavapai-Apache Nation with regard to activities in Fossil Creek.

Arizona Game and Fish Department: AGFD, as the agency responsible for managing and protecting Arizona's fish and wildlife resources, is a cooperating agency in developing the CRMP. AGFD leads the reintroduction, surveys, and monitoring of wildlife and native fish species within the Fossil Creek WSR. In 2004-2005, the agency joined with the USFWS, Forest Service, and other entities to build a fish barrier in the lower part of Fossil Creek, remove non-native fish above the barrier, and restore native fish above the barrier. Efforts were implemented again in 2012 to repair the fish barrier and remove non-native fish, which had re-colonized portions of the Fossil Creek after high flows in 2011. AGFD opened a four-mile stretch of the Fossil Creek corridor to seasonal catch-and-release fishing in the fall of 2009. AGFD also sets game animal harvest levels, hunting seasons, and similar wildlife population regulatory actions for its game management units, or statewide, based on the species. Fossil Creek lies within portions of game management units 6A and 22. AGFD collaborates with agencies to enhance nongame wildlife habitats and biotic communities and to prevent or mitigate losses, especially regarding wildlife species of special concern.

Bureau of Reclamation (BOR): The BOR assisted the Forest Service with the permanent fish barrier installation in 2004. After the discovery of non-native fish above the permanent fish barrier, the BOR completed environmental analysis to install a temporary fish barrier in 2011 to limit further upstream migration of non-natives. At time of plan approval the BOR oversees annual inspections of the permanent fish barrier and is transferring operation and maintenance responsibilities to the Central Arizona Water Conservation District.

Arizona State Historic Preservation Office (SHPO): Under Section 106 of the National Historic Preservation Act of 1966 and its implementing regulations at 36 CFR 800, federal agencies are required to consult with SHPOs regarding the eligibility of historic and cultural properties for nomination to the National Register of Historic Places, and on determinations of effect from federal undertakings and management decisions.

U.S. Fish and Wildlife Service (USFWS): To support native species, the Forest Service partners with the USFWS to protect endangered species, manage migratory birds, restore nationally significant fisheries, and conserve and restore wildlife habitat. The USFWS participates with AGFD in reintroduction, surveys, and monitoring of listed species within Fossil Creek. Multiple agencies assist with the stocking and implementation plans, which are developed annually by AGFD in cooperation with the USFWS as part of the Central Arizona Project funded by the U.S. Bureau of Reclamation. To meet Endangered Species Act requirements, the Forest Service enters into informal and/or formal consultation with the USFWS on the effects of implementation of proposed actions on federally-listed or proposed species and critical habitat.

Arizona Department of Environmental Quality (ADEQ): ADEQ sets guidance to prevent, control, and abate pollution of air, water and land resources; provides information on water quality conditions; establishes water quality standards; and develops water quality management plans. If water quality within Fossil Creek were to be placed on the list of streams not meeting water quality standards (303(d) list), ADEQ would place affected reach(es) on their schedule of streams for developing water quality management plans. ADEQ can take enforcement actions for violations of water quality standards. ADEQ also identifies waters of the state for additional protections under the Outstanding Arizona Waters (OAW) program; Fossil Creek was designated as an OAW in 2010. Through an Intergovernmental Agreement with ADEQ, the Forest Service has been designated as the management agency for control of non-point sources of pollution on national forest lands through best management practices (BMPs).

Arizona Department of Water Resources (ADWR): ADWR ensures dependable long-term water supplies for Arizona communities. It administers state water laws (except those related to water quality), explores methods of augmenting water supplies to meet future demands, and works to develop public policies that promote conservation and distribution of water. It oversees the use of surface and ground water resources under state jurisdiction. Surface water rights within and above the WSR corridor are administered and enforced by ADWR.

Because an adjudication of the Verde River basin has not been completed, these rights have not been quantified, and their priority of use has not been established. In the future, ADWR will assist the Forest Service in assessing and administering water rights.

Army Corps of Engineers: Oversees the Section 404 permitting process for water resources and other projects.

Gila and Yavapai Counties: Forest Road 708 from Highway 260 to Fossil Creek is maintained in part by Yavapai County under a road maintenance agreement. In terms of emergency response, sheriff's offices for both Gila and Yavapai counties assist within the Fossil Creek WSR corridor. Local and county governments possess the authority to regulate and control land use and development activities.

Verde Front and Fossil Creek Working Group: A part of the Verde Front regional collaborative, the Fossil Creek Working Group assists the Forest Service with Fossil Creek planning, management, and monitoring. The Working Group has held numerous meetings since 2015 co-convened by the AGFD and the Forest Service. The roughly 30 participants include state entities like Arizona State Parks; local government entities like the Town of Camp Verde and the Pine-Strawberry Fire Department; Gila, Yavapai, and Coconino counties; congressional offices and other political entities; academic institutions like Northern Arizona University; environmental groups like the Center for Biological Diversity and the Sierra Club; recreation user groups like American Whitewater and Rim Country Riders, and tribal groups like the Yavapai-Apache Nation.

Northern Arizona University (NAU): Research and monitoring efforts by NAU provide valuable data on a variety of components of the Fossil Creek system.

Arizona Conservation Corps (AZCC): AZCC, supported through AmeriCorps' Conservation Legacy Program, has partnered with the Forest Service to hire local youth through a resource assistant program. Employment of AZCC staff is also done through the Verde Watershed Restoration Coalition.

Verde Watershed Ambassadors: The Verde Watershed Ambassadors have assisted Forest Service staff with stewardship activities and environmental education in Fossil Creek. The ambassadors roved the Fossil Creek WSR corridor during the high-use season to educate visitors about Leave No Trace ethics and implemented environmental resource protections, including blocking user-created trails and collecting trash.

Verde Watershed Restoration Coalition (VWRC): As a program under the Friends of the Verde River, VWRC has collaborated with the Forest Service for more than a decade. VWRC partners with AZCC, tribal entities, and veteran crews to do natural and cultural resource restoration. VWRC efforts in 2017 rehabilitated approximately 4.5 miles of social trails and supported treatment of invasive weeds within the Fossil Creek WSR corridor.

Implementation and Future Modification of the CRMP

The CRMP is intended to be adaptable to changing conditions and needs in order to facilitate more effective protection and enhancement of the river values. Further, the CRMP provides broad flexibility to use a variety of tools to manage Fossil Creek. Implementation of actions approved by the CRMP (described in Chapter 5) can be phased as needed to accommodate management needs, river value conditions, and resource availability. The CRMP emphasizes an adaptive management approach, recognizing there is uncertainty regarding how river values will respond to changing management and unforeseen events. The adaptive management approach is described in Chapter 6. Monitoring, also described in Chapter 6, is an essential component of adaptive management, and although the CRMP prescribes specific approaches to monitoring, these approaches may be changed if needed to more effectively determine the condition of river values or incorporate new scientific understanding or more efficient methodologies.

Chapter 2. River Corridor Resources

A wild and scenic river's defining characteristics include free-flowing condition, its water quality, and the existence of at least one "outstandingly remarkable value." Together, these are referred to as river values. Management of a wild and scenic river must protect and enhance the river values. This chapter discusses each of Fossil Creek's river values in detail, including a summary of its baseline condition in 2009 and its existing condition. The remainder of the CRMP is then devoted to discussing concepts and management that are critical to protecting and enhancing the river values.

Fossil Creek's final river values are free-flowing condition, water quality, geology, Western Apache and Yavapai traditional and contemporary cultural values, biological values (comprised of both wildlife and fish populations and habitats), and recreation. Additionally, Fossil Creek's water quantity is a critical component of the river values.

Concepts Related to the River Values

These concepts are used throughout the CRMP, in particular with respect to describing Fossil Creek's river values.

River Values: A river is added to the National Wild and Scenic Rivers System in acknowledgement of its free-flowing condition, water quality, and outstandingly remarkable values. Collectively, these qualities are referred to as river values. Management of a wild and scenic river under the CRMP must protect and enhance the river values.

Free-flowing Condition: A river must be in a free-flowing state to be eligible for inclusion in the National Wild and Scenic Rivers System. A free-flowing river, or section of a river, moves in a natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. Once a river is designated, the managing agency is required to preserve its free-flowing condition for the benefit and enjoyment of present and future generations. Under the CRMP, the Forest Service will protect its free-flowing condition by adhering to Section 7 of WSRA, as described further in Chapter 5.

Water Quality: Another WSRA mandate is to protect the water quality of designated rivers. Water quality is affected by many natural variables within the watershed and human activities. Water quality may be monitored directly or through indirect measures such as soil condition and riparian function.

Baseline Condition Assessment: An assessment of the health of river values that serves as the basis from which the degree/intensity of existing and future impacts can be measured. All future activities are to be measured from this baseline to ensure continued high quality conditions and to eliminate adverse effects (protect) or improve conditions (enhance) within the river corridor. The CRMP describes the baseline conditions at the time of designation—including a description of any pre-existing degradation—and provides management actions and management direction to protect and enhance Fossil Creek's river's values.

Adverse Impact: A substantial reduction in the condition of a river value in relation to baseline conditions as a result of public use, development, and/or administrative use. An adverse impact is a condition that requires immediate management attention. It may be detected by periodic monitoring or by other means. When more than one indicator is monitored for any river value, an adverse impact associated with any one of the indicators constitutes an adverse impact on the value as a whole. This definition is specific to management of Fossil Creek under this CRMP and is not the same as the definition used in NEPA.

Degradation: Degradation is the state in which a river value has been fundamentally altered by public use or development to the point that its condition is reduced below the baseline documented at time of designation. Degradation is both long-term and segment- or corridor-wide. A river value has been degraded when recovery would only be possible through a sustained change in management and a significant investment of financial capital. Degradation may be detected by periodic monitoring or by other means. The Ninth Circuit has held under

WSRA that a comprehensive management plan must "trigger management action before degradation occurs" (FYVIII, 520 F.3d 1024, 1034-35, Ninth Circuit, 2008).

Protect and Enhance: Protection of a wild and scenic river occurs by documenting and eliminating adverse impacts on river values, including activities that were occurring on the date of designation (IWSRCC 2002). Enhancement actions are taken to improve the condition of a river value to the point where it meets or exceeds the desired condition. Where possible, these actions correct past and present degradation. The state of enhancement is the best possible condition for a river value.

Adaptive Management: Adaptive management refers to a "rigorous approach for learning through deliberately designing and applying management actions as experiments" (Murray and Marmorek 2003). The CRMP includes monitoring indicators and metrics associated with specific objectives. As the CRMP is implemented, monitoring provides the data that inform the adaptive management process and is the critical link in determining when action is needed. Adaptive management is an important component of this CRMP, as described in Chapter 6.

Monitoring: Evaluation of the condition of river value-related indicators to determine if they are protected and enhanced or to detect adverse impacts and to inform the need for adaptive management actions. The monitoring program for Fossil Creek is described in Chapter 6.

Indicator: Indicators are factors assessed through monitoring to determine the condition of river values. Indicators are selected based their relationship to river values, their ease of measurement, precision, sensitivity to changes over time, and, if possible, their ability to satisfy multiple objectives of the monitoring process. Chapter 6 describes the indicators specific to Fossil Creek's monitoring program.

Thresholds: Thresholds signify degrees of movement toward adverse impact to or degradation of river values. The thresholds are pre-defined decision points that indicate, barring mitigating circumstances, an adaptive management action is warranted to ensure protection or prevent degradation of river values. These thresholds are described in Chapter 6.

> **Soft Threshold**: Soft thresholds indicate the point at which adverse impacts may be occurring.
>
> **Hard Threshold**: Hard thresholds indicate the point at which degradation is threatened.

Resource Protection Measures: Resource protection measures consist of mitigations and best management practices. Relevant resource protection measures are listed in Appendix A.

> **Mitigation:** A component of resource protection measures. Mitigation includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; or (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
>
> **Best Management Practices:** Best management practices (BMPs) relate most directly to water quality and include methods, measures, or practices selected by an agency to meet its nonpoint source pollution control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters.

River Values Background

The Wild and Scenic Rivers Act (WSRA) Section 1(b) requires administering agencies (the Forest Service in the case of Fossil Creek) to protect a wild and scenic river's values. Section 1(b) states:

> "It is hereby declared to the be policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish

> and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes."

The Interagency Wild and Scenic Rivers Coordinating Council has issued specific guidance and criteria for identifying ORVs (IWSRCC 1999). To be considered outstandingly remarkable,

- **A value must be river-related or river-dependent.** To be considered river-related or river-dependent, a value must be located in the river or on its immediate shorelands (generally within 0.25 mile on either side of the river); contribute substantially to the functioning of the river ecosystem; and/or owe its location or existence to the presence of the river.
- **A value must be rare, unique, or exemplary in a regional or national context**. To be considered rare, unique, or exemplary, a value should be a conspicuous example from among a number of similar values that are themselves uncommon or extraordinary.

A variety of methods assist land managers, as guided by IWSRCC 1999, in determining whether certain resources are so unique, rare or exemplary as to make them outstandingly remarkable. Input from organizations and individuals familiar with specific river resources should be sought and documented as part of the process.

The determination that a river contains outstanding values is a professional judgment on the part of an agency's interdisciplinary team, based on objective, scientific analysis. Only one value is needed for eligibility as a WSR.

Descriptions of Fossil Creek's river values presented in this chapter are considered benchmarks against which all proposals for future management will be measured for meeting the standard of protection and, to the extent possible, enhancement.

Previous Identification of ORVs

In the 1990s, the Forest Service conducted studies of Arizona's free-flowing rivers. The *Preliminary Analysis of Eligibility and Classification for Wild/Scenic/Recreational River Designation* (USDA 1993a) identified 57 rivers and streams as potentially eligible for inclusion in the National Wild and Scenic Rivers System. This study concluded Fossil Creek was potentially eligible for designation and identified its ORVs for the first time as geology, fish, wildlife, history, ecology, and riparian community values.

In the early 2000s, the Forest Service proposed management changes for Fossil Creek to provide resource protection and improved recreation quality, partly in response to the expected decommissioning of the Arizona Public Service's (APS) Childs-Irving hydropower system. Although this planning process was not completed, the proposal published on the Forest Service website included an analysis of the eligibility of Fossil Creek as a wild and scenic river from Fossil Springs to the Verde River in anticipation of restoration of flows. The river's outstandingly remarkable values were modified to scenery, geology, fish, wildlife, history, and botany.

In 2003, the Arizona Wilderness Coalition published a report titled *Fossil Creek Wild and Scenic River Study* (Arizona Wilderness Coalition 2003). This report evaluated resources of Fossil Creek from Fossil Springs to the Verde River to determine outstandingly remarkable values. Using criteria consistent with those developed by IWSRCC, it found scenery, geology, fish, wildlife, cultural resources, and ecology met the outstandingly remarkable value criteria. Table 2-1 lists previously identified ORVs.

Table 2-1. Previous evaluations of outstandingly remarkable values for Fossil Creek

	1993 reports	Early 2000s Forest Service planning	2003 Arizona Wilderness Coalition report
Reach studied	Just below Fossil Springs dam to the Verde River (approximately 13.5 miles)*	Fossil Springs to the Verde River (approximately 14 miles)	Fossil Springs to the Verde River (approximately 14 miles)
ORVs identified	• Geology • Fish • Wildlife • History • Ecology • Riparian Community	• Scenery • Geology • Fish • Wildlife • History • Botany	• Scenery • Geology • Fish • Wildlife • Cultural Resources • Ecology

*In 1993, the WSR-eligible reach of Fossil Creek began just downstream of the diversion dam and extended to the Verde River. Once the dam was partially removed during decommissioning, Fossil Creek in its entirety was eligible for designation. When Congress formally designated Fossil Creek in 2009, it included approximately three additional miles over those previously identified.

Shortly after Fossil Creek was designed as a wild and scenic river in 2009, the Forest Service released a resource assessment for public comment (USDA 2010). This document conducted a new assessment of Fossil Creek's river values. In 2011, a revised resource assessment, which addressed public comments, was published (USDA 2011). Over time, some river values were altered because of changed conditions since previous evaluations or additional rigor in the analysis. For example, fish, aquatic species, wildlife, and habitat were combined into one biological ORV in 2016 (USDA 2016).[15]

Final River Values, Including ORVs

This CRMP makes a final determination that Fossil Creek and its immediate environment possess one or more outstandingly remarkable values. The significance of selected river values follows criteria provided in IWSRCC 1999 as incorporated into agency policy (FSH 1909.12, Ch. 82.73a).

Using public comments and a resource assessment identifying changed conditions, the Forest Service simplified its river values to ensure they better align with agency policy related to WSRA. Characteristics of each potential river value were assessed within a "region of comparison," which for Fossil Creek is the Central Highlands Planning Area; this regional area is one of seven planning areas identified by the Arizona Department of Water Resources (ADWR 2009; figure 2-1). It encompasses approximately 13,900 square miles and includes the Agua Fria, Salt River, Tonto Creek, Upper Hassayampa, and Verde River basins. The Central Highlands physiographic province is a transition zone between the plateau uplands to the north and the basin and range lowlands to the south.

Fossil Creek's river values consist of water (free-flowing condition and water quality) and four ORVs:

- Geology
- Biological (defined as both wildlife and fisheries populations and habitats)
- Western Apache and Yavapai traditional and contemporary cultural values
- Recreation

Changes to the previously identified river values are intended to streamline how they are addressed in the CRMP and to reflect conditions that have changed since the earlier evaluations of Fossil Creek. For example, a variety of ecological values, including fish, wildlife, and habitat components of the riparian area are combined into the biological ORV to reflect the connectivity and interdependence of Fossil Creek's ecology. Recreation was added as an ORV because of the unique and outstanding recreation opportunities offered by the creek after restoration of full flows, as evidenced by the recent increase in demand for access and the fact that it has become an international destination. Scenery was removed from the list of river values because further evaluation indicated

[15] Combining multiple resources into one river value does not in any way reduce the value of the individual parts but will reduce redundancy in the environmental analysis.

that, although the scenery in Fossil Creek is diverse, scenery is also striking in other rivers and areas within the region and the state and large power lines impact the scenery within the corridor. Further, key components of Fossil Creek's scenery such as its geology, biology, and water, are protected as their own river values.

All river values are treated equally and retain the same status for protection under the CRMP. All river values apply to the entire river corridor.

This section first describes the connection of Fossil Creek's water to the ORVs. Next it describes the four ORVs in the context of the criteria used to determine eligibility for designation as an ORV. Baseline and existing conditions for the river values are described later in this chapter.

Figure 2-1. Arizona Water Atlas planning areas. The Central Highlands is the region of comparison for this evaluation.

Water

WSRA requires that the free-flowing condition of designated wild and scenic rivers be preserved and their water quality protected. As a result, this CRMP holds Fossil Creek's water, defined as a combination of free flow and quality, to a protection standard similar to that associated with the ORVs. Additionally, WSRA allows the federal government to obtain a federal reserved water right for the quantity of water sufficient to achieve the purposes of the WSRA (e.g. protecting ORVs). Though water quantity is not an ORV on its own, because it is a critical component of Fossil Creek's ORVs, protecting water quantity is key to protecting the ORVs. The link between free flow, water quality, and water quantity and the ORVs is summarized below and described throughout this CRMP.

Free Flow

The year of designation of Fossil Creek as a Wild and Scenic River, 2009, constitutes the baseline condition for its free flow. Leading up to designation, the restoration of natural flows to the creek in 2005 and the lowering of the Fossil Springs Dam in 2009 served to improve its free-flowing characteristics. The importance of free flow to Fossil Creek's ORVs is evidenced by changes in the river corridor seen after restoration of flows. For example, without flow diverted into the flume system, travertine deposition appears to be returning to a pattern similar to historic conditions (Overby 2018); wildlife species such as the lowland leopard frog have expanded their ranges; a robust native fishery has become established in a large portion of the creek; the presence of full flows is a vital element of the cultural values ORV; and water-based recreation opportunities have expanded substantially.

Water Quality

Fossil Creek's water quality, particularly its unpolluted nature, calcium carbonate content, temperature, color, and clarity, are important components of Fossil Creek's ORVs.

Available data suggest Fossil Creek has excellent water quality (ADEQ 2017). This contributes to the high-quality habitat for fish and aquatic macroinvertebrates present in the creek, which is an important element of the biological ORV. Additionally, the high water quality allows visitors to readily enjoy water-based recreation.

Water, infiltrating into the ground from recharge areas above the Mogollon Rim, dissolves limestone as it percolates through sedimentary formations. Carbon dioxide is dissolved into the water during the limestone dissolution process and emerges at Fossil Springs at pressures up to 150 times greater than atmospheric conditions (Malusa et al. 2003). Outgassing of the dissolved carbon dioxide results in supersaturation with calcium carbonate ($CaCO_3$). Once a critical level of supersaturation is exceeded, the calcium carbonate precipitates to form travertine deposits. This travertine deposition is a critical component of the geology ORV and contributes to the wildlife and fish habitat in and around the creek.

The temperature of the water discharging from Fossil Springs is relatively warm, ranging from 67 to 72 degrees Fahrenheit, and the water is exceptionally clear and an attractive blue-green color during baseflow conditions. These characteristics add substantially to the scenic and recreational qualities of the creek.

Water Quantity

Fossil Creek's baseflow emerges over a 1,000-foot reach of channel from a complex of springs that constantly discharge from just a few gallons of water per minute to more than 10 cubic feet per second (cfs). Total flows from the spring complex range from about 40 to 52 cfs (Nelson 2003). The uniform nature of the discharge from the springs maintains a constant baseflow in the creek.

Fossil Creek's ORVs owe their existence to the combination of the abundant, constant flow of water at baseflow conditions and periodic flood flows that can alter channel conditions, increase habitat complexity, and create the conditions needed for recruitment of native riparian species. Fossil Creek's travertine features are formed at times of baseflow and altered by flood flows. This dynamic is key to shaping the creek's geology, channel morphology, and riparian ecosystem, which in turn contribute to complex wildlife and fish habitat. Constant water flow with periodic flood flows allows for the presence of the native fishery and macroinvertebrates and creates a diverse and extensive riparian community that is home to numerous wildlife species. Year-round water availability made human habitation of the Fossil Creek area possible, creating the deep cultural connection of the Western Apache and Yavapai to Fossil Creek. Continued flows create the landscape that is critical to maintaining this cultural connection today. Finally, without Fossil Creek's constant flows, the recreational opportunities in the area would be far fewer, and the area would not be the draw that it is to people from around the state, country, and world.

Future quantification of the federal reserved water right to "to achieve the purposes of the WSRA" by protecting Fossil Creek's ORVs should account for the strong relationship between Fossil Creek's full range of flows and the existence of the ORVs. Both baseflows and flood flows are critical to maintaining this relationship.

> *"Water in a desert state is the primary resource. It carves the red rock country, sustains our forests. And supports all our unique flora and fauna. Water conservation and allocation will be the prime movers of our economic and environmental survival. Please continue to thoughtfully protect this wild river and its basin and drainage to the very best of your ability for the sake of all living things that depend upon it."* – Katherine E.[16]

Geology ORV

Geology ORV Criteria: For geology to be an ORV, per IWSRCC guidance, it should meet several criteria:

- The river, or the area within the river corridor, contains one or more examples of a geologic feature, process or phenomenon that is unique or rare within the region of comparison.
- The feature(s) may be in an unusually active stage of development, represent a "textbook" example, and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial or other geologic structures).

Description: Fossil Creek produces travertine, which is a geologic feature and process phenomenon that is unique within the region of comparison. The existence of extraordinary travertine dams extending some distance downstream from the spring sources, often creating impressive pools, has long been documented.[17]

Travertine is defined, per the American Geological Institute, as biotically and/or abiotically precipitated calcium carbonate (predominately calcite and aragonite) from spring-fed, heated and/or ambient-temperature waters. Travertine is chemically identical to the mineral calcite, which is distinguished from other forms of calcium carbonate by its banded and often porous structure, resulting from its mode of deposition. A rare combination of natural processes is required for the calcium carbonate-rich spring water to form travertine dams.

Springs emitting water supersaturated with calcium carbonate ($CaCO_3$) have the potential to create travertine structures that dramatically alter stream morphology. Structures form when water interacts with the soil zone, carbonate aquifers, organic material, or regional geothermal activity to produce inorganic carbonic acid (H_2CO_3). The carbonic acid increases dissolution of carbonate rocks, resulting in elevated concentrations of dissolved carbon dioxide (CO_2) in the water. The concentration gradient between atmospheric CO_2 and dissolved CO_2 in water emerging from an aquifer initiates outgassing. As carbon dioxide concentrations move toward equilibrium through outgassing, the water becomes supersaturated with calcium carbonate. When a critical level is exceeded, a kinetic barrier is surpassed and calcium carbonate precipitates to form travertine deposits.

After construction of a 26-foot high dam resulted in Fossil Creek's diversion for the Childs-Irving hydropower system in 1909, the travertine structures in the channel were breached and destroyed by episodic floods and debris flows. The return of full flows to Fossil Creek in 2005 triggered rapid re-growth of travertine dams; within months, hundreds of new travertine dams started to form within the stretch of river downstream of the historic dam (Fuller et al. 2011).

In North America, only three travertine systems are larger (with respect to water discharge and mineral deposition potential) than Fossil Creek; all three of these are partially or wholly contained within national parks. These systems consist of Havasu Creek (Havasupai Indian Reservation and Grand Canyon National Park), Blue Springs of the Little Colorado (Navajo Reservation and Grand Canyon National Park), and Mammoth Hot Springs (Yellowstone National Park). In addition, sites similar to Fossil Creek in Mexico (Agua Azul) and Croatia (Plitvice) are protected in national parks.

[16] Letter from Katherine E. to Coconino National Forest, March 20, 2019
[17] Lummis (1891) and Chamberlain (1904), as cited in Malusa et al. 2003

Fossil Creek is the only creek within the Central Highlands physiographic region that is dominated by travertine-forming water chemistry.

Geology Finding: The travertine formations in Fossil Creek are the fourth largest in North America; the potential to quickly rebuild a huge travertine system is a rare feature and contributes to complex, dynamic fish and wildlife habitat. Based on these findings, geology is carried forward as an ORV with the same standing as all the other Fossil Creek river values.

Biological ORV (Fish and Aquatic Resources)

The biological ORV is comprised of both habitat and populations of fish, aquatic invertebrates, and wildlife. Discussion of the biological ORV is divided into two sections; this section focuses on fish and aquatic resources.

Biological (Fish and Aquatic Resources) Criteria: For fish and aquatic resources to be part of a biological ORV, values may be judged on the relative merits of either populations or habitat, or a combination of these conditions, per IWSRCC national evaluation guidance.

• *Populations:* The river is nationally or regionally an important producer of resident and/or anadromous fish species. Of particular significance is the presence of wild stocks and/or federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration.

• *Habitat:* The river provides exceptionally high-quality habitat for fish species indigenous to the region of comparison. Of particular significance is habitat for wild stocks and/or federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of habitats is an important consideration.

Population Description

Once full flows were restored in 2005 and native fish populations were restored, Fossil Creek supported an exclusively native fish community in more than 10 miles of stream above a permanent fish barrier. This fish community is of particular importance to the value of the biological ORV and is primarily composed of roundtail chub, desert sucker, Sonora sucker, speckled dace, and longfin dace.

Six federally listed or Forest Service sensitive fish species either are present or have suitable habitat in the Fossil Creek area (table 2-2). The endangered fish species are the loach minnow, Gila topminnow, and spikedace. Forest Service sensitive species, on the Southwestern Regional Forester's 2013 sensitive species list, are the roundtail chub, desert sucker, and Sonora sucker.

From 2007-2014, Arizona Game and Fish Department (AGFD) and the U.S. Fish and Wildlife Service (USFWS) stocked razorback sucker[18], spikedace, loach minnow, and Gila topminnow. Longfin dace, although already thought to be present in Fossil Creek, was stocked to augment the native Fossil Creek population. Populations of Gila topminnow and spikedace have persisted for several years after stocking ceased, though catch per unit effort of both species declined in recent AGFD surveys (Rinker and Rogers 2017; Rinker and Rogers 2018). Razorback sucker and loach minnow have not been detected for several years and those repatriation efforts are considered failed (Robinson and Mosher 2018).

Fossil Creek contains a high diversity of macroinvertebrates compared to other southwestern streams, with well over 100 species. The Fossil springsnail and a caddisfly are listed as Forest Service sensitive species.

Table 2-2. Federally listed and Forest Service sensitive fish and macroinvertebrates with potential to occur in the Fossil Creek corridor

Species	Status	Critical Habitat in Fossil Creek
Fish		
Loach minnow, *Tiaroga cobitis*	Endangered	Yes

[18] In previous Fossil Creek analyses, the razorback sucker (*Xyrauchen texanus*) was included based on its presence and stocking of the fish. It has since been determined that this fish is no longer present (Robinson and Mosher 2018).

Species	Status	Critical Habitat in Fossil Creek
Spikedace, *Meda fulgida*	Endangered	Yes
Gila topminnow, *Poeciliopsis occidentalis*	Endangered	NA
Roundtail chub*, *Gila robusta*	FS-S**	NA**
Desert sucker, *Pantosteus clarki*	FS-S	NA
Sonora sucker, *Catostomus insignis*	FS-S	NA
Macroinvertebrates		
Fossil springsnail, *Pyrgulopsis simplex*	FS-S	NA
A caddisfly, *Wormaldia arizonensis*	FS-S	NA

*In 2016, the headwater chub, roundtail chub, and Gila chub were determined to be a single species, referred to as the roundtail chub (Page et al. 2017).
**FS-S = Forest Service Sensitive Species (USFS, Southwestern Region, Regional Forester's List –September 2013); NA = Not Applicable (no critical habitat has been designated for this species).

After the restoration of native fish species, the Arizona Game and Fish Commission approved creating the country's first-ever blue ribbon catch-and-release-only seasonal roundtail chub fishery along four miles of Fossil Creek in 2009.

Habitat Description

High-quality habitat for native fish, including federally listed or Forest Service species, contributes to Fossil Creek's diverse aquatic community. This community flourishes because of the removal of non-native fish from the system. Macroinvertebrates provide the food base for many native fish, and the wide diversity of these species in the system is unique in its own right.

A multi-partner fisheries restoration project has made Fossil Creek into one of the most valuable habitats for native fish, reversing the effects of a century of water diversion and invasion of non-native fish species. As part of this effort, a fish barrier was constructed in 2004 on the lower portion of Fossil Creek (4.5 miles above the confluence with the Verde River), and non-native fish species above the barrier were removed. The fish barrier prevented upstream incursion of non-native species from the Verde River. Survey of Fossil Creek's aquatic habitat by AGFD in fall 2007 determined suitable habitat for native fish species to be repatriated. All reaches above the permanent fish barrier showed habitat complexity, especially the upper reach (Irving power plant upstream to Fossil Springs) with variable gradient, current, depth, and substrates. Travertine formations created pools for aquatic species. Although extreme winter flooding in 2008 and 2010 re-distributed stream substrates and destroyed many of the travertine dams throughout the system, Fossil Creek's system is dynamic, much as it was prior to the early 1900s. Far from being a detriment to native aquatic species, natural flooding and related habitat changes are generally beneficial, removing substrate embeddedness and re-distributing both sediments and nutrients into the riparian zone and downstream. Habitat changes in Fossil Creek do not appear to have harmed the previously established native fish species (Marsh et al. 2010; Rinker and Roger 2018), providing further evidence that native Gila basin fish are well-adapted to flooding (Meffe and Minckley 1987).

> *"Fossil Creek is an Arizona and a National Treasure. A healthy desert riparian stream is very rare. A healthy native fishery is even more rare. Fossil Creek is both. And in fact, Fossil Creek is the best native fishery surviving in the Southwest."* – Center for Biological Diversity and Maricopa Audubon Society.[19]

Biological (Fish and Aquatic Resources) Finding: Fossil Creek is home to a diverse native fish community, presently comprised of six endangered or Forest Service sensitive species and two special-status macroinvertebrates, with no non-native fish above the fish barrier. Interdependence exists among Fossil Creek native fish, invertebrates, and their ever-changing habitat. Based on these findings, fish and aquatic resources are carried forward as a component of the biological ORV, which has the same standing as all the other Fossil Creek river values.

[19] Letter from Center for Biological Diversity and Maricopa Audubon Society to Coconino National Forest, April 2, 2019

Biological ORV (Wildlife)

The biological ORV is comprised of both habitat and populations of fish, aquatic invertebrates, and wildlife. Discussion of the biological ORV is divided into two sections in this document; this section focuses on wildlife.

Biological (Wildlife) Criteria: For wildlife to be part of a biological ORV, values may be judged on the relative merits of either populations or habitat, or a combination of these river-related conditions, per IWSRCC national evaluation guidance.

Populations: The river or area within the river corridor contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique and/or populations of federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration.

Habitat: The river, or area within the river corridor, provides exceptionally high quality habitat for wildlife of national or regional significance, and/or may provide unique habitat or a critical link in habitat conditions for federal or state listed (or candidate) threatened, endangered, or sensitive species. Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of habitats is an important consideration.

Population Description

Fossil Creek and its associated riparian habitat supports roughly 200 known bird, mammal, reptile, and amphibian species, based on survey observations. A potential 300 additional species could be present based on Fossil Creek's diverse available habitat.

Approximately 80 special-status species are present or potentially present within the Fossil Creek drainage. Six federally listed or proposed wildlife species that occur or have existing or potential habitat are the Mexican spotted owl, southwestern willow flycatcher, western yellow-billed cuckoo, northern Mexican gartersnake, narrow-headed gartersnake, and Chiricahua leopard frog (table 2-3). In addition, Fossil Creek is home to eight Forest Service sensitive species; two Forest Service locally important species; 19 federal and state identified neotropical migratory bird species, and Bald and Golden Eagle Act species.

Table 2-3. Federally threatened and endangered wildlife with potential to occur in the Fossil Creek corridor

Wildlife Species	Status	Critical Habitat
Mexican spotted owl, *Strix occidentalis lucida*	Threatened	Yes
Southwestern willow flycatcher, *Empidonax traillii extimus*	Endangered	No
Western yellow-billed cuckoo, *Coccyzus americanus occidentalis*	Threatened	No
Northern Mexican gartersnake, *Thamnophis eques*	Threatened	Proposed*
Narrow-headed gartersnake, *Thamnophis rufipunctatus*	Threatened	Proposed*
Chiricahua leopard frog, *Rana chiricauhensis*	Threatened	No

*A small amount of proposed critical habitat for both gartersnakes occurs along the Verde River, which falls in the last 600 feet of the Fossil Creek river corridor, where it converges with the Verde River. This area is managed under the completed Verde WSR CRMP.

Birds: A number of bird species of regional significance occur near or along Fossil Creek, in particular the common black-hawk and Mexican spotted owl. Other special-status birds observed in or near the Fossil Creek corridor include bald and golden eagles, zone-tailed hawk, American dipper, Bell's vireo, Lucy's warbler, belted kingfisher, peregrine falcon, and Costa's hummingbird.

The common black-hawk, a riparian obligate, nests all along Fossil Creek. The common black-hawk is considered a species of concern throughout much of its range in the southwestern United States because of human-caused threats to riparian habitat that have reduced native fish and amphibians to feed its nestlings. Aquatic prey have undergone significant declines in many riparian systems. In 2008 and 2009, a study documented prey delivery to 18 black-hawk nests in four tributaries of the Verde River drainage; fish dominated the prey composition brought to Fossil Creek nests, distinguishing nests from the other three tributaries (Oak Creek, Wet Beaver Creek, Red

Tank Draw; Etzel et al. 2014). Restoration of Fossil Creek may have allowed diets of nesting black-hawks to be similar to historical diets due to an increase in native fish abundances.

While Mexican spotted owls are known to nest just outside of the Fossil Creek corridor, they historically nested in the riparian area, likely using the corridor for foraging during the breeding season and spending time in the riparian habitat in winter. The Fossil Creek corridor is considered recovery riparian habitat for the Mexican spotted owl.

Potential habitat for the southwestern willow flycatcher and suitable habitat for the western yellow-billed cuckoo exists in Fossil Creek. Surveys for these species in Middle Fossil have failed to detect either species; however, Fossil Creek may be capable of supporting populations of cuckoos and flycatchers as these species re-occupy their historic range.

Mammals: Mammal species of significance known to occur in Fossil Creek include Arizona gray squirrel, a high diversity of bat species, beaver, river otter, ring-tailed cat, coatimundi, and various game species.

Arizona gray squirrel populations have declined concurrent with the loss of southwest riparian woodlands. They are uncommon and only occur in limited canyons within central and southern Arizona where water, walnuts, and acorns are available.

Bat surveys in Fossil Creek have documented 17 of the possible 23 bat species that may occur in Fossil Creek. Mexican free-tailed bat, pallid bat, and California myotis are the dominant species recorded. Forest Service sensitive species include Allen's lappet-browed, pale Townsend's big-eared, spotted, and western red bats; all but spotted bats have been detected along Fossil Creek. Despite few bat roost inspections, occupied bat roosts are known to occur in cliff dwellings with other roosts occurring in natural structures, such as underneath loose bark on snags, and in man-made structures, such as bridges and flume tunnels. Water sources such as earthen stock tanks, springs, seeps, and streams are important for bat drinking and foraging.

Many game mammals occur in Fossil Creek. Rocky mountain bighorn were introduced into the West Clear Creek area in 2006. Since then, populations have established in various portions of the Fossil Creek corridor. Other species include javelina, mountain lion, bear, mule deer and white-tailed deer.

Non-game mammal species include several species of skunks, which occur primarily within riparian zones within close proximity to the presence of camp supplies and trash. Other mammal species in the Fossil corridor include rock squirrels and various species of woodrats and mice.

Reptiles and Amphibians: Reptile and amphibian species of significance in the Fossil Creek corridor include lowland leopard frogs, gartersnakes, Arizona toads, and Gila monsters.

The only viable population of lowland leopard frogs on the Coconino National Forest persists in Fossil Creek. Prior to restoration, lowland leopard frogs only persisted above the Fossil Springs dam and were at record low numbers. Since restoration efforts, these frogs are recovering and recolonizing below the historic dam downstream to Irving. Because of the lack of non-native fish and limited crayfish, the lowland leopard frog population in Fossil Creek is the most secure population in the entire regional planning area.

Chiricahua leopard frogs, a federally listed species, occur at higher elevations and are present within the upper watershed of Fossil Creek, but not in the Fossil Creek corridor.

While the federally listed narrow-headed and northern Mexican gartersnakes have not been detected in Fossil Creek, narrow-headed gartersnakes have been detected along the Verde River near the Fossil Creek confluence. It is unknown whether these two gartersnakes historically occurred in Fossil Creek because there were no herpetological surveys prior to hydropower operations at the turn of the 20th century. The travertine-dominated portion of Fossil Creek with its dense aquatic vegetation, pools, and slower flows provides optimal habitat.

The Arizona toad historically occurred in Fossil Creek, but intensive amphibian surveys have not detected any juveniles or adults. Gila monsters occur in the Fossil Creek corridor as well as along FR 708 to Highway 260.

Habitat Description

Riparian areas, which are the most productive biotic communities in the southwest, provide habitat for wildlife, including the majority of breeding bird species of the West. Less than one percent of the Coconino and Tonto national forests are comprised of riparian areas. The conservation value of riparian areas is disproportionate to their spatial extent, particularly in arid and semi-arid environments (Miller et al. 2003).

Upward of 80 percent of southwestern wildlife species (Chaney et al. 1990) and approximately 60 to 70 percent of Western bird species completely depend on riparian areas (Ohmart 1996). Breeding bird densities along the Verde River were found to be in excess of 800 pairs per 100 acres (Carothers et al. 1974). This represents the highest avian population density per unit area recorded in North America (Johnson et al. 1977). Given that Fossil Creek is contiguous to the Verde River and that Fossil Creek's travertine supports even more complex habitat, it is likely that breeding bird densities along Fossil Creek are similar to or even higher. Riparian areas also provide critical resources for migrating birds.

Riparian corridors facilitate faunal mixing on a regional level, especially at the interface of different biomes or ecoregions (Sogge et al. 2005). When compared to other Verde River tributaries, Fossil Creek is the only intact perennial system with continuous flow without any water diversions in Arizona. Fossil Creek provides the only uninterrupted system between the Verde River and the Mogollon Rim. This unfragmented system not only provides contiguous habitat for riparian obligates, it also provides a contiguous corridor for wildlife species moving through during dispersal or migration.

Fossil Creek's riparian area is unusual compared to most riparian areas because it is travertine-dominated. The deposition of travertine and creation of travertine dams has resulted in impoundment of sediments and formation of terraces that support a variety of submergent, floating, emergent, herbaceous, and shrubby habitat components. The floristic diversity of aquatic and riparian vegetation provides a variety of physical structures, which in turn supports a wider diversity of wildlife species. In addition to the floristic diversity, the presence of travertine has greatly increased the diversity of pools, riffles, glides, runs, and backwaters, all of which provide a diverse array of habitat for numerous wildlife species.

Adjacent to the riparian habitat, there are important areas of mesquite bosques (woodlands), which provide critical nesting and foraging habitat for certain species such as yellow-billed cuckoo, Bell's vireo, Lucy's warbler, and verdin.

The presence of introduced plants and weeds from historic and ongoing human disturbance in Fossil Creek is evident. Even though the Forest Service has continued to treat the high-priority invasive species along the riparian corridor, invasive weed populations continue to persist.

Finding: Fossil Creek is home to a diverse native wildlife community with hundreds of species, six of which are federally listed and many others are special-status. Fossil Creek is the only intact perennial system with continuous flow without any water diversions in Arizona. The diverse habitat, free of non-native fish, supports regionally important populations of species, such as the common black-hawk and the lowland leopard frog. This unfragmented system not only provides contiguous habitat for species that can only survive in riparian habitat; it also provides a contiguous corridor for wildlife species moving through during dispersal or migration. In the travertine-dominated reaches, creation of travertine dams has resulted in the formation of terraces that support a variety of submergent, floating, emergent, herbaceous, and shrubby habitat components. Based on these findings, wildlife is carried forward as a component of the biological ORV, which has the same standing as all the other Fossil Creek river values.

Western Apache and Yavapai Traditional and Contemporary Cultural Values ORV

Cultural ORV Criteria: For cultural values to be an ORV, per IWSRCC national evaluation guidance, they should meet several criteria:

> The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past or present that was or is rare, unusual, or one-of-a-kind in the region. Many such sites are listed on the National Register for Historic Places, which is administered by the National Park Service. A historic site(s) and/or feature(s) in most cases is 50 years old or older. There may also be locations of exceptional cultural value or importance to American Indian tribes.

Traditional cultural practices and ceremonies, together with associated sites and spaces, constitute the Western Apache and Yavapai traditional and contemporary cultural values ORV. In Fossil Creek's past, two concurrent historic occupations existed: one by the indigenous Apache and Yavapai and one by Anglo workers associated with hydropower production.

Prehistory through Historic Times: Human habitation in the Fossil Creek river corridor began several millennia ago and extended into the 1950s; most recently, the Apache and Yavapai peoples inhabited the river corridor and currently live in its vicinity.

Certain Apache and Yavapai clans consider Fossil Creek to have been a central part of their home territory from the beginning of memory (Randall et al. 2009). Although both the Yavapai and Apache lived a nomadic lifestyle, the Apache developed farmland along Fossil Creek and returned seasonally to plant and harvest crops. The Apache likely would have been in residence along Fossil Creek when the first Europeans made their way into what is now Arizona. The rough terrain initially would have insulated the river corridor from Anglo settlers who began streaming into the Verde Valley in the 1860s.

By the 1870s, the U.S. Cavalry pursued an active campaign against the Yavapai and Apache throughout central and southern Arizona. By 1873, only a few families lived in secrecy along Fossil Creek, remaining hidden from government troops. Some of these families survived through the entire Reservation Period (approximately 1871 until 1900) without ever being sent to San Carlos Reservation (Pilles 1981; Randall et al. 2009). These few individuals provided an unbroken cultural continuum—living isolated along Fossil Creek and then renewing the traditional culture among those who returned from San Carlos.

Euro-American settlers started to explore Fossil Creek in the late 19th and early 20th centuries.[20] The seclusion of the area changed in 1900, when Lew Turner filed for water rights in Fossil Creek. This set the stage for the long process that eventually resulted in the development of the Childs-Irving hydroelectric power system; with it came a bustle of activity that continued for more than a century.

Fossil Creek was the site of the first hydrologic power system in Arizona, when, in 1909, construction began on the Childs-Irving system. Hydropower generation facilitated the development of mines in the Prescott, Jerome, and Humboldt areas. The Childs-Irving hydroelectric project was also supplying up to 70% of the power for Phoenix in 1920 (Effland & Macnider 1991). The Childs-Irving system was listed on the National Register of Historic Places in 1991 to recognize both its accomplishment as an engineering and construction feat and its contribution to the economic development of Arizona.

The construction of the Childs-Irving hydropower system played a role in the return of the Yavapai and Apache to Fossil Creek. Both the Yavapai and Apache were beginning to leave the reservations at San Carlos, Fort McDowell, and elsewhere in the early 1900s. Many returned to familiar places along the Verde River and the

[20] An isolated parcel of land in Fossil Creek was homesteaded in 1906, but very little is known about how the homesteaders fit into the larger history of Fossil Creek.

Mogollon Rim, only to find that settlers had taken over their traditional homelands during their 30-year absence. The sudden flood of Indians in need of employment and space where they would be allowed to set up camps for their families coincided with the need for huge amounts of manual labor to construct the Childs-Irving system. Some brought their families and stayed, either doing maintenance on the power system after initial construction was completed or farming along Fossil Creek. The return of people to their traditional territory, rich with cultural significance, and a reconnection with traditional practitioners who managed to survive along Fossil Creek reinvigorated traditional religious practices.

By the mid-1950s, much of the two power plants had been automated, and few Indians remained on the payroll. Their farms had also been abandoned as families moved onto reservation lands in the Verde Valley or closer to towns where wage jobs were easier to find. The last of the Apache camps were bulldozed by APS in the early 1950s, thus ending the long history of Apache and Yavapai residential habitation of Fossil Creek. Traditional Apache camps left little permanent archaeological evidence, and the sites in the Fossil Creek river corridor are no exception. (KenCairn & Randall 2007; Krajl & Randall 2009; Randall et al. 2009).

The process of returning natural flows to Fossil Creek led to the dismantling and removal of much of the Childs-Irving hydropower system. There is scant evidence of this astonishing engineering accomplishment left on the landscape. There are still interpretive opportunities related to the power system, but the significance of the remaining features would not be obvious to the typical visitor without specific explanation.

Traditional and Contemporary Cultural Use Description: The Fossil Creek area is very important in Apache and Yavapai culture. The Apache maintain many place names associated with features in and adjacent to the corridor (North, Senior, & Foster 2002; Vincent Randall and Chris Coder, personal communication, March 30, 2011). Fossil Creek plays a role in several Apache creation stories and other significant stories (Krajl & Randall 2009). Apache elders have identified several locations within the corridor as being "holy" (significant beyond that connoted by "sacred," Vincent Randall and Chris Coder, personal communication, March 30, 2011; Bob Bear, personal communication, March 12, 2013). The Yavapai-Apache Nation has requested that a portion of the Fossil Creek river corridor be nominated to the National Register of Historic Places as a Traditional Cultural Property. Both the Yavapai and Apache continue to conduct ritual visits to Fossil Creek (Randall et al. 2009).

> *"…Fossil Creek, its water sources, watershed, and distinctive riparian area possess singular and exceptional values for Apache, Yavapai, and other Indigenous peoples. In particular, the area affected by the CRMP has served as a uniquely important place of refuge from violent invasion, as a source of animals, plants, and minerals essential to the conduct and perpetuation of our cultures, and as a still-vital wellspring for spiritual and cultural inspiration and refreshment."* –San Carlos Apache Tribe[21]

Traditional and Contemporary Cultural Values Finding: Fossil Creek played a significant role in two interconnected events that occurred over the past 100-plus years. First, Fossil Creek was a traditional territory of the Yavapai and Apache, and it was one of the first places that many families returned to after being allowed to leave reservations. Also, some families hid out in the Fossil Creek area during the reservation period and were able to retain and pass on important cultural information. The Yavapai-Apache Nation has provided oral evidence that Fossil Creek has in the past and continues to play an important role in their traditional practices and spiritual wellbeing. Based on these findings, Western Apache and Yavapai traditional and contemporary cultural values are carried forward as an ORV with the same standing as all the other Fossil Creek river values. Second, the Childs-Irving hydropower system was built along Fossil Creek in the early 20th Century and played an important role in early state of Arizona economic development. However, there is very little visible evidence left to attest to the history of hydropower generation that has played out along Fossil Creek over the past century due to the decommissioning of the system before the Wild and Scenic River designation. Therefore, hydropower cultural sites are not considered outstandingly remarkable.

[21] Letter from San Carlos Apache Tribe to Coconino National Forest, April 29, 2019

Recreation ORV

Recreation ORV Criteria: For recreation to be an ORV, per IWSRCC national evaluation guidance, it should meet several criteria:

- Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing, hunting, and boating.
- Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the region of comparison.

Description: Fossil Creek provides outstanding opportunities for a variety of recreational activities and it historically has attracted large numbers of visitors per day, many of whom return year after year and come from outside the local area. Permit data from 2016 revealed that 89 percent of visitors were from outside the local area. Fossil Creek provides relief from the desert heat. Visitors enjoy the shade and cooler temperatures created by the dense riparian canopy, and there is an abundance of deep, clear pools in which to wade, swim, and snorkel. The springs that form Fossil Creek keep the water flow constant throughout the year, which is an uncommon and welcome attribute for visitors in the desert southwest. Calcium carbonate dissolved in the water gives it a beautiful blue-green color and creates interesting travertine structures, admired by visitors.

Other attractions and opportunities include the 72-degree Fahrenheit water, camping, hiking, wilderness appreciation, fishing, wildlife and nature observation, photography, bird watching, and cultural and historical site interpretation. Visitors typically access Fossil Creek along the 3.5 miles of road that parallels the creek, by hiking northeast of the road along Fossil Creek to a waterfall, and by hiking or backpacking using the Bob Bear (formerly Fossil Springs) Trail. Specific river-related recreation opportunities in Fossil Creek include:

Swimming: Fossil Creek has numerous swimming holes and waterfalls that were greatly enhanced by the return of full flows to Fossil Creek in 2005. Swimming is reported as the most popular activity in Fossil Creek.

> *"…my favorite part [of Fossil Creek] is getting to swim in the crystal clear water. I swam there for the first time last summer and it was the most magical experience. There is something so serene and almost euphorical about swimming in such perfect and clear water. The fact that it's an oasis in Arizona, makes it even more of a treasure that should be enjoyed by those who dare to trek the hot and extensive hike."* – Hannah J.[22]

Camping: Dispersed camping is also a popular form of recreation at Fossil Creek. Car camping occurs in Middle Fossil, and backpacking occurs in the Fossil Springs area and, to a lesser extent, in the wild segments. Visitors historically camped in Fossil Creek year-round, but because of adverse resource effects camping is currently only available in portions of the river corridor during the low-use season. Year-round designated camping opportunities may be expanded under this CRMP.

Hiking: The trail system in and around Fossil Creek provides diverse hiking and backpacking opportunities, including to the Mazatzal Wilderness, Fossil Springs Wilderness, Fossil Springs Botanical Area, and Verde Wild and Scenic River. Portions of four designated trails are present in the Fossil Creek river corridor: the Flume Trail, the Bob Bear (formerly Fossil Springs) Trail, the Mail Trail, and the Deadman Mesa Trail. The first three trails lead into the Fossil Springs Wilderness and the botanical area. Deadman Mesa Trail, which is rarely used, accesses the Mazatzal Wild Segment and Verde Wild and Scenic River. A one-mile trail connects the Dixon Lewis

[22] Letter from Hannah J. to Coconino National Forest, January 27, 2017

(formerly Waterfall) Trailhead to the popular waterfall destination. This trail is designated as a National Forest System Trail through the CRMP.

Boating: Since the return of natural flows to Fossil Creek in 2005, kayakers and pack rafters often boat Fossil Creek between the Waterfall and Bridge, and, to a lesser extent, other sections of creek. They enjoy kayaking all year long—a rare opportunity as most streams in the warm desert run dry in summer or are too cold in winter in other areas. Fossil Creek is the only major whitewater in Arizona that is both accessible and navigable year-round, and is the only boat-navigable travertine waterway in the U.S.

> *"Fossil Creek's waterfalls, deep pools, rapids, geology, scenery, water quality, and flow regime combine to make it a rare, unique, and exemplary whitewater paddling resource."* – American Whitewater[23]

Cultural Attractions: The Childs-Irving hydropower system is designated as a National Register Historic District. Surveys and predictive models suggest prehistoric sites are present in high densities. All alluvial flats used for camping and picnicking are likely to contain prehistoric resources. Opportunities exist to interpret these cultural resources.

Fishing: After dam removal, the Arizona Game and Fish Commission approved a catch-and-release seasonal roundtail chub fishery along a portion of Fossil Creek (the season is currently the first Saturday in October through April 30). Many anglers enjoy fishing for native species in their native habitat, an opportunity that is rare in Arizona.

Hunting: Hunting is popular in the Fossil Creek area, especially for deer, javelina, and quail. The Fossil Creek river corridor is part of game management units 6 and 22.

The existence of the recreation ORV is directly related to the existence and condition of Fossil Creek's other river values. The abundant, consistent water flow; high water quality; and outstandingly remarkable geology, biology, and cultural values together make up a place that visitors from around the world seek to experience. Protecting the health of the other river values is essential to protecting the recreation ORV.

> *"Allowing for recreational use within Fossil Creek is extremely import[ant] to many Arizona residents, this can be seen in the large numbers of people who flock to Fossil Creek during the warm summer months. This recreational site provides a unique experience as it is one of the few bodies of water in Arizona, and is the closest to our friends in the valley who feel the heat of the summer most intensely. It provides an escape to those who commonly find themselves in city environments most of the time."* – Prestin C.[24]

Recreation Finding: Many visitors to Fossil Creek come from outside the Arizona Central Highlands region. Although it is common for Phoenix residents to comprise a large proportion of visitors at recreation areas in Arizona, including Fossil Creek, Fossil Creek also attracts both national and international visitors. The river corridor contains exceptional opportunities to swim, wade, boat, hike, view wildlife and native fish, and appreciate the history and geology of the area, and it is rare that all of these opportunities exist in one place. Based on these findings, recreation is carried forward as an ORV with the same standing as all the other Fossil Creek river values.

Water Quantity and Quality Requirements to Protect River Values

The USGS installed a continuously recording flow gage in 2010 at the Fossil Creek Bridge along FR 708; data collected by the gage are important to developing an understanding of Fossil Creek's flows. A more explicit explanation of the connection between Fossil Creek's flow, water quality, and protection of its river values will be

[23] Letter from American Whitewater to Coconino National Forest, January 20, 2017
[24] Letter from Prestin C. to Coconino National Forest, April 3, 2019

completed separately. Protecting Fossil Creek's flow would contribute to protection, and, potentially, enhancement all of Fossil Creek's river values.

Protecting and Enhancing River Values

WSRA requires comprehensive planning for wild and scenic rivers to provide for the protection and enhancement of a river's free-flowing condition, water quality, and the ORVs that make it worthy of designation in the National Wild and Scenic Rivers System. WSRA further specifies that designated rivers and their values be protected and enhanced for the enjoyment of present and future generations. WSRA Section 10(a) states:

> "Each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its aesthetic, scenic, historic, archeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

In 1982, the secretaries of the departments of the Interior and Agriculture jointly issued guidelines for implementing WSRA. These guidelines[25] interpreted Section 10(a) as a "nondegradation and enhancement policy for all designated river areas, regardless of classification" (p. 39458). The guidelines further clarify that wild and scenic rivers "will be managed to protect and enhance the values for which the river was designated, while providing for public recreation and resource uses which do not adversely impact or degrade those values. Specific management strategies… will always be designed to protect and enhance the values of the river area" (pp. 39458-59).

A statutory amendment to WSRA in 1986 added Section 3(d)(1), requiring river managers to prepare a detailed CRMP:

> "For rivers designated on or after January 1, 1986, the Federal agency charged with the administration of each component of the National Wild and Scenic Rivers System shall prepare a comprehensive management plan for such river segment to provide for the protection of the river values. The plan shall address resource protection, development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of this Act."

In addition, the IWSRCC interpreted "protection" and "enhancement" of river values. Protection is the elimination of adverse impacts (also referred to as adverse effects) on river values, including those occurring on the date of designation; enhancement is the improvement in conditions (IWSRCC 2002).

As part of the general management principles, the 1982 interagency guidelines advise agencies to address carrying capacity, the amount of public use and access, and the types of public facilities that the river area can sustain without adverse impact or degradation of river values. Carrying capacity (referred to as user capacity) is addressed in Chapter 4.

In order to satisfy the requirement of WSRA to protect and enhance Fossil Creek's river values, the CRMP includes the following components:

1. A detailed description of free flow, water quality, water quantity, and the outstandingly remarkable values identified for Fossil Creek, including a description of the baseline (2009) and existing resource conditions – this chapter;
2. An assessment of the river values for the presence of adverse impacts or degradation – this chapter;

[25] National Wild and Scenic Rivers System; *Final Riverside Guidelines for Eligibility, Classification and Management of River Areas*, September 7, 1982, 47 Fed. Reg. 39453-39461.

3. Desired conditions (goals), standards, guidelines, objectives, and management approaches for protecting and enhancing river values – Chapter 3, *Management Direction*;
4. Management actions (including establishing user capacities and addressing development of lands and facilities) designed to eliminate any adverse impacts or degradation and protect and enhance river values – Chapter 5, *Management Actions*;
5. A monitoring plan with specific indicators for each river value and thresholds identified for conditions at which adverse impacts or degradation are threatened – Chapter 6, *Monitoring and Adaptive Management*; and
6. Adaptive management actions that may be taken to eliminate adverse impacts or degradation if thresholds are reached –Chapter 6, *Monitoring and Adaptive Management*.

The plan identifies management actions needed to correct situations where river values are threatened and describes additional actions using adaptive management if needed to eliminate adverse effects on river values.

Baseline and Existing Conditions

The year a wild and scenic river is designated represents the baseline condition against which subsequent conditions of river values are assessed (IWSRCC 2018). Baseline condition serves as the basis on which the degree or intensity of any existing impacts can be measured and future impacts assessed, should they occur. All future activities are to be measured from this baseline to ensure continued high-quality conditions and, with respect to river values, to eliminate adverse effects (protect) or improve conditions (enhance) within the river corridor. The existing condition of the river values can then be compared baseline condition. This comparison supports establishing management direction and prioritizing management actions in the CRMP.

This section describes baseline and existing conditions for all of the river values. This section also provides general definitions of adverse impact, degradation, protection, and enhancement for each river value. More specific information for determining the condition of river values is provided elsewhere in the CRMP. Chapter 3 contains desired conditions that provide detail on conditions that would represent protection and opportunities for enhancement; Chapter 3 also contains standards and guidelines designed to prevent adverse impact and degradation. Chapter 6 describes indicators for measuring the condition of river values and thresholds that represent specific points at which adverse impact or degradation are threatened.

Water: Free-Flowing Condition, Quality, and Quantity

Baseline and Existing Conditions for Free Flow

The Fossil Creek-Verde River 5th Code watershed occupies about 140 square miles in the Central Highlands physiographic province of Arizona. The upper elevations of the watershed are at approximately 7,260 feet and Fossil Creek's confluence with the Verde River is at approximately 2,550 feet. Approximately 14.5 miles of Fossil Creek between Fossil Springs and the Verde River flows year-round.

Fossil Creek has been free-flowing with few impediments since the restoration of flows to the creek in 2005 and lowering of the diversion dam in April 2009. Fossil Creek's free flow was described in Loomis 2010 and is summarized below. These descriptions represent both baseline and existing conditions. Six constructed features, which existed in 2009 and still exist today, are present within the creek: the historic diversion dam, an old diversion structure at Irving, a low water crossing at Irving, the Fossil Creek Bridge, road gabions on FR 502, and a permanent fish barrier. A temporary fish barrier existed from August 2011-August 2013. Five of the structures are found in the recreational segment, and the fish barrier is within the Mazatzal Wilderness in the Mazatzal wild segment.

Historic Fossil Springs Dam: The dam is located approximately 0.4 miles downstream of the start of perennial flow in Fossil Creek. The dam formerly diverted the creek into the flume system. The dam was partially removed

during decommissioning of the Childs-Irving system, leaving a structure that is approximately 65 feet wide and 13 feet high. The effects on free flow include a reduction in the stream gradient above the dam, which reduces sediment transport capacity and creates of a vertical drop where the flow passes over the top of the dam and creates a barrier to upstream fish movement. The dam continues to represent a modification of the waterway.

Irving Diversion Structure: This features is a concrete and rock structure located at the former Irving power plant site. There are remnants of one- to two foot-high rock and mortar walls and parts of the excavated channel still visible. The diversion structure represents a modification of the waterway that is so minor as to have negligible impact on free flow and river processes.

Irving Low Water Crossing: Also located at the former Irving power plant site, the low-water crossing is a concrete apron that crosses Fossil Creek and previously provided vehicle access across the creek. The structure is about 45 feet long and 15 feet wide. It rises about 18 inches above the natural creek bed. Free flow is affected by a small decrease in creek gradient above the structure and a small increase in gradient below the structure.

Fossil Creek Bridge: Located at the boundary between the Coconino and Tonto national forests is a single span concrete arch bridge. The length of the arch is about 70.5 feet between the abutments, and width is 23 feet. The abutments are located within the bed and banks of Fossil Creek. The structure modifies the waterway and affects free flow by constricting flows.

Road Gabion: The gabion is located on FR 502 south of the Sally May recreation site. The gabion was installed to protect the road from flood flows in Fossil Creek. The gabion is a rock-filled wire basket that is approximately 70 feet long and 12 feet high and extends downstream to the point where the road curves away from the stream. The structure is a form of riprap and because of its location within the ordinary high water channel affects free flow by causing a small constriction of bankfull flows. The overall effect on the river values throughout the designated reach of Fossil Creek is small. Water quality is not affected by this structure.

Permanent Fish Barrier: Located in the Mazatzal wild segment, a fish barrier was constructed in 2004 to prevent non-native fish from moving above the barrier. The fish barrier was constructed in three bedrock notches in the channel. The combined length is 28 feet and it is about five feet high; however, modification to the waterway is minor. A free-flow analysis was completed prior to construction and it was determined there would be a minor effect on free flow because the barrier resulted in a slight modification of the channel and reduction in channel gradient. Floods in 2010-2011 caused partial failure of the fish barrier. The barrier was repaired in 2012-2013.

Temporary Fish Barrier: After the discovery of non-native smallmouth bass above the permanent fish barrier following a flood event that damaged the barrier, a temporary fish barrier was installed through a joint effort with the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and Arizona Game and Fish Department in August 2011 just below the Sally May recreation site to limit further upstream migration of non-native fish. In August 2013, the temporary barrier was removed after the permanent barrier was repaired.

Overall, the free-flow analysis determined that the historic Fossil Springs Dam, Irving low water crossing, Fossil Creek Bridge, road gabion, and the permanent fish barrier affect free flow by modifying the waterway. Cumulatively, all structures have negligible adverse or direct effects to any of the river values. Both the fish barrier and the historic dam have beneficial effects on the biological ORV by preventing upstream migration of non-native fish.

Adverse Impact to Free Flow

Free flow would be adversely impacted by water resources projects that impound, divert, and/or impact the ability of Fossil Creek to interact with its floodplain.

Protection of Free Flow

Free flow would be protected by adhering to the Section 7 analysis process for newly proposed water resources projects that may affect Fossil Creek.

Baseline and Existing Conditions for Water Quality

Arizona Department of Environmental Quality (ADEQ) is responsible for establishing state water quality standards and monitoring the quality of the state's surface water. ADEQ has designated Fossil Creek as an "Outstanding Arizona Water," which recognizes the quality and recreational and ecological significance of its water. As required under the Clean Water Act, ADEQ assesses the water quality of Arizona every periodically and publishes its findings in a report submitted to the Environmental Protection Agency (EPA) titled "Water Quality in Arizona 305(b) Assessment Report" (305(b) report). The purpose of the report is to provide a comprehensive analysis of water quality data associated with Arizona's surface waters to determine whether state water quality standards are being met and designated uses of these waters are being supported. The most recent 305(b) report indicates that Fossil Creek is in full attainment of water quality standards and supports all designated uses (ADEQ 2017); however, additional monitoring conducted by NAU (Adams et al. 2014) suggests that there may be localized water quality issues in areas where high concentrations of humans tend to congregate.

Beginning in 2010, monitoring for enterococci, an indicator of fecal coliform contamination, was conducted by NAU as part of the "Middle Fossil Creek Riparian Habitat Protection and Restoration Project," hereafter referred to as the NAU study (Adams et al. 2014). Although a state water quality standard for enterococci has not been promulgated, the EPA has published recreational water quality criteria for enterococci based on an estimated illness rate with a geometric mean of 35 colony forming units (cfus) per 100 mL for an estimated illness rate of 36 per 1000 primary contact recreators and a geometric mean of 30 cfus/100mL for an estimated illness rate of 32 per 1000 primary contact recreators. Samples were typically collected by NAU in late May/early June, August, and October in 2010 through 2013 at three sites in Middle Fossil Creek, including a site 0.3 miles below the popular Waterfall area, the Fossil Creek Bridge, and Purple Mountain. When compared against EPA's water quality criteria value for the lower illness rate (i.e., 30 cfus/100mL), out of a total of 30 samples, 9 exceeded the EPA's water quality criteria value. It is, however, difficult to draw conclusions from this study regarding causation. Exceedances most often occurred in August (7 exceedances; however, no samples were collected in August of 2012) with the other two exceedances occurring in late May/early June. Visitor use is typically high in August but so is the incidence of storm events associated with the North American Monsoon.

In the fall of 2009 and into 2010, 10 temporary toilets were placed at popular recreation nodes in the Fossil Creek area. During that time, evidence of human waste deposited outside toilet facilities was recorded as part of a graduate study (Anderson 2011). Despite the presence of the portable toilets, Anderson detected evidence of more than 2,200 incidents of improper human waste disposal. The numbers of incidents were highest at Homestead with 831 and lowest at the Irving site with 27. This is waste that was disposed of improperly and could lead to bacterial contamination of Fossil Creek. In 2017, eight vault toilets were installed in Fossil Creek to replace most of the temporary toilets in the WSR corridor.

Exceedances of water quality standards for fecal indicator bacteria have been noted to occur during high use periods at Slide Rock State Park in Oak Creek Canyon, also on the Coconino National Forest. The resuspension of bottom sediments through recreation activities and increases in river discharge during storm events has been identified as a primary means by which state water quality standards for *E. coli* have been exceeded at this popular recreation site (OCWC 2012). Additionally, there are many sources of fecal indicator bacteria including natural, non-fecal sources including plants, sand, soil and sediments.[26] All of the various sources of fecal indicator bacteria produce a background level in surface waters that varies according to local environmental and meteorological conditions. *E. coli* monitoring conducted by the Coconino National Forest at four sites in Fossil

[26] https://www.epa.gov/national-aquatic-resource-surveys/indicators-enterococci

Creek including Irving, Sally May, FR 708 bridge, and Purple Mountain did not detect any exceedances of state water quality standards for this species of fecal indicator bacteria.

Recreational users in Fossil Creek are expected to pack out all of their garbage, except at the Bob Bear (Fossil Springs) Trailhead site, where a trash can is present. NAU (Adams et al. 2011) detected increasing amounts of garbage at transects in riparian areas established to detect disturbance to riparian areas between 2010 and 2011. Trash has been picked up annually by volunteers, including kayakers, and seasonal employees regularly at high-use recreation sites along Fossil Creek during the high-use. The Forest Service removed 11,511 pounds of trash from Fossil Creek in 2015, 4,463 pounds in 2016, and 2,490 pounds in 2017. Trash may negatively affect water quality.

The other water quality constituent of concern in Fossil Creek is suspended sediment. Arizona's numeric water quality standard for suspended sediment is based on a median sediment value of 80 mg/l with a minimum of four samples collected at least seven days apart and an exclusion of data within 48 hours of a local storm event (ACC R18-11-109(d)). Arizona also has a narrative standard for bottom sediments that applies to "wadeable, perennial streams with an aquatic and wildlife (cold water) or an aquatic and wildlife (warm water) designated use" (ACC R18-11-108.02). With Fossil Creek's designated aquatic and wildlife (warm water) use, the following narrative standard would normally apply; however, ADEQ does not apply this standard to Fossil Creek because of the naturally high deposition of travertine on bottom sediments (Jones, personal communication, 2018).

"A surface water shall not contain pollutants in amounts or combinations that settle to form bottom deposits that inhibit or prohibit the habitation, growth, or propagation of aquatic life." (AAC R18-11-108(A)(1))

In April 2009, when the Fossil Springs Dam was lowered by 14 feet as part of the APS decommissioning project, a portion of the estimated 25,000 cubic yards of sediment that had accumulated behind the dam was exposed. The lowering of the dam resulted in erosion and sloughing of the stream banks from the dam location and continuing upstream. Erosion of sediments formerly stored behind the dam created an incised zone that extends upstream from the remnants of the dam approximately 800 feet. Steep eroding banks up to 15 feet high border the channel in this reach, but this has decreased over time with revegetation and recovery. Channel width between the eroding banks is approximately 100 feet. Sufficient channel width exists between the banks to provide an opportunity for a stable channel to begin to develop. Seedling woody riparian vegetation exists in the channel bottom and channel geomorphology has stabilized since this time. Continued erosion of the steep banks is likely, but the majority of the sediments stored behind the original diversion dam have eroded from the site and are migrating downstream. Many of these sediments may already have been transported well downstream or deposited on floodplains as a result of floods in 2008, 2010, 2013, 2015, and 2017. ADEQ monitoring has not detected violations of the suspended sediment standard since these sediments began moving downstream.

In 2011, road deterioration came to the forefront in Fossil Creek for safety reasons with related water quality concerns. The Forest Service had to close an approximately four-mile section of FR 708 between the Dixon Lewis (Waterfall) Trailhead and Bob Bear (Fossil Springs) Trailhead because of the deteriorating condition of the road. In particular, a road segment of at least ½ mile extending from the Waterfall parking area to the first switchback is hydrologically connected the Fossil Creek, meaning that much of the runoff and associated sediment from the roadbed drains directly to Fossil Creek. In the context of natural erosion from an intense rain event such as occurs during the North America monsoon, the contribution of sediment from the road may be a small portion but, nonetheless, it is something that could at least be partly addressed through improved road maintenance.

In 2011 the Dixon Lewis (Waterfall) trail was realigned in several areas to move the trail out of wetted soil. In addition, footbridges were installed over several spring drainages along this trail, mitigating effects to riparian habitat, native fish, and Fossil springsnails. By elevating the footbridges above the exposed wetted soils, sediment input was reduced to Fossil Creek at this location. Management efforts in recent years have also resulted in the re-vegetation of many bare soil areas that may have previously added sediment to Fossil Creek.

Adverse Impact to Water Quality

Water quality would be adversely impacted if exceedances of state water quality standards that are attributed to public use, development, or administrative use are detected, such as through the presence of human or pet waste in areas that may result in water contamination. Specific indicator(s) and sampling locations may be selected to indicate adverse impact.

Degradation of Water Quality

Water quality would be degraded if any segment of Fossil Creek is included on the federal Section 303d (Clean Water Act) listing of waters not attaining minimum water quality objectives.

Protection and Enhancement of Water Quality

Water quality is protected if public use, development, or administrative use do not result in exceedances of state water quality standards. Opportunities for enhancement include actions such as improving sanitation facilities, preventing expansion of areas of unplanned disturbance, focusing recreational use in areas less susceptible to causing water quality impacts, restoring areas impacted by unplanned disturbance, and expanding educational programming related to responsible visitor behavior.

Baseline and Existing Conditions for Water Quantity

A stream gage (No. 09507480), installed by the U.S. Geological Survey (USGS) at Fossil Creek Bridge, has provided continuous stream flow data since Sept. 15, 2010 (figure 2-2). Descriptions here represent both baseline and existing conditions.

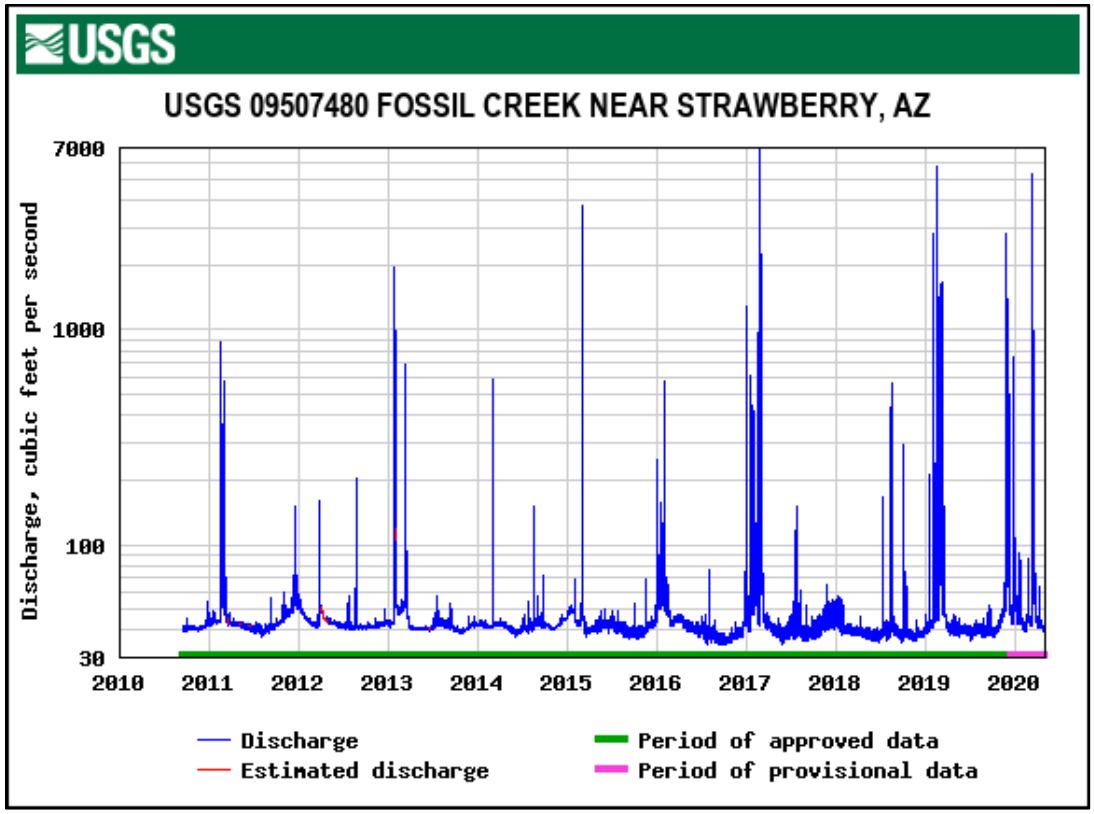

Figure 2-2. Instantaneous discharge in cubic feet per second at USGS Gage 09507480 at Fossil Creek Bridge

The main stem of Fossil Creek begins at the confluence of Calf Pen and Sandrock canyons, which drain from the Mogollon Rim. The creek is intermittent for the first three miles, flowing in response to rainfall and snowmelt. The subdued topography above the Mogollon Rim, geologic structures, high winter precipitation, and a winter snowpack all promote high rates of infiltration and recharge (Parker et al. 2005). Precipitation infiltrating through

volcanic rocks at the top of the Mogollon Rim is thought to flow vertically downward through Coconino Sandstone and recharge the limestone aquifers below, including the Naco Formation, the Redwall Limestone, and the Martin Formation. The volume and stability of discharge from Fossil Springs, as well as hydrogen and oxygen isotope values, suggest water discharging from Fossil Springs has a large contributing area and is connected with the limestone aquifer by large open structures. Perennial flow begins at Fossil Springs where a series of springs emerge from the contact between the sedimentary Naco Formation and the Redwall Limestone over a 1,000-foot-long reach of channel.

Numerous individual spring orifices form the Fossil Springs complex. Discharge from these springs ranges from a few to nearly 4,500 gallons per minute. Annual water yield from the springs is estimated at approximately 33,000 acre feet per year (NAU 2005). Water yield at the springs, where instantaneous stream flow measurements were collected for two years starting in 1997, recorded an average discharge of approximately 47 cubic feet per second (cfs). These flows were based on 48 manual monthly flow measurements collected by the Forest Service to support an instream flow water right application for Fossil Creek (Nelson 2003). Discharge data from the USGS gage at Fossil Creek Bridge have indicated a mean discharge close to 42 cfs with peaks in flow occurring in conjunction with monsoonal and winter weather precipitation events. Small increases in Fossil Creek's flow occur where other springs discharge to Fossil Creek, such as where Hardscrabble Creek discharges into Fossil Creek near the confluence with the Verde River. Fossil Creek increases the flow in the Verde River by almost 50 percent (based on median monthly flows at a Camp Verde gage) during the low-flow season from May through July.

Discharge from the springs forming Fossil Creek is more than twice that of any other spring or spring complex in the Central Highlands Planning Area. In the State of Arizona, the only springs with discharge greater than that of Fossil Springs are Blue Springs which discharge into the Little Colorado River above the Grand Canyon at a rate of about 225 cfs and Havasu Spring that forms the beginning of perennial flow in Havasu Creek and flows at a rate of about 65 cfs (ADWR 2009). Fossil Creek's baseflows are greater than most of the major tributaries to the Salt and Verde rivers, all of which have much larger contributing watershed areas than Fossil Creek. Only the Black and White rivers, which form the headwaters of the Salt River, and the main-stems of the Salt and Verde rivers have greater baseflows. Reports of Fossil Creek a century ago remarked on the uniformity of the discharge from Fossil Springs (Masson 1910). The uniform nature of this discharge (as well as the magnitude of the discharge) made Fossil Creek attractive as a hydroelectric power source.

The Fossil Creek Bridge gage's peak flow of record was on Feb. 28, 2017. On this date, the gage had a height above 10 feet and a discharge level above 7,000 cfs. Using USGS methods for estimating flood magnitude and frequency in Arizona, this 7,000 cfs stream flow approaches a 25-year flood recurrence interval. A 50-year flood would measure 11,150 cfs, and a 100-year flood would measure 16,175 cfs at the Fossil Creek Bridge gage. Both Fossil Creek's consistent baseflow and its periodic flood flows are essential to the existence—and protection—of its river values. A full range of flows is a component of the creek's free-flowing condition and influences its natural water quality characteristics. The quality, extent, and diversity of wildlife and fish habitat are a direct result of consistent water flow punctuated by flood events that modify channel characteristics, support wetland vegetation, and promote regeneration of riparian species. The cycle of travertine growth and destruction that is an important component of the geology ORV, and that creates valuable habitat diversity, would not exist if not for consistent baseflow and periodic flood flows. The recreation ORV owes its existence to the riparian corridor created by the creek's natural flow regime. The cultural values ORV is rooted in the persistence of natural processes, which are shaped by the flow regime.

A potential threat to water discharge from Fossil Springs is groundwater use in the vicinity of Fossil Creek. At this time, groundwater use from the portion of the regional limestone aquifer that supports perennial flow in Fossil Creek is extremely limited or absent. Development of a production well in the vicinity of Fossil Springs would likely impact discharge at the springs since groundwater would be withdrawn from the same regional limestone aquifer that supports springs discharge and groundwater extraction would be in close proximity to Fossil Springs.

Water Rights

Arizona Public Service (APS) held a Fossil Creek water right with a Feb. 26, 1900, priority date for 31,123 acre feet per year to generate hydroelectric power at its Irving and Childs power plants. The point of diversion was the Fossil Springs dam; the diverted water was eventually discharged to the Verde River at Childs, 3.5 miles above its confluence with Fossil Creek. The settlement agreement signed by APS to surrender its license and decommission its facilities in Fossil Creek included a stipulation to transfer its water right claims to the Forest Service. This transfer was completed in August of 2011. The Forest Service, however, has not been able to convert the power production right into an instream flow right because, as currently written, the Arizona water rights statutes do not make such a conversion possible.

The Coconino and Tonto national forests also applied for and received from the State of Arizona an instream flow water right for Fossil Creek (Certificate No. 33-96622) that is separate from the APS right and provides for monthly instream flows, ranging from 42.5 cfs in September to 51 cfs in February. Total volume of the right is 33,280 acre feet per year. Flows are intended to provide water for wildlife, including fish, and recreation. The reach protected by the Arizona state instream flow certificate begins approximately one-half mile above the historic Fossil Springs dam and extends to the confluence of Fossil Creek with the Verde River.

Several other water rights and claims exist within the Fossil Creek watershed. These include water right claims for stock ponds; water right certificates for domestic use from springs in the watershed for use at APS's employee housing (also transferred to the Forest Service in 2011); and water rights claims for instream livestock use by grazing permittees.

WSRA allows the federal government to obtain a federal reserved water right for the quantity of water sufficient to achieve the purposes of the WSRA and protect river values. This right is to waters not otherwise obligated under state law. The priority date for the federal reserved right is the date of Fossil Creek's wild and scenic designation on March 30, 2009. The Forest Service needs to quantify stream flows required to protect river values in order to claim the federal reserved water right that comes with wild and scenic river designation. This right may result in protection of greater flows than the state-based right.

Adverse Impact to and Degradation of Water Quantity

Adverse impact/degradation would occur if public use, development, or administrative use results in a persistent decrease in Fossil Creek's baseflow discharge. Adverse impact to and degradation of water quantity are considered synonymous because any persistent change in Fossil Creek's baseflow discharge has the potential to degrade river values. Additionally, although outside the scope of the CRMP to address, water development in the Fossil Creek watershed that alters the timing, duration, and frequency of flood flows constitutes and adverse impact and may lead to degradation.

Protection and Enhancement of Water Quantity

Water quantity is protected if Fossil Creek's baseflow discharge is maintained within its natural range of variability. Opportunities for enhancement include strengthening administrative protections of Fossil Creek's natural flow regime.

Geology ORV

Travertine dams or terracing is the dramatic geological phenomenon that makes Fossil Creek both aesthetically and scientifically valuable and contributes to the finding that geology is an ORV.

Effects to the dynamic constructive-destructive cycle of a travertine system can occur from either changes in the constructive aspect, such as loss of a water source, or the destructive phase, in which flood events outpace the formation of travertine dams. Installation of power generating facilities, dams, reservoirs, and a water conveyance system began in Fossil Creek in 1908 at the Childs location on the Verde River (Monroe 2001). Water used to drive the turbines at Childs facility came from a series of flumes, tunnels, and temporary storage at Stehr Lake. This early water withdrawal likely had little impact on travertine deposition as it was below the stream reach

actively producing travertine dams. Beginning in 1914 until April of 1916, construction of the Irving generating facility was completed along with a diversion dam and flume for water conveyance (Monroe 2001). The Irving facility and its operation depleted the water that emanated from Fossil Springs except during flood events. During the flood events water diversion to the power plant was released back into the channel to prevent damage to the diversion flume. These flood waters were allowed to flow through the natural channel in the reach where travertine dams had historically formed. From 1916 to 2005 the destructive processes due to flooding were allowed to function without the constructive phase of travertine dam formation, eliminating the channel-width travertine dams found in a naturally functioning Fossil Creek system. Evidence of dam destruction after cessation of channel flow was documented by Overby and Neary (1996) with approximately 81 relict features that stretched the full width of the channel. What has not been determined was how many of these relict dams where in place prior to water diversion beginning in 1916. What we do know is that this historical travertine reach no longer had the ability to build new travertine dams. Also, at some time during power generating operations, the capacity to withdraw all of the water from Fossil Creek diminished, which allowed very small flows to seep past the upper diversion dam and to be released at the tailrace at Irving. The flow that was released below the Irving tailrace developed an active travertine system in miniature. The release of water at the tailrace also created a new area for people to recreate. Unmanaged as a recreation site, this stream reach not only created, but also demonstrated destructive impacts that recreation can have on newly forming travertine. Impacts from trampling were the most observable, but there were numerous places where individuals created dams by stacking rocks across the channel knowing that travertine would fill spaces and grow over the crests creating larger and larger pools. Also observed were travertine dams that had been notched by boaters to allow easier passage.

Baseline Conditions – 2009

Restoration of base flows to the creek in 2005 has stimulated deposition of new travertine features below the springs. By spring of 2009, there was more than three years of natural travertine dam formation and development. In the fall of 2008, the upper portion of the diversion dam below the springs was removed lowering the dam approximately 14 feet, resulting in erosion of sediments stored behind the dam and some channel adjustments, but this had minimal effects to travertine dam growth and deposition. One research study was conducted between 2005 and 2009 that provides data on travertine dam growth, development, and formational processes (Fuller et al 2011).This study provides information on travertine dam formations at the time of WSR establishment in 2009. This description of baseline conditions draws heavily from this research.

After dam decommissioning, measurements of travertine dam growth rates and erosion rates found that net positive growth rates averaged 43 ± 4 mm/year and the median growth rate was 25.5 mm/year (n=611 data points) (Fuller et al. 2011). Many locations showed more than 10 cm/year sustained over the two year study period (2006-2008). The four dominant growth mechanisms of travertine dams observed at the small scale (decimeter) were calcite precipitation, algal growth, growth of emergent plants and trapping of organic material including leaves, litter, branches and logs. The travertine dams and bedrock steps trap and entrain large quantities of organic and inorganic debris, which is then incorporated into new travertine deposition. Growth rates were shown to decline systematically downstream from the diversion dam consistent with the progressive loss of dissolved calcium carbonate and biotic processes such as algal growth and trapping became the dominant mechanism enabling travertine dam growth further downstream from the dam.

Abiotic factors of channel constrictions, bedrock steps and turbulence drive the process of travertine deposition. Decreased turbulence and temperature also result in decreased outgassing and travertine precipitation. Biotic factors of algal growth and emergent plants on dam crests along with trapping of floating organic material, leaf litter, branches and logs allow for dam growth. With flow restoration, dam growth and deposition will gradually increase over time, punctuated by periods of erosion from flood flows. Fuller et al. (2011) speculated that disturbance created by travertine erosion during floods could have a rejuvenating effect as new sites for organic matter accumulation can create a positive feedback on dam renewal and growth.

At the baseline year of 2009, in-channel travertine dam formation processes were restored below the diversion dam following restoration of full flows and partial removal of the diversion dam. The spring discharge and calcium carbonate content are in a natural condition that was found both before and after the power generating

facilities were decommissioned. Spring discharge has been measured over several time periods, 1946-1952 and 1996. Perennial and steady base flow discharges of ~ 1,200 liters per second (42.4 cfs) have been measured from Fossil Springs (Feth and Hem 1962; Malusa et al 2003). Geochemical modeling based on chemical analysis of stream water predicted a potential for calcium carbonate precipitation of 26,290 pounds per day over a distance of 4.2 miles downstream of the springs (Malusa et al. 2003).

Existing Conditions

After the diversion dam was lowered in 2008, it was expected that channel adjustments would take place both upstream and downstream of the dam in response to flood flows and as sediment that was deposited above the dam became mobilized and was re-deposited through the channel downstream. Flood flows in fall and winter of 2009-2010 scoured the channel upstream of the lowered dam resulting in loss of riparian vegetation, channel bank erosion and deposition of sediment and bed load materials (figure 2-3). The channel in this area rapidly recovered from this event. Another major destructive flood occurred again in February of 2017. A new field survey of the travertine deposition segment needs to be performed to determine rate of travertine deposition process and distance downstream of the new formations. Communications from field personnel imply that new dam formations are above the waterfall, with little to no dam formation occurring below the waterfall.

Figure 2-3. Fossil Creek channel above the diversion dam in August 2009 with willows and aquatic vegetation (left) and 2010 after flood flows (right).

Adverse Impact to Geology

The geology ORV would be adversely impacted if public use, development, or administrative use result in new damage to travertine dams and other features that cannot be visibly restored through the natural annual depositing phase of the constructive-destructive cycle.

Degradation of Geology

The geology ORV would be degraded if public use, development, or administrative use alter the natural pattern of formation of travertine dams and other travertine features throughout the reach of Fossil Creek characterized by travertine deposition.

Protection and Enhancement of Geology

The geology ORV is protected if the natural pattern of formation of travertine dams and other travertine features is present and public use, development, or administrative use do not damage the dynamics of travertine system within Fossil Creek. Opportunities for enhancement include expanding interpretation related to Fossil Creek's travertine system and educational programming intended to reduce human impacts to travertine, focusing recreational use in areas or at times less likely to impact travertine deposition, or supporting additional research intended to improve the understanding of travertine system dynamics.

Biological ORV (Fish and Aquatic Resources)

Fish and aquatic resources in Fossil Creek are especially valuable because they are an example of an aquatic system that does not suffer from habitat modification via damming or diversion and are composed of primarily native species. Water flow restoration increased the number of native fish in the system three-fold (Marks et al. 2010). Although some specific data regarding conditions at time of designation or after are unavailable or limited, conditions described here can be reasonably assumed to represent baseline (2009) and existing conditions. Macroinvertebrate studies available for Fossil Creek are limited with inadequate sampling to provide baseline monitoring data.[27]

Fish and Aquatic Resources Populations

The 2004 fish restoration resulted in habitat free of non-native fish and the four common native fish (roundtail chub, desert sucker, Sonora sucker, speckled dace) populations grew dramatically (Marks et al. 2010). Four endangered fish species (spikedace, loach minnow, Gila topminnow, and razorback sucker) have been stocked into Fossil Creek (Robinson and Mosher 2018). The intent of stocking the first three species was to establish new populations in Fossil Creek; razorback sucker were stocked into Fossil Creek with the hope that they would utilize the stream as a "grow out" area, thus moving into the Verde River at a size large enough to avoid most predators. Special-status macroinvertebrates are also present, including the caddisfly *Wormaldia arizonensis* and the Fossil springsnail, both of which are Forest Service sensitive species.

Populations of roundtail chub, desert sucker, Sonora sucker, and speckled dace appear resilient to natural flooding events, and longfin dace populations remain small but present (Rinker and Rogers 2018). Initial 5-year repatriations of spikedace, loach minnow, Gila topminnow, and razorback sucker are complete, and future augmentations are not currently planned (Robinson and Mosher 2018). Loach minnow and razorback suckers are not found in Fossil Creek and these repatriations are considered to have failed (Robinson and Mosher 2018). Spikedace and Gila topminnow repatriations have been more successful in that natural reproduction has been detected for both species, and Gila topminnow was found in the creek by the hundreds (Robinson and Mosher 2018; Rinker and Rogers 2018). However, the success of both species occurred during a period of several years where Fossil Creek did not see significant flooding events. AGFD survey data from fall 2017 indicates populations of both species have declined, perhaps due to large flooding events during winter 2016-2017 and spring 2017. The long-term viability of spikedace and Gila topminnow in Fossil Creek is thus in question.

The following is a summary of the baseline and existing condition of specific native species.

Spikedace and its Critical Habitat: Spikedace is an endangered species with designated critical habitat in Fossil Creek. The critical habitat includes 13.8 miles of Fossil Creek from its confluence with the Verde River upstream to the historic dam. Stockings occurred 2007-2012, with small numbers of spikedace found in 2009. Spikedace were uncommon in Fossil Creek through 2016 (Robinson and Mosher 2018, Rinker and Rogers 2018), but the population appears to have declined sharply following winter 2016-2017 floods with only one fish detected between the fish barrier and Irving falls (Rinker and Rogers 2018). Spikedace is considered present, but its long-term viability in Fossil Creek is in doubt.

Gila Topminnow: Gila topminnow, an endangered species, is a small viviparous fish that historically inhabited springs, cienegas, and slow moving side channel habitats of the Gila River. The middle Santa Cruz lineage Gila topminnow was stocked in Fossil Creek six times from 2007-2011, with success based on AGFD monitoring. Though Gila topminnow expanded their distribution in the creek indicating reproduction (Robinson and Mosher 2018), populations declined following winter 2016-2017 floods with only two fish detected between Irving Falls and the fish barrier (Rinker and Rogers 2017).

[27] The Arizona Department of Environmental Quality periodically surveys macroinvertebrates above the dam and publishes Index of Biological Integrity (IBI) values. There are fewer invertebrate surveys that follow IBI protocol and present IBI scores below the dam. Therefore most of the creek has inadequate sampling to provide baseline IBI monitoring data.

Loach Minnow and its Critical Habitat: Loach minnow is an endangered species with designated critical habitat in Fossil Creek. It is a small cyprinid that specializes in riffle habitats. Male loach minnow excavate nests under cobbles in early spring, so unembedded cobble substrate is a critical habitat feature for spawning. The travertine nature of Fossil Creek may make unembedded cobble a rare habitat feature. Loach minnow were stocked into Fossil Creek from 2007-2013 and may have been present in 2009; however, the 2009 population was not considered established. Loach minnow stockings ceased in 2013. Though difficult to detect, loach minnow are not thought to persist today in Fossil Creek, and no further stockings are planned (Robinson and Mosher 2018).

Roundtail Chub: Roundtail chub, a Forest Service sensitive species,[28] is found throughout the upper and lower Colorado River basins and within all aquatic habitats in Fossil Creek. Roundtail chub are a common fish species in Fossil Creek, found throughout the system in nearly all habitat types. AGFD snorkel surveys in 2017 detected roundtail chub in nearly 80% of surveyed pools (Rinker and Rogers 2017). Roundtail chub is a legal sport fish in Arizona and does not appear to be threatened by fishing (Rinker and Rogers 2018).

Desert Sucker: Desert sucker, a Forest Service sensitive species,[29] is a medium-sized member of the sucker family common in nearly all Fossil Creek habitat types. Desert sucker still occurs throughout most of its range and populations are considered stable (USFWS 2009a). They are common in Fossil Creek and are found throughout the system, primarily in pools, backwaters, and runs. AGFD snorkel surveys in 2017 detected desert suckers in more than 85% of pools between Irving Falls and the fish barrier (Rinker and Rogers 2017).

Sonora Sucker: Sonora sucker, also known as the Gila sucker, is a Forest Service sensitive species common in Fossil Creek and found in nearly all habitat types (Marks et al. 2010). Sonora suckers spawn in late winter or early spring on graveled riffles, and hybridization between the Sonora and desert suckers has been known to occur (AGFD 2002a). Sonora suckers still occur throughout most of their historical range and populations are considered stable (AGFD 2002b, USFWS 2009b). AGFD snorkel surveys in 2017 detected desert suckers in more than 60% of pools between Irving Falls and the fish barrier (Rinker and Rogers 2017).

Aquatic Macroinvertebrates: Fossil Creek supports a diverse macroinvertebrate community, with several rare or sensitive species (Adams 2012, Marks et al. 2005, Dinger and Marks 2007, Stevens and Ledbetter 2014). This diversity contributes to the aquatic resources that form Fossil Creek's biological ORV. Furthermore, macroinvertebrates are a critical link in the food web with their role of transferring energy from primary producers to higher level predators. Macroinvertebrates are a primary food source for aquatic vertebrates (icthyofauna and herpetofauna) and alterations to the food web at the lower levels will have repercussions to these higher-level consumers.

As a group, aquatic macroinvertebrates are often sensitive to environmental disturbance and are thus one of numerous parameters identified as a valid indicator of water quality and normative function for stream ecosystems (ADEQ 2015). From 2010 to 2011, NAU researchers surveyed macroinvertebrates in Fossil Creek, following the Arizona warm water Index of Biological Integrity (IBI) methods to compare invertebrate diversity in Fossil Creek. NAU surveyed five sites from above the historic dam to below the permanent fish barrier. The most dominate taxa were the dipterans of the Chironomidae and Ceratopogonidae families. Increasing sediment changes the benthic habitat in favor of chironomids, Oligochaetes, and other sediment dwellers over mayflies, stoneflies, and caddisflies that prefer substrate with greater particle sizes and larger interstitial spaces (Rabeni and Minshall 1977, McClelland and Brusven 1980, Berkman and Rabeni 1987, Waters 1995, Zweig and Rabeni 2001). The site with the greatest mean insect abundance and richness was the furthest upstream site, referred to as Above Dam, also with the greatest IBI value (70.8). The Purple Mountain site had the lowest IBI score of 43.1,

[28] Roundtail chub is a member of the *Gila* species complex. Fossil Creek was previously thought to contain two species of chub, roundtail chub (*Gila robusta*) and headwater chub (*Gila nigra*). Taxonomic changes to the genus *Gila* have resulted in combination of three Gila species (*G. robusta, G. nigra,* and *G. intermedia*) into the species *Gila robusta* (Page et al. 2017).
[29] Both the desert sucker and the Sonora sucker are Forest Service sensitive and on the Tier 1B species of greatest conservation need in the State of Arizona.

which is the only site that had a score in the inconclusive range. The Arizona IBI classifies any score between 40 and 49 as being inconclusive while a score below 39 is considered to be impaired (ADEQ 2015).

- **Rare Macroinvertebrates:** Notable rare macroinvertebrates that have been confirmed in Fossil Creek include the caddisflies *Polycentropus arizonensis*, *Hydropsyche venada*, *Wormaldia arizonensis*, *Metrichia nigritta*, and *Mayatrichia acuna* (Adams 2012, NAU 2005, Dinger 2006, Stevens and Ledbetter 2014). All of these species are relatively rare in Arizona, occurring in between 2-17% of Arizona streams with limited distributions across the Southwest.

Fossil Springsnail: One of Fossil Creek's most notable aquatic macroinvertebrates is the Fossil springsnail, which is listed as a Forest Service sensitive species and is of interest because only a few small populations exist; as such, they are vulnerable to population die-offs and risk of extinction. Fossil springsnails are found only in the headsprings and upper sections of perennial free-flowing springs and seepages feeding Fossil Creek. These endemic springsnails, which prefer shallow areas of springs that are close to spring sources to meet their need for stable water chemistry and flow, are considered indicators of spring health. Only certain springs have been surveyed for Fossil springsnails. Many seeps and springs are inaccessible due to extremely steep terrain or the spring orifices being tucked in narrow spaces in travertine formations; a recent mapping effort revealed 11 potential springsnail sites not visited due to inaccessible terrain.

Surveys in the 1970s-1990s documented seven springsnail populations in the Fossil Creek river corridor. NAU conducted surveys between 2002 and 2009, documenting springsnails in six out of eight springs surveyed. Surveys by USFWS in 2011 and 2013 monitored four known sites (Fossil Springs and four along FR 708), determining springsnails continued to exist in these sites. AGFD has assisted with monitoring existing populations in 2005, 2013, and 2017. Through the 2017 effort, an additional population of springsnails was located near the Waterfall Trail. Also in 2017, Forest Service biologists surveyed for springsnails in five locations in the Fossil Springs area; none were detected, including at a spring that previously was known to support springsnails. As of 2018, there are as many as 11 known occupied sites, at least 8 unoccupied sites, and at least 11 unsurveyed sites that have potential to support springsnails.

To protect the springsnail's riparian habitat, since 2011 the Forest Service has limited camping impacts, closed a user-created trail crossing a springsnail-occupied stream, and installed footbridges across three springs crossing the Dixon Lewis (Waterfall) Trail. Himalayan blackberry is present in the vicinity of some springs and may pose a threat to springsnail populations.

Adverse Impact to Fish and Aquatic Resources Populations

The fish and aquatic resources population component of the biological ORV would be adversely impacted if public use, development, or administrative use result in aquatic habitat changes or negatively impact the size (number of fish), structure (population metrics such as length-frequency), or requirements of a population of native fish, populations of aquatic macroinvertebrates, or populations of Fossil springsnails in the Fossil Creek corridor.

Degradation of Fish and Aquatic Resources Populations

The fish and aquatic resources population component of the biological ORV would be degraded if native fish populations (population size, structure) are being negatively impacted by non-native fish or if public use, development, or administrative use impact the size, structure, or requirements of an established population of native fish, populations of aquatic macroinvertebrates, or populations of Fossil springsnails to the extent that a reduction of population viability in the Fossil Creek corridor is likely.

Protection and Enhancement of Fish and Aquatic Resources Populations

The fish and aquatic resources population component of the biological ORV is protected if no non-native fish are present above the permanent fish barrier and the size and structure of established populations of native fish, aquatic macroinvertebrates, and Fossil springsnails support long-term species viability in the Fossil Creek corridor. Opportunities for enhancement include expanding interpretation and educational programming related to

fish and aquatic resources intended to reduce human impacts to these species' populations, actions that would enhance water quantity and quality, and supporting inventories and research intended to improve the understanding of fish and aquatic resources populations.

Fish and Aquatic Resources Habitat

Key habitat components for fish and aquatic resources include a variety of suitable habitat types (for example, riffles, runs, chutes, shallow pools, deep pools, and shallow still water); suitable habitat conditions for all life stages (for example, natural hydrologic and sedimentation regime, spawning substrate, and slack water areas for larvae); absence of non-native fish; a functioning riparian system; and absence of human impacts such as pollution, trash, and unnatural sedimentation (i.e. sediment redistribution due to recreation).

Before full flows were restored in 2005, the Fossil Springs diversion dam dewatered approximately 14 miles of Fossil Creek. For nearly a century, approximately four miles of the stream below Fossil Springs dam received only a fraction of historic baseflow (only 1-3 cfs, as compared to 43 cfs). The impact of this water diversion on native fish was clear: the reduction in water flow appears to have altered the aquatic food base and reduced the available habitat so there were about 60 percent fewer fish below the dam than above (Marks et al. 2010).

The restoration of Fossil Creek began with the 2004 installation of a permanent fish barrier in Fossil Creek within the Mazatzal Wilderness to prevent non-native fish from swimming upstream. A partnership of federal and state agencies conducted a chemical renovation through piscicide treatments to remove non-native fish in 9.5 miles of Fossil Creek in 2004 (Weedman et al. 2005).[30] The treatment successfully removed all non-native fish from the system above the barrier, and the barrier functioned to prevent re-contamination from downstream sources.

Dramatic changes in Fossil Creek's ecosystem were clear within two years of flow restoration. Roundtail chub, Sonora sucker, desert sucker, speckled dace, and longfin dace were present, and four species of imperiled fish were stocked (razorback sucker, Gila topminnow, spikedace, and loach minnow). The restoration of flow shifted the food base of the restored section of creek to an autochthanous system similar to the unaltered section above the dam (Marks et al. 2010).

Fossil Creek was surveyed in 2007 upstream from the permanent fish barrier for potential native fish stocking sites (Carter 2007). The lower reach (from the barrier upstream to the lowest road access point in the Mazatzal Wilderness) was described as being canyon-bound with a steep gradient, turbulent riffles, boulder-cobble substrate, deep pools, and deep runs. Habitat in this reach supported sizeable populations of roundtail chub, desert sucker, Sonora sucker, and longfin dace with speckled dace in low abundance and appeared best suited for razorback sucker. The middle reach (up to Irving) was dominated by travertine formation with loach minnow habitat offered by shallow riffles and supported all native fish present pre-renovation. The upper reach (Irving to Fossil Springs) contained yet more habitat complexity, with travertine formation and habitat suitable for loach minnow, spikedace, Gila topminnow, and desert pupfish (Carter 2007). From the dam to Fossil Springs, there was no travertine formation, and Fossil Creek appeared more typical of other nearby streams that are able to support loach minnow, spikedace, topminnow, and pupfish, with longfin dace present in low abundance.

Observations after flooding in January 2010 indicated that the flooding re-distributed stream substrates and destroyed many of the travertine dams throughout the system, changing or removing many pool and side-channel habitats, including riparian vegetation, that had developed behind them (Marsh et al. 2010). This dynamic system, much as it was prior to the early 1900s, produces a variety of habitat types and is beneficial.

The 2010 flooding also deposited boulders below the fish barrier, which allowed smallmouth bass to re-invade the protected portion of Fossil Creek. A second bass re-invasion event, also in 2010, was the discovery of about nine large smallmouth bass in a pool near Homestead. Installation of a temporary fish barrier occurred in August 2011 downstream of Sally May wash to limit further upstream migration of non-natives while the second bass invasion

[30] Piscicides were used on Stehr Lake non-native fish in 2006. Razorback suckers were salvaged prior to piscicide use.

site became the target of a massive mechanical removal effort. The permanent fish barrier was repaired, and the stream below the temporary barrier was re-treated with piscicide in 2012 to remove the bass. The re-invasion and quick actions to control and re-treat Fossil Creek serve as a reminder that the fish barrier and species present above the barrier require monitoring to ensure the creek remains a safe and secure habitat for native fish.

Adverse Impact to Fish and Aquatic Resources Habitat

The native fishery habitat component of the biological ORV would be adversely impacted if non-native fish that are likely to be invasive are present above the permanent fish barrier or if terrestrial (especially riparian) habitat, water quantity, or water quality indicators display adverse impacts because of their influence on the condition of fish and aquatic species. Fossil springsnail habitat would be adversely impacted if the function of occupied springs is trending downward as a result of public use, development, or administrative use.

Degradation of Fish and Aquatic Resources Habitat

The native fishery habitat component of the biological ORV would be degraded if non-native fish populations have increased to the point that native fish populations are being impacted (changes in population size, structure) or if terrestrial (especially riparian) habitat, water quantity, or water quality indicators are degraded because of their influence on the condition of fish and aquatic species. Fossil springsnail habitat would be degraded if public use, development, or administrative use interfere with occupied springs' ability to attain and maintain functional condition in the long term.

Protection and Enhancement of Fish and Aquatic Resources Habitat

The native fishery habitat component of the biological ORV is protected if no non-native fish are present above the permanent fish barrier and terrestrial habitat, water quantity, and water quality are protected because of their influence on the condition of fish and aquatic species. Fossil springsnail habitat is protected if public use, development, or administrative use are not causing a downward trend in the function of occupied springs. Opportunities for enhancement include expanding interpretation and educational programming related to fish and aquatic resources that is intended to reduce human impacts to habitat, actions that would enhance water quantity and quality and spring function, and supporting research intended to improve the understanding of fish and aquatic resources habitat requirements.

Biological ORV (Wildlife)

The biological ORV is comprised of wildlife and fish and aquatic resources. The wildlife component of the biological ORV consists of both wildlife habitat and populations.

Fossil Creek and its associated riparian habitat support roughly 200 known bird, mammal, reptile, and amphibian species, based on survey observations. A potential 300 additional species could be present based on Fossil Creek's diverse available habitat. Although some specific data regarding conditions at time of designation (2009) are not available, conditions described here can be reasonably assumed to represent baseline and existing conditions.

Wildlife Populations

Special-status wildlife species in Fossil Creek include federally listed or proposed species, Forest Service sensitive species, Forest Service locally important species, federally and state-identified neotropical migratory bird species, and Bald and Golden Eagle Act species. Dozens of special-status species are present or potentially present in Fossil Creek.

Federally Listed Species: Six federally listed or proposed wildlife species that occur or have existing or potential habitat in the Fossil Creek corridor are the Mexican spotted owl, southwestern willow flycatcher, western yellow-

billed cuckoo, northern Mexican gartersnake, narrow-headed gartersnake, and Chiricahua leopard frog[31]. Though these species are not currently known to occur in the corridor, it is possible they will be present in the corridor in the future so their habitat requirements are described here.

Mexican spotted owls do not occur within the Fossil Creek WSR corridor; however, habitat exists in the larger watershed, which contains five Mexican spotted owl protected activity centers (PACs). The northern portion of the WSR corridor contains 112 acres of designated critical habitat. Southwestern willow flycatchers prefer dense riparian thickets in areas where perennial flow, surface water, or saturated soil is present when nesting. Surveys in the Fossil Creek corridor do not show the presence of southwestern willow flycatchers; nor is there critical habitat within or near the river corridor. Since full flows were restored, travertine formations have created step pools with slower water, resulting in better quality habitat for flycatchers. Western yellow-billed cuckoos prefer large tracts of undisturbed riparian deciduous forest where willow, cottonwood, sycamore, or alder occur, or, in higher elevations, mesquite and tamarisk. Although a yellow-billed cuckoo was detected in Fossil Creek in 1999 and again in 2019, multiple surveys by NAU from 2005-2009 did not detect cuckoos. No critical habitat exists near or within the river corridor, but potential habitat exists where the channel is not canyon-bound and where adjacent mesquite woodlands occur, such as at Homestead, Purple Mountain, Mazatzal, and Stehr Lake. The northern Mexican gartersnake is most closely linked to shallow slow-moving or impounded waters and is associated with leopard frogs, which are a major prey species. Although data are not available on whether gartersnakes existed historically in Fossil Creek, restoration has allowed Fossil Creek's riparian area to become potential habitat. Critical habitat is proposed for the northern Mexican gartersnake along the Verde River; therefore, a small amount occurs within the WSR corridor at the confluence of Fossil Creek with the Verde River. Similar to the northern Mexican gartersnake, data are not available on whether narrow-headed gartersnakes existed historically in Fossil Creek. One occurrence was documented in 2005 by an AGFD fish survey on the Verde River near the confluence with Fossil Creek. Critical habitat is proposed for the narrow-headed gartersnake along the Verde River; therefore, a small amount occurs within the WSR corridor at the confluence of Fossil Creek with the Verde River. There are no records of Chiricahua leopard frogs in Fossil Creek (the species of leopard frog in Fossil Creek is the lowland leopard frog). Currently occupied, previously occupied, suitable unoccupied, and critical Chiricahua leopard frog habitat occurs in the upper portion of the Fossil Creek watershed, approximately 2.5 to 3 miles from the river corridor.

Other Species: In addition to the federally listed species, Fossil Creek is home to eight Forest Service-designated sensitive species, two Forest Service locally important species (table 2-4), and 19 neotropical migratory birds. Of the other wildlife species, common black-hawks and lowland leopard frogs are of particular focus because they are good indicators for the condition of riparian and aquatic populations and habitats.

Table 2-4. Forest Service sensitive species and locally important species list for Fossil Creek WSR Corridor

Common Name	Scientific Name	Status
Mammals		
Western red bat	*Lasiurus blossevillii*	Sensitive
Spotted bat	*Euderma maculatum*	Sensitive
Allen's lappet-browed bat	*Idionycteris phyllotis*	Sensitive
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Sensitive
Birds		
Bald eagle	*Haliaeetus leucocephalus*	Sensitive
American peregrine falcon	*Falco peregrinus anatum*	Sensitive
Common black-hawk	*Buteogallus anthracinus*	Locally Important Species
Northern goshawk	*Accipiter gentilis*	Sensitive
Amphibians		
Lowland leopard frog	*Lithobates yavapaiensis*	Sensitive

[31] In previous Fossil Creek analyses, the Yuma clapper rail (*Rallus longirostris yumanensis*) was analyzed based on the presence of marginal habitat, primarily Stehr Lake. Since the power system's decommissioning that resulted in Stehr Lake drying up, it has been determined that this bird is no longer present.

Common Name	Scientific Name	Status
Arizona toad	*Bufo microscaphus microscaphus*	Locally Important Species

Common Black-hawk: Currently a Coconino National Forest locally important species, the common black-hawk in Fossil Creek is an important species[32] because it is an indicator of human disturbance within the watershed and a good indicator for other canopy nesting, riparian obligate bird species. The black-hawk has been observed in all reaches of Fossil Creek where suitable nesting habitat is present. Nesting and food availability along Fossil Creek above the fish barrier reflect historic conditions for this top level predator.

Occupying low-elevation riparian areas, the black-hawk is dependent upon mature, relatively undisturbed habitat supported by a permanent flowing stream. Unlike all other perennial system in the Verde Valley, abundant native prey (fish) is available in Fossil Creek to black-hawks (Etzel et al. 2014). Groves of tall trees must be present along the stream course for nesting and for hunting from tree perches. Streams of low to moderate gradient and less than one foot deep with scattered boulders are ideal for foraging. NAU conducted a prey delivery study to compare Fossil Creek prey deliveries to those of other Verde Valley tributaries (Oak Creek, Wet Beaver Creek, and Red Tank Draw) in 2008 and 2009. Fossil Creek black-hawks delivered a higher percentage of native aquatic prey (fish and amphibians) to nestlings than black-hawks in other systems (which relied on predominately crayfish[33] and reptiles).

Surveys for black-hawks were conducted in 2005, 2006, 2007, 2009, 2011, and 2019. Black-hawk populations in 2009 are used to represent baseline condition. In 2006, four nests were occupied along 4.25 miles between Fossil Springs and Irving. After 2007, numbers of nest sites from the historic dam downstream to just below Irving had decreased from four to two—with abandoned nest sites by the historic Fossil Springs dam and by the Waterfall in Middle Fossil. During the 2009 survey, two additional black-hawk nests were found, both downstream of the Mazatzal recreation site, equating to a total of four nests. In 2011, surveys showed the two nest sites downstream of Mazatzal were abandoned but six nests still existed elsewhere. Areas of nest abandonment, throughout the seven years of monitoring, appear to correspond to areas with increased recreational activity. In particular, between 2008 and 2009, visitation almost doubled, with definite impacts from camping observed per bare soil indicators at the Waterfall and at Fossil Springs.[34] Surveys in 2019 were completed from just upstream of the historic dam to Fossil Creek Bridge and from the Bridge to the fish barrier. Four active nests were detected.

Lowland Leopard Frog: As a Forest Service sensitive species, the lowland leopard frog in Arizona is now only found below the Mogollon Rim in central and southeastern Arizona. Fossil Creek supports the single remaining viable population on the Coconino National Forest and a significant population on the Tonto National Forest.

The lowland leopard frog prefers permanent stream pools, springs, stock tanks, and side channels of major rivers from almost sea level to 6,400 feet in elevation. Leopard frogs are seldom found in association with non-native bullfrogs or crayfish, which can cause declines of leopard frogs by predating on them. All life stages of leopard frogs have been observed in high to moderate abundance from the Fossil Springs area downstream to the Waterfall and in low abundance from the Waterfall downstream to above the Waterfall Trailhead.

Prior to restoration of the native fishery and full flows in Fossil Creek, few leopard frogs remained and were limited to above the historic dam. Historically, lowland leopard frogs were found near the Fossil Creek Bridge in 1950 but not in the 1980s or 1990s.

Decommissioning activities were closely managed in order to prevent the loss of the Fossil Creek population. Forest Service frog surveys from 2005 to 2009 showed leopard frogs responded well to more flows, complex habitats created by travertine formations, and the lack of non-native fish. In response to restoration of full flows,

[32] Common black-hawk had been listed as a Forest Service sensitive species prior to 2013.

[33] Crayfish are non-native and take more energy for birds (adults and nestlings) to consume because of the hard exoskeleton.

[34] During the high-use season (generally April-September), approximately 45,938 people or 15,573 vehicles visited Fossil Creek in 2008 as compared to 80,745 people or 27,371 vehicles in 2009.

lowland leopard frogs recolonized Fossil Creek below the historic dam and reached viable population levels before the historic dam was lowered.

Although 2009 baseline conditions showed an increase in the number of leopard frogs, a decrease likely attributable to multiple factors, including increased decommissioning activities and flood events, began shortly after. After APS lowered the Fossil Springs dam in 2009, the new channel height above the lowered dam was unstable with raw exposed banks and no vegetation. Exacerbating this condition were several large flood events in 2009 and 2010 that further scoured the banks and channels, impacting established frog habitat below the dam. At the same time, frog monitoring showed lower population levels. Limited surveys in 2010, 2011 and 2012 showed frog numbers increasing. By 2017, surveys showed the frogs persisting and abundant with well more than 100 estimated in the Fossil Springs area but not present in Middle Fossil below the Waterfall Trailhead.

Fossil Creek's intricate ecological habitat plays a key role in the success of the lowland leopard frog. The reach from the Fossil Springs downstream to the Waterfall contains the most developed travertine formations and the most complex habitat. Suitable habitat exists downstream of the Waterfall although habitat below the Waterfall has fewer travertine formations, more bedrock with swift flows, and less aquatic vegetation.

Adverse Impact to Wildlife Populations

The wildlife population component of the biological ORV would be adversely impacted if public use, development, or administrative use negatively affect the size, structure, or requirements of wildlife species populations in the Fossil Creek corridor in a way that reduces population numbers but not to the level that affects population viability.

Degradation of Wildlife Populations

The wildlife population component of the biological ORV would be degraded if public use, development, or administrative use impact the size, structure, or requirements of wildlife populations to the extent that viability of populations in the Fossil Creek corridor is threatened.

Protection and Enhancement of Wildlife Populations

The wildlife population component of the biological ORV is protected if the size and structure of wildlife populations support long-term species viability in the Fossil Creek corridor. Opportunities for enhancement include expanding interpretation and educational programming related to wildlife intended to reduce human impacts to these species' populations; actions that would enhance water quantity and quality, riparian function, travertine formations, and prey bases; the Fossil Creek corridor contributing to down-listing or delisting of federally listed species that occur or have potential to occur in the corridor; and supporting inventories and research intended to improve the understanding of wildlife populations.

Wildlife Habitat

The wildlife habitat component of the biological ORV is based on the vigorous deciduous riparian community and the complexity of aquatic habitat created by travertine formations within the stream channel.

The Fossil Creek corridor occurs in Arizona's transition zone province and ranges from approximately 2,550 feet in elevation at the confluence with the Verde River to 5,000 feet in the vicinity of Fossil Springs. This large elevational gradient produces a wide range of temperatures and amounts of precipitation, which leads to a high diversity of habitat types. Fossil Creek is characterized by seven vegetative communities: riparian, semi-desert grassland, pinyon/juniper woodland, juniper/grassland transition, alligator/Utah juniper savanna, ponderosa pine forest, and mixed conifer forest. As described in the *Wildlife Populations* section above, this habitat diversity supports a wide diversity of wildlife species. A high diversity of plant species is also present, with recent estimates suggesting approximately 540 species potentially present in the corridor.

Approximately 10% of the river corridor is comprised of riparian vegetation. Fossil Creek's riparian communities consist of lotic (riverine), lentic (springs), and wetland systems. Over 20 miles of stream occur in the river

corridor. Of these, only Fossil Creek and the Verde River are perennial. Intermittent streams include Boulder Canyon, Sally May Wash, Mud Tank Draw, Tin Can Draw, and Hardscrabble Creek. Numerous springs are present in the river corridor, with the highest concentration in the Fossil Springs area. Wetlands are present along the creek and around springs.

Travertine formations in the stream channel represent a remarkable component of Fossil Creek's habitat. These formations are most pronounced between the historic dam and the waterfall. This reach is characterized by an extremely dynamic network of travertine dams and deep pools that are shaped by rapid deposition of travertine and episodic flood flows that can remove large sections of the dams. Where the dams are above water, they are often covered by watercress and monkeyflower (figure 2-4). Significant evolution of these dams has been witnessed since restoration of full flows and time of designation, with travertine dams between the historic dam and waterfall generally expanding and dams downstream of Irving that were formed by flows released from the flume reduced by flood flows.

Figure 2-4. Travertine formations in 2012 (left) below the historic dam. Mature travertine formations create deep, long pools below the dam in 2017 (right).

Impacts to wildlife habitat observed in Fossil Creek have been associated with visitor use and invasive plant species. The amount of bare soil associated with areas receiving visitor use was tracked as an indicator of human-caused disturbance and potential for impacts to wildlife habitat from 2002 to 2013. The amount of disturbance increased as visitor numbers increased through 2011 and began to decrease once measures were taken to better manage visitor use. Initial bare soil monitoring efforts were focused on camping impacts, so the most extensive data available are related to bare soil areas associated with camping use. In 2002, monitoring indicated that camping had created a total of 2.2 acres of bare soil adjacent to Fossil Springs and Fossil Creek. The amount of this disturbance peaked in 2011 at 5.9 acres and decreased to 4.4 acres in 2013 (Rotert 2014).

With vegetation loss noticeably increasing, the scope of bare soil monitoring was expanded in 2010 to include all vegetation loss resulting from visitor use. In addition to camping, the expanded monitoring included assessment of unauthorized trails, spur roads, vehicle pullouts, parking lots, and day use areas. The total denuded area detected in Fossil Creek was 15.0 acres in 2010 (Rotert 2010), 19.6 acres in 2011 (Rotert 2012b), 15.9 acres in 2012 (Rotert 2013a), and 15.0 acres in 2013 (Rotert 2014). Decreases in the amount of bare soil have corresponded with improved management of visitor use, as described in the "Recreational Use and Management" section of Chapter 1.

Non-native invasive plant species do exist in the Fossil Creek corridor. The main species include giant reed, tamarisk, Himalayan blackberry, and tall fescue. Mechanical and herbicide treatments have been conducted on tree of heaven, salt cedar, giant reed, and Russian olive in 2010, 2012, 2013, 2014, 2019, and 2020 from the Fossil Springs area to two miles south of the permanent fish barrier, the Stehr Lake area, and the last three-quarter miles of Fossil Creek down to the Verde River confluence.

Adverse Impact to Wildlife Habitat

The wildlife habitat component of the biological ORV would be adversely impacted if water quantity or quality, riparian function, the amount or function of travertine formations, invasive species, or prey bases are affected by public use, development, or administrative use in a way that risks causing declines in wildlife populations or population viability in localized or previously unimpacted areas.

Degradation of Wildlife Habitat

The wildlife habitat component of the biological ORV would be degraded if water quantity or quality, riparian function, the amount or function of travertine formations, invasive species, or prey bases are affected by public use, development, or administrative use to the extent that long-term, segment-wide declines in wildlife populations or population viability are likely to occur as a result.

Protection and Enhancement of Wildlife Habitat

The wildlife habitat component of the biological ORV is protected if water quantity or quality, riparian function, the amount or function of travertine formations, and prey bases provide for the needs of Fossil Creek's wildlife populations and if invasive species do not result in declines in wildlife populations or population viability. Opportunities for enhancement include expanding interpretation and educational programming related to wildlife that is intended to reduce human impacts to habitat; actions that would enhance water quantity and quality, riparian function, travertine formations and prey bases; and supporting research intended to improve the understanding of wildlife habitat requirements.

Western Apache and Yavapai Traditional and Contemporary Cultural Values ORV

Fossil Creek continues to be recognized as a place of special cultural and religious importance to many traditional Apache and Yavapai people (KenCairn and Randall 2007; Krajl and Randall 2009; Randall et al. 2009). Many stories continue to "live" along Fossil Creek that are tied to specific places within the corridor.

It is impossible to unravel the sacred from the secular when considering the traditional cultural use of any landscape by Indian tribes. However, Fossil Creek (*Tú Dotł'izh*, "Blue Water") and the canyon it lies in clearly rise to the highest level of cultural importance for local tribes (Vincent Randall and Chris Coder, personal communication, March 30, 2011; Wally Davis Jr., personal communication to Noni Nez, November 29, 2011; Bob Bear, personal communication, March 12, 2013). The Apache and Yavapai occupied the Fossil Creek corridor from sometime in prehistory through historic times, and the project area falls within the traditional territories of the *Dilzhé'é*, as well as a few Yavapai clans.[35] Several *Dilzhé'é* clans, some intermarried with Yavapai, are known to have inhabited portions of the project area or kept farms there (North et al. 2003; Vincent Randall and Chris Coder, personal communication, March 30, 2011). Although specific sites with evidence of Apache or Yavapai occupation are poorly represented in the current archaeological inventory, several specific locations are known to have been inhabited by Apache families during the early 1900s. In addition, the *Dilzhé'é* maintain many place names associated with features in and adjacent to the project area (North et al. 2003; Vincent Randall and Chris Coder, personal communication, March 30, 2011).

Fossil Creek plays a prominent role in the mythologies of both the Western Apache and Yavapai, including some creation stories (KenCairn and Randall 2007; Krajl and Randall 2009). Apache elders have identified several locations within the corridor as being "holy", that is significant beyond that connoted by "sacred" because they are places where humans interacted directly with God/the Creator (Vincent Randall and Chris Coder, personal communication, March 30, 2011; Bob Bear, personal communication, March 12, 2013; Vincent Randall, personal communication, June 2, 2015). Both the Yavapai and Apache continue to conduct ritual visits to Fossil Creek, and

[35] The term *Dilzhé'é* is preferred by many Apache over the more common "Tonto Apache" used to refer to those Western Apache who traditionally lived between the San Francisco Peaks and the Pinal Mountains and between the Verde River and Canyon Creek (KenCairn and Randall 2007).

one contemporary Apache “Holy Ground” is within the project area. The tribes have clearly demonstrated that Fossil Creek has exceptional traditional cultural value to various Western Apache and Yavapai groups and continues to play an important role in their traditional practices and spiritual wellbeing (Randall et al. 2009).

The cultural ORV is defined from the point of view of traditional cultural practitioners, principally the Yavapai – Apache Nation, and any changes to its condition are defined from their point of view as well. For traditional cultural practitioners, a healthy cultural ORV consists of Fossil Creek looking, sounding, and feeling as natural and untrammeled as possible, while allowing for some concentrated recreational use at compatible locations along Middle Fossil and limited backcountry recreational use focused around the creek and adjacent banks. The principal way Yavapai-Apache Nation members have described the health of the Cultural ORV is through the lens of the number of people in Fossil Creek and associated impacts. Impacts have included overcrowding, denuded soil from parking and foot traffic, and increased trash and human excrement on the landscape. The reporting of these impacts has corresponded with periods of unmanaged recreational use, and reports of improved conditions have corresponded with implementation of measures designed to better manage recreational use and reduce undesirable impacts.

Prior to the 2009 designation, traditional practitioners had access to natural resources and most places along the corridor without conflict. There were no facilities within the corridor at the time of designation to devalue the visual setting for traditional cultural practitioners.

At the time of the 2009 designation, visitation numbers nearly doubled between the 2008 and 2009 summer seasons, from approximately 45,000 people to approximately 80,000 per year. Many visitors at this time acted with a notable lack of stewardship ethic. As a result, recreation-related impacts increased to a point that exceeded levels acceptable to the tribes. In December 2009, the Yavapai-Apache Nation informed the Forest Service that visitation, and resulting impacts, were unacceptably high, particularly at certain locations, including the Dixon Lewis (Waterfall) Trailhead and the Waterfall (Randall, personal communication 2009). Based upon this, recreation-related impacts were presumably at an acceptable level the year before designation in 2008, but exceeded that level in the following year when designation occurred.

By 2011, recreation-related impacts, particularly crowding, appeared to the Yavapai-Apache Nation to be at their worst. The multi-year surge in visitors expanded the recreational footprint throughout the riparian corridor, increasing areas of bare soil due to dispersed camping, dispersed parking, and user-created trails. Bare ground presents a potentially serious problem because it disrupts the natural setting of the cultural ORV and leads to increased erosion within heritage resources. Apache elders visiting Fossil Creek in the summer of 2011 reported that there were “too many” people at Fossil Creek (Vincent Randall and Bob Bear, personal communication, June 7, 2011). Some types of recreational behavior, such as drinking, cliff jumping, and swimming were perceived as being disrespectful at several locations, particularly sacred locations. Forest Service interim management measures, including capacity controls and camping restrictions, were implemented, producing an improvement in visitor behavior shown, for example, by reduced trash and human waste, as noted by the Yavapai-Apache Nation.

Cultural ORV conditions from 2016 to the present have improved. Vehicles parked in established spaces and fewer visitors spread more evenly throughout the corridor have also led to a decrease in the amount of denuded area within the corridor. The Yavapai–Apache Nation has told the USFS that the 2016 permit system and the 2017 vault toilet installation have improved the condition of the Cultural ORV to an acceptable condition (Yavapai-Apache Nation Tribal Consultation, June 26, 2017). The Cultural ORV is a renewable resource and can be degraded and subsequently enhanced by management actions.

Adverse Impact to Cultural Values

The Western Apache and Yavapai traditional and contemporary cultural values ORV would be adversely impacted if traditional cultural practitioners, principally the Yavapai-Apache Nation, determine that the Fossil Creek area fails to look, sound, and feel as natural and untrammeled as possible while allowing for some concentrated recreational use at compatible locations along Middle Fossil and limited backcountry recreational use focused

around the creek and adjacent banks. Past impacts have included overcrowding, denuded soil from parking and foot traffic, and trash and human excrement on the landscape.

Degradation of Cultural Values

The Western Apache and Yavapai traditional and contemporary cultural values ORV would be degraded if traditional cultural practitioners, principally the Yavapai-Apache Nation, determine that the accumulation of adverse impacts impairs the Fossil Creek area at the segment-wide and long-term scales.

Protection and Enhancement of Cultural Values

The Western Apache and Yavapai traditional and contemporary cultural values ORV is protected if traditional cultural practitioners, principally the Yavapai-Apache Nation, describe Fossil Creek as looking, sounding, and feeling as natural and untrammeled as possible while allowing for some concentrated recreational use at compatible locations along Middle Fossil and limited backcountry recreational use focused around the creek and adjacent banks. Opportunities for enhancement include expanding interpretation and educational programming related to traditional and contemporary cultural values in the Fossil Creek area, actions that manage recreational use in a way that maintains access and protects river corridor resources; and providing opportunities for traditional cultural practitioners to actively participate in the management of Fossil Creek.

Recreation ORV

Fossil Creek hosts outstanding recreational opportunities as a year-round freshwater source that provides relief from the desert heat. Visitors enjoy the shade and cooler temperatures under the dense riparian canopy, and there is an abundance of clear, blue-green pools in which to wade, swim and snorkel. Travertine formations represent unusual and interesting landscape features.

River-dependent recreation and visitor experience quality are the principle components of the recreation ORV. The following elements contribute to the recreation ORV: public access, experience quality, and river-dependent recreation activity participation, and will be used in describing baseline and existing conditions. Because of the difficulty of quantifying recreation activities and capturing the qualitative nature of the recreation experience, data can be limited or have limited reliability.

- Public access: Evaluated by the number of people able to visit Fossil Creek during the April-September peak-use season.
- Recreation experience quality: Inferred based on proposed management actions that would address problems (like trash, toilets, and crowding) identified by 2011 survey respondents (Lee 2012).
- Recreation activity participation: Inferred based on the principle that more recreation availability or infrastructure would result in more potential for public participation in camping, hiking, kayaking, rafting, swimming/wading, fishing, hunting, and wildlife viewing.

Fossil Creek provides a diversity of recreation opportunities. A 3.5-mile stretch of road paralleling the creek in the recreation segment provides visitors easy access to the creek, while the two wild segments, overlapping with the Mazatzal and Fossil Springs wildernesses, allow experienced hikers and backpackers to venture into remote areas, exploring primitive nature surrounded by rugged, steep-walled canyons and springs.

Fossil Creek has a long history of recreational use (described in more detail in Chapter 4, “Visitor Use and User Capacity”). Visitation data from before full-flows were restored to the creek in 2005 are limited; however, after dam removal was completed in April 2009, the Forest Service started more consistent patrols of the area, including counting of people and vehicles. During the summer of 2009, rangers patrolled nearly every day to interact with visitors and count people and vehicles. Rangers observed that recreation use grew dramatically 2006-2012. Simultaneously, the Forest Service initiated parking capacity measures and other restrictions[36] to manage

[36] In the Fossil Creek river corridor, campfires have been prohibited since 2010 and glass containers since 2014.

the impacts of increasing use. In 2009, an estimated 80,745 people entered Fossil Creek during the April-September peak-use season. By the year 2012, the highest number of visitors entered—90,396—during the April-September peak-use season.[37] With an interim permit system instituted in 2016 for the high-use season, a decrease in visitor numbers was observed, with 47,927 visitors entering in 2016 and 52,301 in 2017.[38]

Baseline and Existing Conditions in the Recreational Segment: In 2009, recreation opportunities in the recreational segment of Fossil Creek were similar to those currently available. The most common visitor activity in this segment was swimming (42 percent of visitors)—with more than 100 people at popular swimming holes, such as the Fossil Creek Bridge, Irving, and the Waterfall, during weekends and holidays—and camping (29 percent) as the second most common activity, according to opportunistic visitor interviews (Rotert 2009a). Other activities visitors participated in included hiking/running, relaxing/getting away, and observing the creek, with very few visitors participating in OHV use (1 percent) or kayaking/rafting (1 percent).[39]

Visitor use increased dramatically in the years following the 2005 restoration of full flows. In 2006, the estimated number of people at Fossil Creek from May to October was 20,480 people. In 2009, the estimated number of people at Fossil Creek during the same time period was 80,745, about fourfold compared to 2006 (Rotert 2013b). It is possible that the large increase in use levels had an effect on recreation experience quality. About a third of visitors choosing to participate in opportunistic conversations with field staff in 2009 may have felt some level of crowding since they believed the area would benefit from a permit system in order to manage capacity (but about a quarter indicated 2009 conditions were fine).

The most useful research on visitor experiences was collected in 2011 by NAU, using a statistically representative survey method, which will be used to describe the baseline condition. Visitor responses to the survey were mixed regarding the perception of trash and the crowding. While 37.7 percent of visitors perceived trash as the most negative environmental and social condition, 37.9 percent indicated the amount of trash was not bad. While 23.1 percent of visitors perceived the number of people as negative, 31.1 percent indicated the area was not too crowded. Visitors stated their preferences for improvements to facilities and infrastructure related to trash disposal (20.7 percent) and more, or permanent, toilets (11.6 percent and 20.5 percent, respectively). Conversely, 36.4 percent stated that facilities were good as is, and 12.8 percent preferred less development. Finally, the majority of visitors (79.9 percent) indicated a desire for some overnight camping in Fossil Creek due to the long drive or to enjoy the area longer (Lee 2012).

Of particular concern within the recreational segment has been unrestricted camping through the years that impacted areas adjacent to Fossil Springs and Fossil Creek. “Engineering” of campsites and the search for firewood resulted in damage to soils, trees, and shrubs (Roughan 2003; Rotert 2009b). Continued camping at riparian locations eliminated the natural vegetation, leaving areas devoid of ground cover or infested with noxious weeds. Dispersed camping has been mapped and evaluated multiple times, including in 1988, 1996, 2002, 2010, and 2013. In response to increasing disturbance from camping in the Fossil Creek riparian area, the Forest Service implemented restrictions on camping at certain locations[40] in the corridor beginning in 2010. Decreases in the number of campsites and denuded area were observed after restrictions were implemented (Rotert 2014).

Prior to 2012, access to Fossil Creek was essentially unlimited. Anybody who wanted to go to Fossil Creek could do so. Increasing visitation resulted in congestion along FR 708, vegetation and soil disturbance from unmanaged

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[37] As capacity controls began as interim management measures, the number of people turned away increased from 2012 through subsequent years until the start of the 2016 permit system.

[38] With the interim permit system, an estimated 136,160 visitors could enter Fossil Creek during the high-use season if all of the 148 permits were reserved each day.

[39] Approximately 1% of visitors kayaked or packrafted the section of Fossil Creek between the Waterfall and Irving or the bridge, per 2009 observations; however, data collection only occurred during the summer season, which would not have included winter/spring high flows popular with creek boaters. Further, sampling methodologies were not representative.

[40] Camping restrictions existed in 2010 within 100 feet of Fossil Creek and within the reach of Fossil Creek from the historic dam downstream to the Fossil Creek Bridge.

parking, and blocked access for emergency responders. As a result, in 2009-2011, the Forest Service began managing traffic and parking, delineating parking areas, and restoring disturbed sites, and, in 2012, managing capacity by physically limiting visitor access. Separately, in 2011, a 4-mile section of FR 708 was closed to public use because of rockfall and road damage. Challenges with capacity management practices began in 2012, particularly safety concerns for Forest Service personnel and the public, leading to a parking permit system in 2016 through www.recreation.gov. The permit system allowed for 148 vehicles (approximately 740 people) per day: 115 vehicles at eight designated locations in Middle Fossil and 33 vehicles at the Fossil Springs Trailhead. No camping was allowed in the Fossil Creek river corridor during the permit season (however, camping can occur from Stehr Lake to Childs and outside the permit boundary year-round). Outside of the permit season, dispersed camping was allowed downstream of the Fossil Bridge and in the Fossil Springs area.

In 2016-2017, the Forest Service took several actions to reduce resource damage and improve the visitor experience, including modifying parking at the Fossil Creek Bridge, installing eight vault toilets to replace portable toilets, and constructing hardened creek access trails at Fossil Bridge and Sally May. The Forest Service also provided funding to the Oak Creek Watershed Council's Verde Watershed Ambassador program to assist with weekend public education, cleanup, and restoration in Fossil Creek.

In 2012 and subsequent years, recreation opportunities in Fossil Creek were similar to those in 2009. Field observations in 2012 hinted that visitors participated in similar activities and in similar proportions as in 2009 (Rotert 2012a). For instance, the most common visitor activity continued to be swimming, with camping the second most common visitor activity. Hiking was again the third most popular activity. Similarly, a much smaller number of visitors reported that they were there to use OHVs or to kayak/raft. The number of people able to access the Waterfall in Middle Fossil and Fossil Springs area were also reduced due to fewer parking spaces available at the Waterfall Trailhead and Fossil Springs parking lots. Direct vehicle access to Fossil Creek from Strawberry, including for OHVs, was no longer available following closure of a section of FR 708 in 2011.

Overall, current recreation opportunities are more constrained in the recreational segment compared to the 2009 baseline condition due to limitations placed on camping and parking. Conversely, the quality of the visitor experience has likely improved due to actions taken to address primary public concerns (identified in the 2011 NAU visitor survey) by installing vault toilets and creating reservable parking in designated lots.

Baseline and Existing Conditions in the Wild Segments: The wild segments of Fossil Creek are located within designated wilderness areas, both north (Fossil Springs Wilderness) and south (Mazatzal Wilderness) of the recreational segment.

- **Mazatzal Wild Segment:** Visitors have relatively easy access to the Mazatzal Wilderness from Middle Fossil since the wilderness boundary is a short distance from the Mazatzal parking area. Most visitors only go about a quarter mile from the wilderness boundary to access a few swimming holes. Very few visitors venture beyond this point unless occasionally to camp within the first half mile of the wilderness.
- **Fossil Springs Wild Segment:** Most visitors access Fossil Springs Wilderness via the Bob Bear (Fossil Springs) Trail on the south side of the wilderness coming from Strawberry. It is also possible to access the wilderness from Highway 260 above the rim via the Mail Trail.

Since the wilderness areas have relatively little visitor use, they offer exceptional opportunities for experienced hikers and backpackers to venture into remote areas, explore primitive nature and have a wilderness experience characterized by solitude, personal reflection, immersion in nature, and self-reliance. No formal studies documenting visitor satisfaction, perceptions of crowding, or encounter rates have been conducted in either of these wilderness areas. Use in these areas is uncommon enough that it is assumed that visitor satisfaction is high (for those looking for a wilderness experience) and that crowding and encounter rates are not an issue.

The existing condition of the recreation ORV for the wild segments of Fossil Creek is most likely similar to the 2009 baseline condition. There is little reason to assume that the amount of recreation or the types of recreation activities in the wild segments have changed substantially since 2009. No formal studies documenting visitor satisfaction, perceptions of crowding or encounter rates have been conducted in either of these wilderness areas.

Adverse Impact to Recreation

The recreation ORV would be adversely impacted by declines in visitor satisfaction, visitor access to Fossil Creek during the peak use season, or availability of river-depended recreation activities compared to 2009 baseline conditions or by adverse impacts to other river values.

Degradation of Recreation

The recreation ORV would be degraded by substantial declines in visitor satisfaction, visitor access to Fossil Creek during the peak use season, or availability of river-depended recreation activities compared to 2009 baseline conditions or by degradation of other river values.

Protection and Enhancement of Recreation

The recreation ORV is protected if visitor satisfaction, visitor access to Fossil Creek during the peak use season, or availability of river-depended recreation activities are maintained to at least 2009 baseline conditions and if other river values are protected. Protecting the health of the other river values is essential to protecting the recreation ORV. Opportunities for enhancement include actions that improve visitor satisfaction, expanding access to and availability of river-dependent recreation activities, and actions that enhance other river values.

Other Resource Summaries

Throughout CRMP development, natural and cultural resources beyond those defined as ORVs have been studied. Although these resources in and of themselves did not rise to the level of outstandingly remarkable, in many cases, aspects of them are related to the river values. These relationships are summarized below. Specifically, resources previously identified as ORVs (see table 2-1) are incorporated to a great extent in the final river values.

Ecology: Fossil Creek's ecology is related to the free-flow and water quality river values and the biological and geology ORVs.

Riparian communities and botanical resources: Fossil Creek's riparian communities and botanical resources are related to the free-flow and water quality river values and the biological and geology ORVs. The riparian communities along Fossil Creek are not unique within the Arizona Central Highlands Planning Area. The botanical diversity of the riparian vegetation is important, but does not rise to the level of outstandingly remarkable. Although potentially suitable habitat exists within the Fossil Creek WSR corridor, threatened, endangered, or sensitive plant species have not yet been documented. Riparian communities and botanical resources are important but not outstandingly remarkable values.

Scenery: Criteria for determining whether scenery is outstandingly remarkable relate to landscape elements of landform, vegetation, water, color and related factors as notable or exemplary visual features and/or attractions within the region. When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and the length of time negative intrusions are viewed may be considered. The criteria allow scenery and visual attractions to be highly diverse over the majority of the river or river segment. Although the scenery on Fossil Creek is diverse, scenery is striking in other rivers and areas within the region and state. In addition, power lines impact the scenery within the corridor. Fossil Creek's scenery, therefore, was not deemed unique or rare within the region, so it does not rise to the level of outstandingly remarkable.

Other heritage resources: Other heritage resources consist of National Register of Historic Places (NRHP)-eligible historic properties. Many of the prehistoric sites within the Fossil Creek corridor have integrity and meet the criteria to be listed on the NRHP; however, none of these sites is substantially different from numerous sites found in the Verde Valley and along the Mogollon Rim. There is nothing known from the archaeological record indicating Fossil Creek fostered any unique prehistoric cultural developments; therefore, prehistory of Fossil Creek does not rise to the level of outstandingly remarkable. Additionally, many heritage sites along Fossil Creek have been impacted by activities associated with the Childs-Irving system and recreational use. Construction of the power system and subsequent maintenance was done without regard to impacts to cultural sites.

The Childs-Irving system was named a Historic Mechanical Engineering Landmark in 1971 and was added to the NRHP in 1991 as an engineering and construction feat and in recognition of its contribution to the economic development of Arizona. Additionally, the Fossil Creek Bridge is listed on the NRHP as an unaltered example of an important Arizona bridge type. However, there is little visible evidence of the history of hydropower in Fossil Creek over the past 100+ years. The cultural sites that remain are interesting but not outstandingly remarkable.

Chapter 3. Management Direction

Introduction

This chapter provides management direction that must be followed when managing the Fossil Creek Wild and Scenic River Corridor special area. Management direction includes desired conditions, standards, guidelines, objectives, and management approaches for Fossil Creek's river values and other resources and uses occurring in the area. This management applies to all future projects and activities within the Fossil Creek WSR special area.

Special areas are identified and managed to maintain their unique special character or purpose and may be designated by statute or administratively. The Fossil Creek CRMP establishes a formal boundary for the Fossil Creek WSR special area (figure 3-1). This boundary coincides with the Fossil Creek WSR corridor described in Chapter 1 and includes approximately 5,192 acres.

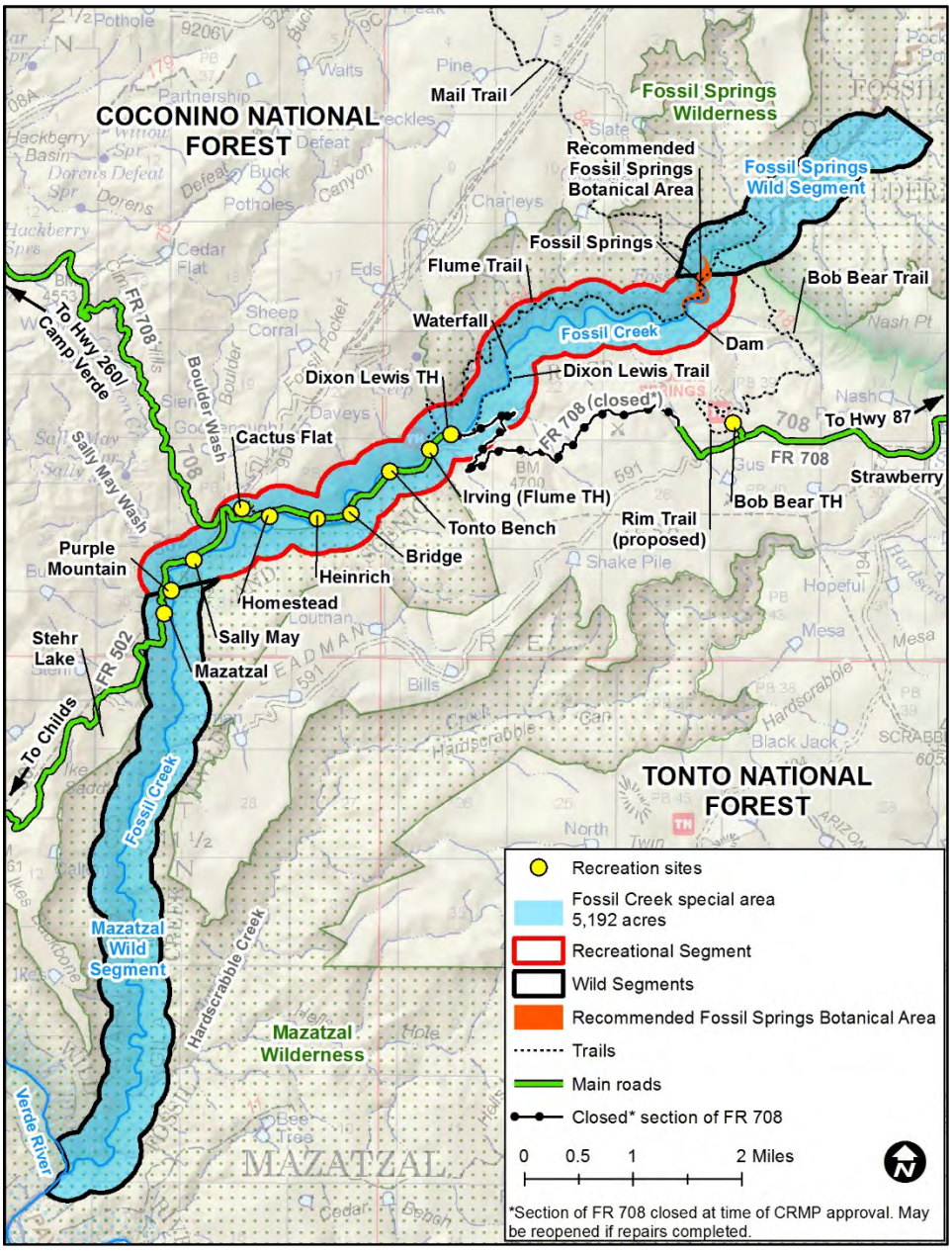

Figure 3-1. Fossil Creek special area boundary

In addition to the management direction included in this chapter, forest-wide Coconino and Tonto National forest plan components and components in the Verde Valley Management Area (described in the Coconino National Forest plan) apply to the Fossil Creek WSR special area. When plan components conflict, the more restrictive plan components generally prevail. A project- or activity-level evaluation, however, may be required to resolve the conflict. For those portions of the Fossil Creek WSR corridor that overlap with the Verde WSR corridor,[41] the Verde WSR CRMP prevails in order to ensure management continuity of the Verde WSR corridor.

Definitions of Management Direction

This chapter provides plan components and other content for the Fossil Creek WSR special area. Plan components include desired conditions, objectives, standards and guidelines. Once plan components are approved, any substantive changes to them will require a plan amendment. Other content, in the form of management approaches, is meant to provide information and assist in understanding the larger management context but is not mandatory direction. A change to "other content" may be made using an administrative correction process. Administrative corrections are also used to make nonsubstantive changes to plan components, such as data and map corrections or updates, minor boundary adjustments, and typographical error corrections. The public will be notified of all plan amendments and administrative corrections.

Plan Components

Desired conditions set forth the social, economic, and ecological goals for managing Fossil Creek. They attempt to paint a picture of what we (the public and the Forest Service) desire the WSR corridor to look like or the goods and services we desire it to provide. Desired conditions are generally expressed in broad, general terms; however, more specificity may be added to clarify the intent. Desired conditions are timeless in that there is no specific date by which they are to be completed. They are aspirations and not commitments or final decisions that approve projects or activities, and they may only be achievable over a long timeframe. In some cases, a desired condition matches the current condition, in which case the goal is to maintain the current condition.

Projects and site-specific activities must be consistent with desired conditions. Project documentation should explain how the project or activity is consistent with desired conditions and describe any short-term or negligible long-term adverse effects the project may have concerning the maintenance or attainment of any desired condition. Projects that conflict with desired conditions will require a plan amendment.

To be consistent with the desired conditions outlined in this chapter, a project or activity, when assessed at the appropriate spatial scale, must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions without adversely affecting progress toward, or maintenance of, other desired conditions; or
- Be neutral with regard to progress toward plan desired conditions; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short term; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long term.

Standards are constraints upon project and activity design. A standard is an absolute requirement to be met in the design of projects and activities. A project or activity is consistent with a standard when its design is in accord with the explicit provisions of the standard; variance from a standard is not allowed except by plan amendment.

[41] The Verde WSR corridor overlaps with the Fossil Creek WSR corridor for a distance of 1/4 mile upstream of the confluence of Fossil Creek and the Verde River.

Guidelines are sideboards that guide management activities and provide specifications that a project or activity would adopt unless there is a compelling or defensible reason to vary from the guideline. Unlike a standard, deviation from the explicit provisions of the guideline is permitted without a plan amendment, as long as the intent of a guideline is met. Deviation from the explicit provisions of a guideline, if it is meeting the intent of the guideline, must be documented in the project record. Projects that deviate from a guideline's intent must be accompanied by a plan amendment that would allow for the deviation.

Objectives are statements of measurable, anticipated results that help achieve or make progress toward desired conditions over the life of the plan. Objectives are projections based on recent trends, current and anticipated staffing levels, and anticipated budgets. Not every action the Forest Service may undertake is identified here as an objective.

Objectives may be exceeded or not fully achieved based on changes in environmental conditions, budgets, and other factors during the plan period, which may result in a need to re-evaluate plan objectives. Objectives are not decisions that authorize specific actions in specific locations; project-level planning and decisions are used to authorize specific actions in specific locations. Objectives are not targets, nor are objectives intended to be limitations on management activities. For example, an objective would not restrict the amount of treatment that can occur or the type of treatment that can be used.

Other Content

To support plan components, **management approaches** help clarify how plan direction may be applied and identify probable management actions that are designed to maintain or make progress toward desired conditions and objectives. Management approaches describe the priorities and expectations for future program coordination. Partnerships and collaborative arrangements may also be included as part of the management approaches for accomplishing desired conditions. Management approaches are strongly influenced by recent trends, past experiences, anticipated staffing levels, and short-term budgets. Decisions about what projects are actually proposed and approved, as well as details of project design, are determined by public involvement, science, and professional experience at the project or activity level.

Management Direction for the Fossil Creek Wild and Scenic River

This section provides management direction for the Fossil Creek Wild and Scenic River. While some direction applies generally across the corridor, most is organized by resource area or use. Most management direction applies both to the recreational segment and the two wild segments. When direction applies only to the wild segments or recreational segment, this is noted in **bold text**.

General Management Direction

Desired Conditions

The character and integrity of Fossil Creek and the wild and scenic river corridor associated with the Wild and Scenic Rivers Act designation are maintained, with special emphasis on the protection and enhancement of Fossil Creek's river values (free flow, water quality, and outstandingly remarkable values).

Upland and riparian areas outside of recreation sites, construction footprints, and designated roads and trails are managed to serve as relatively undisturbed habitat (refugia) for wildlife, fish, and plants. In refugia areas, the effects from visitor use are so minor as to be negligible, and there is no use of heavy machinery or development of infrastructure except as needed to maintain recreation sites and designated roads and trails.

Other uses[42] within and around the Fossil Creek WSR corridor do not adversely impact the river values and are consistent with river segment classifications.

Activities in **wild segments** are primarily nature-based and are consistent with the characteristics that merit the wild classification.

The primary emphasis of the portion of the **recreational segment** between 1/4-mile upstream of the waterfall to 1/4-mile downstream of the historic dam is protection of travertine formations, riparian and aquatic habitat, and soil productivity.

A variety of recreation opportunities are available throughout the Fossil Creek corridor. Recreation opportunities provide for a spectrum of river-related or river-dependent user experiences within the capacity of forest resources to support them. As population in the region continues to grow and new forms of recreation and/or use increases, recreational use does not adversely impact river values.

Constructed features, facilities, and management activities facilitate sustainability of recreation sites so that use of these sites does not adversely impact river values.

"Leave No Trace," "Tread Lightly," fire prevention, safe hiking practices, wildlife awareness (such as lead reduction, Be Bear Aware, Animal Inn, etc.) and archaeological resource protection principles are promoted and practiced by the visiting public.

Standards

River values shall not be degraded.

Monitoring[43] is used to determine management impacts on river values and inform implementation of the CRMP, including adaptive management actions.

Forest orders are issued as necessary to protect and enhance river values and other river-related resources and protect public health and safety.

Motorized access or development that would compromise the wild classification of the **wild segments** are not permitted in the wild segments.

Guidelines

Resource protection measures[44] should be applied where appropriate to minimize adverse effects of management activities to river values and other resources.

Management Approaches

Develop collaborative relationships with partners and local communities that create opportunities for volunteers and partners to work with the Forest Service to manage recreation, implement projects, provide conservation education programs, and conduct research and monitoring.

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[42] The Interagency Wild and Scenic Rivers Coordinating Council defines "other use" as "use within a WSR corridor other than public use, such as federally authorized mining, forestry, grazing, subsistence hunting and fishing, road use and management, administrative use for other than WSR purposes, and use on non-federal lands in a WSR corridor that have a potential to affect river values. Other use also includes any use on federal or non-federal lands that border upon or are adjacent to a WSR corridor that may substantially interfere with public use and enjoyment of river values" (IWSRCC 2018).

[43] The monitoring and adaptive management strategy is provided in Chapter 6.

[44] Relevant resource protection measures (often referred to as best management practices and mitigation measures) are listed in Appendix A of the CRMP.

Work with local law enforcement, medical, and other relevant officials to ensure safety of visitors and to improve timely emergency access where possible.

Phased development of additional parking and visitor facilities may occur at Cactus Flat, Heinrich, and Bridge, if consistent with river value protection, to support increased visitor capacity. Improvements at other recreation sites should focus on supporting use at and sustainability of those sites. New trails for hiking, bicycling, and equestrian use may be established to enhance recreational opportunities.

Free Flow, Water Quality, and Water Quantity

Desired Conditions for Free Flow, Water Quality, and Water Quantity

Fossil Creek exists in a free-flowing condition with a natural range of flows. Flows provide optimum conditions for native fish and wildlife, travertine formation and maintenance, riparian vegetation recruitment and maintenance, and human enjoyment.

Volumes and rates of spring recharge and discharge remain robust. Stream flows, including peak flows and flood events, occur within the range of natural variability and are not affected by human disturbances. Groundwater flow paths are within their natural range of variability and continue to contribute to base surface flows in Fossil Creek.

Fossil Creek's water quality maintains Arizona Department of Environmental Quality (ADEQ) standards. Water quality is protected or enhanced to conform to the creek's classification as an Outstanding Arizona Water and to protect and enhance its outstandingly remarkable values.

Standards for Free Flow, Water Quality, and Water Quantity

All proposals for water resources projects are subject to a Wild and Scenic Rivers Act Section 7 review process.[45]

Water quality shall be managed for non-degradation of ADEQ standards and to support Fossil Creek's designation as an Outstanding Arizona Water.

All public water systems on national forest system (NFS) lands that use groundwater shall comply with the Environmental Protection Agency's groundwater rules. Proposed wells on NFS lands or that transport groundwater across NFS lands within the river corridor shall comply with regional and national groundwater policy.

Guidelines for Free Flow, Water Quality, and Water Quantity

Ecological processes and biodiversity of groundwater-dependent ecosystems should be protected. Adverse impacts to groundwater-dependent ecosystems should be minimized by (1) maintaining natural patterns of recharge and discharge and minimizing disruption to groundwater levels that are critical for ecosystems; (2) not polluting or causing significant changes in groundwater quality; and (3) rehabilitating degraded groundwater systems where possible. Preferential consideration should be given to groundwater-dependent resources when conflicts among land use activities occur.

Maintenance or modification of existing structures (e.g. the permanent fish barrier, gabion, and abutments of the Fossil Creek Bridge) should preserve or improve their integrity and function to protect river values. Temporary impediments to free flow, such as temporary fish barriers, should remain within the ordinary high water mark for as short a time as possible to minimize impacts to free-flow of the river.

[45] More guidance on the Section 7 determination process can be found in the Interagency Wild and Scenic Rivers Coordinating Council technical report *Wild & Scenic Rivers Act: Section 7* (IWSRCC 2004).

Sanitary and trash facilities should be provided or other strategies should be used, where needed, to minimize impacts from human waste and trash and to protect Fossil Creek's water quality.

Objectives for Free Flow, Water Quality, and Water Quantity

Quantify stream flows needed to protect Fossil Creek's outstandingly remarkable values and claim a federal reserved water right to protect these flows within five years of plan approval.

Block and rehabilitate trails leading to Switchback Spring within five years of plan approval.

Management Approaches for Free Flow and Water Quality

Continue to measure and record Fossil Creek's stream flow.

Secure a federal reserved water right for stream flows needed to protect Fossil Creek's outstandingly remarkable values.

Claim water rights on springs within the Fossil Creek corridor, with priority given to springs that support populations of Fossil springsnails and other sensitive wildlife species.

Seek opportunities to restore the structure and function of springs and seeps that support populations of Fossil springsnails and other sensitive wildlife species as needed.

Coordinate with ADEQ to assess, monitor, and adjust (as needed) management actions in order to meet state water quality standards.

Develop working relationships with local and state agencies with jurisdiction related to zoning of private property and/or use of groundwater and surface water.

Provide input to local and/or state planning processes that may impact Fossil Creek's water quantity, such as groundwater development to supply water to local communities.

Protect stream access by developing recreation sites and a sustainable trail system using appropriate best management practices (BMPs); in particular, designate armored (bedrock or extremely rocky surfaces) stream access points.

Increase vegetation canopy and soil litter by rehabilitating disturbed or denuded areas where recreational infrastructure, including unauthorized trails, campsites, parking lots, day use areas, and forest and spur roads, are not needed. Allow denuded areas located in stream floodplains or with sensitive resource concerns that could be negatively affected by rehabilitation activities to recover naturally.

Riparian Function

Desired Conditions for Riparian Function

Riparian areas and associated stream courses, wetlands, and springs in the Fossil Creek corridor are functioning properly or making improvements toward proper function and are resilient to natural disturbances and changing climate conditions.

Stream bank stability and sedimentation levels fluctuate within natural range of variability and unplanned impacts from human use are rehabilitated.

Stream channel and bank stability are supported by native herbaceous species cover within the site's capability.

Road and trail crossings and other recreation impacts are minimized in springs, seeps, and wetlands. Where the existence of trails and roads over these areas is unavoidable, springs, seeps, and wetlands and their surrounding soil and vegetation are protected and function naturally.

Standards for Riparian Function

An aquatic management zone (AMZ) is established 100 feet from either edge of the perennial portion of Fossil Creek.

An AMZ is established 100 feet from either edge of intermittent stream reaches (including the intermittent portion of Fossil Creek and Sally May and Boulder washes).

Guidelines for Riparian Function

To minimize effects to riparian function, management practices within the AMZ should be planned and implemented in a manner that protects water quality, aquatic wildlife, and terrestrial and aquatic habitats.

Erosion and impaired conditions (loss of vegetation, reduced plant vigor, and impaired soils) should be reduced by removing trails from wetted soils and reducing trailing on fine, erosive soils.

Management activities and educational efforts should minimize human-caused damage to riparian trees, shrubs, herbaceous cover, and protective soil litter that may occur through trampling, rope swing construction, shelter construction, and “dead and down” and live wood collection.

Management Approaches for Riparian Function

Determine riparian function using the best available technique to assure the measureable indicators of riparian function are maintaining or making progress toward desired conditions.

Through coordination with other disciplines, restore or maintain riparian vegetation along Fossil Creek for moderating water temperature, protecting bank stability, and other important functions. Where necessary, investigate and implement cost-effective biological remediation measures to control channel erosion.

Vegetation

Desired Conditions for Vegetation

A broad diversity of native plants representing all plant groups (bryophytes, ferns and their allies, and seed plants, including grasses and other monocots, forbs, vines, shrubs, and trees) is present within site capability. Native vegetation is able to naturally reproduce. Special-status species, endemic species, and species of interest persist where suitable habitat occurs and are not negatively impacted by human activities.

The composition of native vegetation species reflects potential as defined by the Terrestrial Ecological Unit Inventory or best available information. The density and vertical and horizontal canopy cover of native woody riparian tree species increases where not already at potential capability.

Riparian vegetation is at reference conditions for structure and species composition. Outside of recreation sites or creek access areas, vegetation is not trampled and human impacts to seedling and sapling riparian woody species are minimal.

Upland and riparian vegetation prevents accelerated soil erosion and sedimentation into downstream aquatic habitat. Vegetation within the AMZ serves as a natural filter to keep sediment out of the stream, reduce soil erosion, and buffer the stream from damage.

Mesquite bosque stands support productive and diverse understory conditions and remain intact and undeveloped.

Evergreen or live oaks (species known to be present are Emory oak, *Quercus emoryi*; Palmer oak, *Quercus palmeri*; and netleaf oak, *Quercus rugosa*) occur in shrub or tree forms where conditions allow and are sustainable across the landscape. Large live oak trees provide food, roosts, and hibernation sites for wildlife and contribute to culturally important settings.

Invasive plants rarely occur in the Fossil Creek corridor, and where they exist their populations are declining or limited to regularly disturbed areas.

Guidelines for Vegetation

Stream vegetative cover should be managed toward potential natural vegetation outside of recreation sites, as defined by the Terrestrial Ecological Unit Inventory or best available information.

Existing invasive plant species targeted for removal should include, but are not limited to, tamarisk (*Tamarix chinensis*), giant reed (*Arundo donax*), and Himalayan blackberry (*Rubus armeniacus*).

Objectives for Vegetation

Obtain baseline inventory of plant species in Fossil Creek within 10 years of plan approval. When possible, obtain vouchers (or duplicates) through collection efforts and ensure they are curated in Forest Service Herbariums (either Tonto Herbarium or Coconino Herbarium).

Management Approaches for Vegetation

Encourage tree savers[46] for hammock use.

Increase collaboration among botanists, biologists, and ecologists experienced in Arizona/Southwest floristics, rare and invasive plants, and plant systematics in order to better document the flora within the corridor; population status of the special status species, endemic species, and species of interest, including possible new, previously unknown cryptic species that may be detected through further investigation; and to better understand plants and their role in the ecology of Fossil Creek.

Soil Condition

Desired Conditions for Soil Condition

Soil conditions in the Fossil Creek corridor support ecological function. Human-created bare areas outside of recreation sites are minimal, particularly in the AMZ and on connected upper stream terraces.

Guidelines for Soil Condition

Erosion, sedimentation into Fossil Creek, impacts to soil productivity, or other adverse impacts originating in recreation sites, roads, or trails should be mitigated through the use of BMPs, site re-design, or restoration.

If denuded or compacted areas are detected outside of recreation sites, designated trails, or roads, these areas should be evaluated for restoration, with priority given to areas that are hydrologically connected to Fossil Creek.

Geology

Desired Conditions for Geology

Formation of travertine dams and other natural travertine features occurs at varying rates, patterns, and locations consistent with Fossil Creek's natural free flow, water quality, and water quantity.

In the travertine-dominated reaches of Fossil Creek, the deposition of travertine impounds sediments and forms terraces or dams that support a variety of submergent, floating, emergent, herbaceous, and shrubby habitat components. The presence of travertine increases the diversity of pools, riffles, glides, runs and backwaters, all of which provide an array of habitats for numerous plant, wildlife and fish species.

[46] Tree savers are straps that go around trees to minimize hammock damage to the tree bark and cambium.

Travertine formations in areas with creek access recover during the lower visitor use periods if impacts to these formations have occurred.

Guidelines for Geology

Management activities and recreational use should limit disturbance to the relict and contemporary travertine deposits in the corridor. Recreation sites and armored creek access points should be located to limit physical disturbance of travertine and sediment inputs that affect travertine deposition rates.

Management Approaches for Geology

Collaborate with recreational user groups, particularly boaters, for stewardship, protection, user community learning, and site design planning in order to protect travertine formations and deposition.

Encourage research, including long-term studies of travertine dam formation and recreation management, to provide a basis for determining whether human disturbances are influencing travertine deposition.

Wildlife, Fish and Aquatic Species

Desired Conditions for All Wildlife, Fish, and Aquatic Species

Wildlife, fish, and aquatic species are diverse and abundant, and populations are viable where suitable habitat exists. Native wildlife, particularly special-status species, demonstrate high reproductive success rates.

Refugia from human-caused disturbance are abundant and accessible to wildlife, fish, and aquatic species.

Diminished populations of native species remain stable or increase over time to ensure population viability.

Habitat conditions contribute to the survival and recovery of listed species, allow for repatriation of extirpated species, contribute to the delisting of species under the Endangered Species Act, and contribute to keeping common native species common.

The status of special-status species is improving, contributing to recovery of these species. Special-status species populations are not adversely affected by land use or land management activities.

In Middle Fossil, stretches of relatively undisturbed habitat exist outside of recreation sites. These less-disturbed areas provide aquatic and riparian obligatory terrestrial species refugia from human disturbance. Unauthorized trails and other denuded areas do not become established between recreation sites.

Information about the consequences of introduction and spread of non-natives (plants, fish, crayfish, mussels, and diseases) is available to visitors and visitors take measures to inspect, remove, and clean equipment before entering Fossil Creek to prevent spread of exotic species. New invasive exotic species are prevented from being introduced or established in the Fossil Creek corridor through public education, signage, and law enforcement.

Known invasive species are contained, their spread is controlled, and populations are declining. Species that are the most invasive and pose the greatest threat to biological diversity, forest health, and watershed condition are eradicated. Natural population dynamics and predator-prey relationships previously damaged by non-native species are re-established, such as between native leopard frogs, garter snakes, and fish.

Desired Conditions for Wildlife

Baseline conditions for major wildlife taxa (reptiles, amphibians, mammals, birds, and terrestrial invertebrates) are known.

Pollinators are diverse in Fossil Creek and food plants, larval host plants, nesting sites, and over-wintering sites are available throughout the river corridor. Fossil Creek serves as a nectar corridor connecting the Verde River corridor to the Mogollon Rim.

Human activities do not result in common black-hawk nest site abandonment. No detections of nesting mortalities or nest failures attributed to human influences occur. Black-hawks continue to have high nesting success. Native prey constitutes the majority of black-hawks' diets.

Lowland leopard frogs colonize suitable habitat,[47] and population numbers reflect site potential. Non-native species or human activities do not contribute to population declines.

A diverse assemblage of bats is present in healthy populations, and a diversity of roosting structure is present. Disturbance of bat roosts within the river corridor is minimal.

Populations of predators (jays, ravens, grackles, skunks, ringtails), nest parasites (cowbirds), and nuisance wildlife (skunks, rodents, squirrels, and ants) do not increase as a result of garbage or human food.

Desired Conditions for Fish and Aquatic Invertebrates

Fossil Creek supports a diverse assemblage of native fish and aquatic invertebrates. Species and population abundances reflect the diversity, quantity, quality, and capability of habitats in the Fossil Creek corridor.

In the **recreational segment**, stretches of relatively undisturbed aquatic habitat (refugia) exist between recreation sites. These refugia represent all types of habitat present in Fossil Creek and support the ability of native fish to successfully survive and reproduce.

Baseline conditions for fish taxa, especially imperiled taxa, are known.

New and existing instream water rights are procured or maintained to ensure enough water is available to provide for habitat needs of special-status aquatic species.

Human-caused sources of sediment input to Fossil Creek are minimized. Sediment and ash delivery to Fossil Creek resulting from wildfire is rare.

Re-introduced populations of native fish species are self-sustaining and future re-introductions of native fish and other native species support population viability.

Non-native fish are absent in Fossil Creek above the permanent fish barrier.

Fossil Creek supports an abundant and diverse aquatic macroinvertebrate community and rare species are present within the ecosystem's capability.

State fishing rules and regulations are enforced in Fossil Creek.

Standards for Wildlife, Fish, and Aquatic Species

When invasive non-native fish are detected upstream of the permanent fish barrier, efforts shall occur to contain and eliminate the non-native fish.

To prevent the introduction and spread of terrestrial or aquatic pathogens or invasive plants and animals, approved methods shall be followed to decontaminate equipment (such as machinery, monitoring equipment, or footwear) that will come into contact with water or wetted soils in the Fossil Creek corridor.

Guidelines for Wildlife, Fish, and Aquatic Species

To minimize noise and disturbance that may result in nest abandonment or hinder reproductive success, road maintenance and other non-emergency construction and maintenance activities such as power or transmission line

[47] From Irving to the permanent fish barrier, crayfish are present and likely contribute to lowland leopard frogs not colonizing that section. From the permanent fish barrier downstream to the confluence with the Verde River, it is unlikely lowland leopard frogs will become established and persist due to the presence of non-native fish and crayfish.

vegetation maintenance involving loud heavy machinery or other loud activities (such as blasting) should occur only between September 1 and March 14 to avoid the breeding season for special status nesting bird species. Refer to Appendix A for sound levels for equipment and activities. Activities in the high, very high, and extremely high range should not occur during the breeding season (March 15 through August 31).

To minimize abandonment of occupied black-hawk nests sites, a 300-yard buffer around occupied nests should be largely free from visual and aural disturbance during the breeding season (March 15-August 30).

Seasonal closures, such as of trails, roads, or portions of Fossil Creek, should be implemented as needed in order to protect rare wildlife species during critical seasons.

To limit effects to Fossil springsnail populations, known springsnail sites should be protected from human-caused disturbance.

To maintain or augment Fossil springsnail populations, springs interrupted by man-made features such as roads should be restored to the furthest extent possible and should be made compatible with Fossil springsnail survival, if springsnails are found to be present at the location of such features.

Visitation to cliff dwellings, caves, and tunnels should be discouraged to reduce disturbance to roosting bats.

To limit and eradicate invasive species populations, treatment of known populations of highly invasive non-native terrestrial and aquatic species in the Fossil Creek corridor should continue.

The existing fish barrier should be inspected at least once a year (preferably in the fall) to ensure proper function at both base and elevated flows.

Recreation sites and new facilities within mesquite bosques should be limited to prevent habitat fragmentation for Bell’s vireo, yellow-billed cuckoo, and other bosque-dependent species.

To promote refugia between recreation sites, human use outside of recreation sites, roads, and trails within the riparian area should be discouraged through natural barriers, revegetation, signage, or other actions anticipated to be effective.

Species recovery actions should be implemented for species with approved recovery plans or conservation strategies.

To augment or establish populations of native species where suitable habitat exists, re-introductions of extirpated native species should occur when scientifically supported and re-introductions are likely to be successful.

Objectives for Wildlife, Fish, and Aquatic Species

Obtain baseline inventory of the major wildlife taxa (reptiles, amphibians, mammals, birds, and terrestrial invertebrates) in Fossil Creek within 10 years of plan approval.

Obtain baseline inventory of aquatic invertebrate taxa (including IBI or a similar measure) with at least three surveys within 10 years of plan approval.

Management Approaches for Wildlife, Fish, and Aquatic Species

Cooperatively manage the native fishery through existing policy and agreements between the Forest Service and Arizona Game and Fish Department.

Continue cooperation with entities such as U.S. Fish and Wildlife Service, Arizona Game and Fish Department, Bureau of Reclamation, and academia to monitor species populations and habitat, identify threats, and propose adaptive management actions necessary to alleviate threats.

If invasive non-native fish are discovered in the stream above the fish barrier, collaborate with Arizona Game and Fish Department, U.S Fish and Wildlife Service, Bureau of Reclamation, and other agencies to remove the non-native fish using timely means appropriate to the situation. This may include a rapid response using mechanical methods for isolated, small non-native populations up to a temporary barrier with piscicide treatments for larger populations of non-native fish.

Coordinate with search and rescue agencies to record the frequency and location of emergency helicopter landings in the Fossil Creek corridor. Compare landing locations to black-hawk nest sites in order to track whether emergency landings result in changes to black-hawk occupancy and/or nest success.

Through collaborative efforts with Arizona Game and Fish Department and the U.S. Fish and Wildlife Service, track re-routed flows at Irving spring, conduct surveys for Fossil springsnails in wetted areas, and evaluate opportunities to restore or create habitat for springsnails.

Construct temporary fish barriers as needed to contain non-native fish. Treatment may include various methods such as use of piscicides or mechanical removal.

Restore denuded areas such as unauthorized roads, trails, campsites, and pullouts that have been created outside of recreation sites. Prioritize areas in the AMZ, especially denuded areas that have hydrologic connectivity with Fossil Creek. Obliterate unauthorized trails to cliff dwellings, caves, and tunnels in order to reduce disturbance to roosting bats (and archeological sites).

Traditional Cultural Practices

"The Tribe through the Elders Council has developed Four Traditional Guiding Principles used to manage our Tribal lands. The principles are based on Tribal Ecological Knowledge built from a local knowledge base through experience and observation from our Elders:

*"**Respect all aspects of the natural world.** The base of traditional Apache culture is maintaining strong and healthy relationships with all of the elements of the natural world; with one's friends, relatives, and community; and with one's self. This requires an in-depth ecological education, whether traditional, Anglo-European, or both.*

*"**All activities must ensure the long-term health of the natural world.** The traditional guidelines governing land-management practices – such as agriculture, hunting, wild food and natural resource harvesting, and obtaining water for drinking and irrigation – emphasize minimizing impacts on the natural world, and preserving the most natural state of the land as possible. This includes, above all, ensuring the long-term health of all natural resources. In our view, we must resolve to utilize and profit from natural resources without harming them.*

*"**All activities must benefit the entire community.** We all belong to the land. All activities impact the natural world, and affect us all. We must ensure that our activities are for the benefit of all, by working openly together as a community.*

*"**Economic activities must be broad-based and varied.** Apaches have survived all kinds of extremes, both environmental and economic, by depending on a multitude of economic endeavors – even when neighbors have perished. Traditional culture emphasizes distributing economic sustenance over a broad range of practices - such as agriculture, hunting and gathering, and trading - rather than emphasizing just one. This creates a healthy buffer to environmental and economic crises."* – San Carlos Apache Tribe.[48]

[48] Letter from San Carlos Apache Tribe to Coconino National Forest, April 29, 2019

Desired Conditions for Traditional Cultural Practices

The corridor looks, sounds, and feels as natural and untrammeled as possible, while allowing for some concentrated recreational use and continued use of existing infrastructure at compatible locations along Middle Fossil and limited backcountry recreational use focused around the creek and adjacent banks. Trash and human waste are uncommon in the environment and do not impact the perceived traditional cultural value of sites. Use outside of recreation sites, particularly outside of the active flood channel where site density is higher, is uncommon. Overstory vegetation grows in a natural state (mesquite trees are not heavily trimmed, for instance).

To avoid cultural resource impacts, recreation use is limited to established recreation sites, system trails, and sustainable creek access areas.

Heritage resource sites remain unaffected by visitation.

The river corridor upstream and downstream of Middle Fossil appear in a natural, unmodified condition without evidence of non-system trails, human-caused denuded areas, or other evidence of recreational use.

Traditional practitioners have access to areas that provide an opportunity to practice traditional activities, such as plant gathering and ceremonies that are essential to maintaining their cultural identity and the continuity of their culture, with reasonable limitations consistent with resource protection, public safety and multiple uses by other forest users.

Forest products used for traditional practices continue to be available. Collection of culturally important plants does not negatively affect the presence and distribution of those species on the forest.

Traditional practitioners have a suitable area (such as Homestead) available for ceremonial use when requested, and access for traditional activities continues to be protected throughout the corridor. Privacy of traditional practitioners is protected through temporary or limited area closures for ceremonial uses. Traditional practitioners do not feel crowded, except possibly at developed recreation sites.

Fossil Creek provides a setting for the education of tribal youth in culture, history, and land stewardship and for the exchange of information between tribal elders and youth.

Guidelines for Traditional Cultural Practices

To maintain a corridor that looks, sounds, and feels as natural and untrammeled as possible, only infrastructure that helps protect and enhance river values should be constructed.

Visitation to traditional cultural sites that correlate with prehistoric and/or protohistoric activities should not result in visible changes to the site surface, such as the establishment of new trails. Direct and indirect recreational impacts to archaeological resources related to the cultural values ORV should not diminish the information potential of the resources. Soil is retained in place within site boundaries so that surface artifacts are not transported by runoff and the integrity of archaeological deposits is preserved.

Recreational access to cliffs and caves in the uplands should be restricted if necessary to protect heritage resources.

Management Approaches for Traditional Cultural Practices

Maintain open and regular communication with tribes regarding the perceived condition of traditional sites.

Develop interpretation in partnership with tribes that conveys the cultural significance of Fossil Creek to visitors and fosters a public interest in cultural resource preservation.

If recreational use near traditional sites becomes a concern of tribes, improve interpretation to encourage responsible recreational use in sensitive areas, increase management presence, support additional tribal presence

through volunteerism or partnerships, or consider adjusting the amount, duration, or type of the recreational use occurring near sites where this concern exists.

Heritage Resources

Desired Conditions for Heritage Resources

Prehistoric, historic, and traditional/sacred places are protected and preserved. Consultation with affiliated tribes continues.

Subsurface archaeological deposits remain intact and aspects of integrity (location, design, setting, materials, workmanship, feeling, and association) are not degraded. Soils within site boundaries are stable and retained in place. Movement and/or loss of artifacts due to unauthorized collection, which affects site integrity, does not take place. No vandalism of cultural resources occurs.

Guidelines for Heritage Resources

Recreation, fire, and other management activities and permitted uses in the Fossil Creek corridor should employ techniques that minimize ground disturbance because of the high density of historic, prehistoric, and traditional/sacred sites.

Management Approaches for Heritage Resources

Continue consultation with the Yavapai-Apache Nation and other interested tribes to inform ongoing management of the Fossil Creek corridor.

Focus conservation and preservation efforts on sites susceptible to imminent risks or threats, or where elements are rare or unique.

Enhance heritage resources through research and partnerships. Encourage partnerships with tribal communities, volunteers, museums, and universities for documenting, preserving, interpreting, and managing sites and to evaluate and develop creative management opportunities.

Recreation

Desired Conditions for Recreation

Diverse visitors, including family groups, have opportunities to engage in a variety of wild and scenic river-dependent recreation activities. Abundant opportunities exist to view, learn about and appreciate the river values of Fossil Creek. A mixture of unstructured and managed recreation opportunities exists that is compatible with protection of river values.

The spatial and temporal distribution of visitors within the Fossil Creek corridor is consistent with the capacity of the river corridor.

Hunting and fishing opportunities are available in coordination with Arizona Game and Fish Department and do not conflict with resource protection and recreation management needs.

Most visitors are satisfied with their recreation experience. Visitors normally do not experience a sense of crowding or congestion, and do not encounter a lack of recreation opportunities. Infrastructure exists that supports the permitted number of visitors and adds to visitor satisfaction.

Wilderness character is preserved or enhanced in the two **wild segments**. These areas provide a high-quality wilderness recreational experience with outstanding opportunities for solitude, primitive and unconfined recreation, physical and mental challenge, and inspiration.

Interpretation and education support visitor understanding and appreciation of Fossil Creek's river values and stewardship of the land.

Standards for Recreation

Capacities for visitor uses are consistent with protection and enhancement of river values.

Group size in the **wild segments** is limited to 12 persons.

Toilets and developed camping shall be located outside of the 100-year floodplain and AMZ and away from Fossil springsnail habitat.

Dispersed campsites shall be located outside of the AMZ, except for backcountry camping where topography is limiting. Dispersed camping sites shall be located away from Fossil springsnail habitat.

Trails within the riparian area that parallel Fossil Creek and connect recreation sites shall not be constructed or adopted. The established Dixon Lewis (Waterfall) Trail is an exception.

No new trails shall be constructed to or across springs within the Fossil Creek corridor.

Except in designated locations and for emergency, permitted, or administrative use, parking is prohibited throughout the river corridor and in the vicinity of trailheads.

Motorized and mechanized vehicles, such as mountain bikes, shall remain on designated roads and trails, where such uses are authorized.

Motorized watercraft are prohibited within the Fossil Creek corridor.

Discharging a firearm is prohibited within the Fossil Creek corridor except as part of a legal hunting activity.

Campfires, stove fires, and charcoal fires (with the exception of pressurized liquid or gas burners) are prohibited within the Fossil Creek corridor and Stehr Lake, except for tribal use.

Glass containers are prohibited within the Fossil Creek corridor.

Rope swings are prohibited within the Fossil Creek corridor.

Public motor vehicle travel on the 4-mile section of Forest Road 708 between the canyon rim east of Strawberry and the gate near the Dixon Lewis (Waterfall) trailhead is prohibited until road repair is complete and public motor vehicle use on this section of road can be managed for protection of river values.

Off-road motor vehicle use is prohibited.

Guidelines for Recreation

Promote, serve, and retain diversity in users, including by providing information and signage in multiple languages.

Manage portions of the corridor to provide a more remote, backcountry experience. In these areas, social encounters and evidence of human use should be more consistent with a primitive ROS setting. This guideline applies to the full **wild segments** and the **recreational segment** between 1/4-mile upstream of the waterfall to 1/4-mile downstream of the historic dam.

Within refugia areas, recreational use should be dispersed and of low intensity so that the refugia characteristics are not noticeably impacted.

Boating should be managed in a way that limits damage to travertine formations in the river corridor in the reach between 1/4-mile upstream of the waterfall to 1/4-mile downstream of the historic dam.

Recreation should be managed in a way that avoids known and potential Fossil springsnail sites.

To allow recreational opportunities in the river corridor while limiting possible adverse impacts to river values, camping in Middle Fossil and at trailheads within the recreational segment should be allowed in designated areas only once designated areas are established, except for special events authorized on a case-by-case basis.

To provide for unique recreational opportunities while minimizing potential effects to riparian vegetation, water quality, and other wildlife and botanical resources, camping in the Fossil Springs area should be allowed only at designated sites once designated sites are established.

To provide for unique recreational opportunities in a more primitive setting, dispersed camping should be allowed in the **wild segments**, beginning 1/4-mile upstream of the Bob Bear Trail (previously Fossil Springs Trail) in the Fossil Springs wild segment and 1/4-mile downstream of the Mazatzal recreation site in the Mazatzal wild segment.

Instead of building new trails, existing trails should be considered for designation where compatible with river management objectives and sustainable trail design principles can be achieved. Designated trails should be stabilized using BMPs and/or constructing adequate drainage away from stream courses and into adjacent vegetation filter strips.

To minimize effects to soils and water quality, designated trails should be primarily located on soils with low erosion hazard, outside of the AMZ, and away from areas with special-status species concerns and heritage resources. Where they occur within the AMZ or terminate in the Fossil Creek floodplain, designated trails should be designed to terminate in armored areas and to incorporate stabilized tread or other appropriate features.

To minimize the establishment of unauthorized trails, creek access paths from parking areas and designated trails should be delineated and signed to direct visitors to areas along Fossil Creek resistant to recreational impacts.

To minimize effects to soils and water quality, unauthorized trails should be eliminated and rehabilitated, with priority placed on those that lead to denuded and compacted riparian areas or are hydrologically connected to Fossil Creek.

To minimize effects to water quality in springs and Fossil springsnails, no trails should be constructed or adopted that access upland springs.

When access or exclusive use for tribal ceremonial purposes is requested, public access should be managed or limited to areas important to the ceremonial activities.

To minimize noise and disturbance to wildlife and maintain a natural sounding and feeling environment for a unique recreational experience, no helicopter landings should occur in the corridor except for emergency and limited administrative purposes.

To minimize noise and disturbance to wildlife and maintain a natural sounding and feeling environment for a unique recreational experience, use of generators or other loud equipment should be discouraged within the river corridor except as needed for administrative purposes, particularly during the high-use season.

Temporary closures of trails or portions of Fossil Creek should be used to protect resources and public safety when hazardous conditions such as extreme heat or fire danger or wet weather are present.

Objectives for Recreation

Issue forest orders to facilitate implementation and enforcement of the standards for recreation within one year of plan approval.

Management Approaches for Recreation

Develop a recreation site plan that promotes consistent site design that is compatible with Fossil Creek's unique character, enhances visitor experience, and promotes protection of river values.

Determine and implement recreation fees[49] to support management activities such as facility maintenance and operation, staffing, restoration, parking and road maintenance, monitoring, and interpretive programming in the river corridor.

Use educational messaging, management presence, and the design and distribution of roads, trails, and recreation sites to enhance river value protection and the recreational experience.

Encourage visitors to take responsibility for their actions by picking up trash, using restrooms, and parking and recreating in established recreation sites.

If needed to manage visitor capacity, managed entry (such as a permit system[50]) may be used to restrict visitor access to the Fossil Creek corridor. When used, the duration of (whether limited to a portion of the year, certain days, or in place year-round) or locations subject to (whether in place corridor-wide or for specific sites) managed entry may be adjusted to accommodate changing resource protection or management needs.

Promote equal opportunities for all segments of the population, including youth and underrepresented groups, to recreate at and experience Fossil Creek. Tools may include, but are not limited to, making in-person or reduced cost/free permits available when permits are used and outreach to underrepresented communities.

Work with partners to overcome cultural, administrative, and financial barriers that impair equal opportunity to experience Fossil Creek.

Concentrate recreational use at designated recreation sites through site design, signage, and education.

Limit boating impacts to travertine features through education, partnerships, and collaborative site design.

Use an alert system, such as portable signs, phone hotline, social media, and internet messages, to provide visitors information on capacities, closures, and safety.

Recreation/Lands Special Uses

Background

Special use permits authorize a variety of activities on National Forest System lands and can be divided into two broad categories: recreation and lands. Recreation special use permits authorize activities that support the Forest Service mission and meet the recreational needs of the public. These permits are a partnership between the Forest Service and private businesses to provide services such as guided activities and recreational events. Land special uses include authorizations associated with utility lines, road use, research, water resources, and related access.

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[49] Recreations fees here refer to fees beyond the service fee charged to reserve a Fossil Creek permit through Recreation.gov (as of 2020, this service fee is $6).

[50] The term "permit system" is used to describe a system of managed entry in which visitors are required to obtain a permit to access Fossil Creek. Generally speaking, permits for access to an area may be reserved ahead of time and/or may be available on-site or at another physical location, depending on management capacity, technological means, and local considerations. Currently, permits for Fossil Creek are available by reservation only. This is because technological limitations (specifically network connectivity), limited management capacity, and the remoteness of Fossil Creek preclude providing permits on-site or at another physical location. However, this CRMP encourages enhancement of the Fossil Creek permit system by implementing options for obtaining permits that do not require an advance reservation if existing limitations are overcome.

Desired Conditions for Recreation/Lands Special Uses

Recreation special use activities support protection and enhancement of river values (such as by providing a wild and scenic rivers-related educational component or services that reduce visitor impacts) and are compatible with the access and enjoyment of other visitors to Fossil Creek.

Existing utility infrastructure provides for public services and meets utility requirements for safe and reliable operations while minimizing visual impacts in the WSR corridor. Access to maintain and repair existing utilities is available.

Standards for Recreation/Lands Special Uses

Commercial filming/photography shall be limited and approved on a case-by-case basis.

Commercial filming/photography in the **wild segments** shall be consistent with Forest Service Wilderness filming policy.

Commercial recreation events within the **recreational segment** and Middle Fossil are prohibited during the high-use season and are limited during the remainder of the year and approved on a case-by-case basis. Commercial recreation events are prohibited in the **wild segments** outside of Middle Fossil year-round.

Authorizations for management of power lines and utilities shall comply with federal avian (raptor) protection guidelines.

Guidelines for Recreation/Lands Special Uses

Recreation special use permit holders should provide an educational component to their programs in Fossil Creek so clients understand the value of wild and scenic rivers and become familiar with Fossil Creek's river values.

Commercial filming/photography within the corridor should have the primary objective of disseminating information about wild and scenic rivers, river values, or other features of scientific, educational, or historical/cultural value.

Research related to wild and scenic rivers, river values, and other unique aspects of Fossil Creek should be authorized where it can further scientific knowledge or information relevant to land management goals.

To maintain scenic values, equipment used by permit holders should coincide with scenery objectives.

Group size limits should be determined based on available facilities and protection of river values.

No new communication sites should be authorized within the Fossil Creek corridor.

No new aerial utilities should be constructed within the Fossil Creek corridor.

Existing utility corridor rights-of-way within the Fossil Creek corridor should not be widened.

Management of utility corridors within the Fossil Creek corridor, such access and vegetation removal, should be performed in such a way that minimizes impacts to visitors, wildlife, and soils.

To limit effects to visitors, wildlife, scenery, and soils over the long-term, infrastructure and equipment related to research activities should be removed upon completion of data collection. Impacts from research activities should be fully restored to pre-research conditions once research is completed.

Research activities should not interfere with recreation management, opportunities, or access.

Research activities in the **wild segments** should be consistent with Wilderness values and policies.

To limit effects to visitors, wildlife, scenery, and soils while still providing for traditional cultural practices, removal of mineral materials from within the Fossil Creek corridor should be prohibited. Free-use permits for collection of minor amounts of rock and mineral materials may be issued to tribal members for ceremonial purposes.

Objectives for Recreation/Lands Special Uses

Work with the Bureau of Land Management to pursue locatable mineral withdrawal of the **recreational segment**[51] of the Fossil Creek corridor within 10 years of plan approval.

Management Approach for Recreation/Lands Special Uses

Determine the suitability of future commercial services (outfitters, guides, and concessionaires) and complete an outfitter-guide needs assessment. Authorize future commercial services based on the need for services and the ability of such services to protect or enhance river values.

Use recreation special use permits to facilitate resource protection, provide livery services to address parking issues, and improve public safety.

Support research and monitoring with citizen science projects and other efforts.

Roads and Facilities

Desired Conditions for Roads and Facilities

The arrangement and amount of roads and facilities in the Fossil Creek corridor contribute to protection and enhancement of river values.

Roads and parking areas possess adequate drainage and/or water retention features so as not to deliver excessive sediment and water into connected stream courses.

Unauthorized roads are not present in the Fossil Creek corridor.

Developed facilities, such as parking areas, welcome sites, signs, kiosks, and toilets promote a sense of place and embody a rustic appearance where feasible. Facilities promote use by a diverse array of visitors through accessibility features.

Standards for Roads and Facilities

Construction and maintenance activities in the Fossil Creek corridor shall implement BMPs and develop design features to minimize resource impacts.

Where possible given site-specific environmental constraints, all developed recreation sites shall be designed to meet accessibility requirements of the Forest Service Outdoor Recreation Accessibility Guidelines and Forest Service Trail Accessibility Guide, or similar current guidance.

Guidelines for Roads and Facilities

No new system roads should be constructed in the Fossil Creek corridor unless needed to access recreation sites, for authorized special uses, or administrative needs to protect river values.

To maintain and improve water quality, unauthorized roads in the Fossil Creek corridor should be obliterated, with priority given to roads that are hydrologically connected to streamcourses or springs.

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[51] The wild segments of the Fossil Creek WSR corridor are automatically withdrawn from mineral entry through designation under the Wild and Scenic Rivers Act.

To minimize effects to soils, vegetation, and scenery, parking lots should be designed with features to prevent overflow parking outside of designated spots.

All facilities and roads should minimize disturbance to springs and seeps.

To protect riparian vegetation and water quality and promote public safety, all facilities except signs, designated trails, and other minor improvements should be located outside of the AMZ.

Toilets should be provided to manage human waste in order to prevent water quality impacts.

To protect wildlife and minimize human-wildlife conflicts, trash receptacles should be located and designed to prevent attracting predators, nest parasites, and nuisance wildlife.

Recreation infrastructure, such as parking and campsites, should be located outside of areas with special-status species concerns or heritage resources.

Scenery

Desired Conditions for Scenery

A diversity of scenic viewing opportunities is present, where views are mostly of natural-appearing, undeveloped river and canyon settings with a few places where well-designed facilities are incorporated into the natural environment. Fish, wildlife, birds, and a diverse assemblage of native vegetation enhance scenic quality. Unique features such as the scarp of the Mogollon Rim and the travertine in formations are preserved.

The Wild and Scenic River corridor has natural-appearing scenery that promotes a unique sense of place and rustic appearance. Visitors enjoy the riverine landscape, including clear, blue-green water and travertine formations and healthy streamside vegetation in the canyon bottom and contrasting desert scrub and pinyon juniper vegetation as elevation increases.

Recreation settings and forest resources are free from human litter, graffiti and vandalism. Recreation use occurs at designated locations and on designated trails/paths. Unwanted user-created campsites, parking pullouts, and trails are rehabilitated. Where the potential exists, vegetation and woody debris stabilize and protect banks, edges, and shorelines of riparian areas from disturbances.

The Fossil Creek corridor is characterized by high or very high scenic integrity objectives. Visitors experience a high quality scenic landscape as seen from areas such as the Fossil Creek corridor, FR 502 and 708, and developed recreation sites and trails. One of the main attractions of this area is the natural beauty and opportunity to experience nature. Vistas to the creek are managed for high scenic quality. Native vegetation buffers are used to soften views of developed recreation areas and minimize view of development from the river corridor or roadway to the extent possible.

Invasive species are not a noticeable component of the landscape.

Communication sites and utilities are not visible from recreation sites and trails within the corridor, where possible.

Guidelines for Scenery

New projects should be assessed for scenic quality impacts and be consistent with high or very high scenic integrity objectives.

Facilities should incorporate natural materials when possible and be designed to blend with the natural environment while providing critical cues to visitors. If human-made materials are used, they should use color, form, texture and scale appropriate to Fossil Creek with a rustic natural design theme. Buildings and structures should be designed to be subordinate to the surrounding landscape with an emphasis on non-obtrusive design.

Design guidelines should be developed to guide consistent design sensitive to the valued sense of place and unique character of the corridor by defining unifying architectural themes, elements and palettes for use within the corridor. Scale and context should guide development with an emphasis on rustic design principles and in support of the Forest Service image.

Regulatory and interpretive signage should be incorporated such that it causes the least visual disruption without compromising effectiveness. A unique design theme with a unifying palette of colors, fonts and architectural elements should be developed and followed.

Native vegetation buffers should be used to soften views of developed recreation areas and minimize views of development from the river corridor or roadways.

To reduce impacts to scenery, unplanned bare ground areas detected outside of recreation sites, designated trails, and roads should be rehabilitated. Rehabilitation measures should be visually unobtrusive, especially near the creek or in view of visitors.

Infrastructure used for research and monitoring should be visually unobtrusive, especially near the creek or in view of visitors.

Where existing constructed features like utilities impact scenic integrity, these features should be managed to minimize scenery impacts.

Invasive species should be treated for long term benefit to overall scenic quality.

Management Approach for Scenery

Continue to work with power companies on utility corridor management plans to minimize impacts to scenery and recreation resulting from utility corridor management.

Designated Areas

Fossil Springs Botanical Area

The Fossil Springs Botanical Area was established to protect the unique characteristics and processes of the highly diverse riparian deciduous forest in the Fossil Springs area. The Botanical Area surrounds a large and complex spring system that is the headwaters for an unusual travertine system. In order to better encompass the vegetation communities in the Fossil Springs area, the CRMP recommends and expansion of the Botanical Area. Plan components listed here, as well as those provided in the Coconino Forest Plan, apply to this expanded area. Additionally, plan components in the vegetation section above apply to the Fossil Springs Botanical Area.

Desired Conditions for Fossil Springs Botanical Area

The integrity of native species and natural ecological processes is maintained in the Fossil Springs Botanical Area.

Vegetation communities and soil productivity in the Fossil Springs Botanical Area are largely free of impact from human activities.

Guidelines for Fossil Springs Botanical Area

Projects treating invasive plants in the Fossil Springs Botanical Area should be staggered in order to avoid excessive erosion and to allow for recovery of treated areas before additional areas are treated.

Horse camping should not be permitted within the Fossil Springs Botanical Area.

Mazatzal and Fossil Springs Wilderness Areas

Desired Conditions for the Mazatzal and Fossil Springs Wilderness Areas

Ecosystems within wilderness are functioning within their historic range of variability. Other ecological features (e.g., biophysical features, geological resources, aquatic systems) are functioning properly. Native species are present and invasive plants and animals do not occur at levels that disrupt ecological functioning. Disturbances, including fire and flooding, are able to play their natural role, consistent with public health and safety concerns.

Standards for the Mazatzal and Fossil Springs Wilderness Areas

Any conflict between the provisions of the 1964 Wilderness Act and the 1968 Wild and Scenic Rivers Act shall be resolved in favor of the more restrictive provisions.

Guidelines for the Mazatzal and Fossil Springs Wilderness Areas

Proposed activities with the potential to affect Wilderness character should be evaluated using the interagency minimum requirements analysis process.

Interpretation and Education

Desired Conditions for Interpretation and Education

Environmental education and interpretation enhance public enjoyment of Fossil Creek, help visitors learn first-hand about the natural processes and cultural features that make Fossil Creek special, and support protection and enhancement of river values. Well-designed environmental messaging instills in visitors an active stewardship ethic, builds a connection between visitors and the natural world, and instills the importance of natural areas for present and future generations.

The Fossil Creek corridor provides a setting for tribal youth education related to culture, history, and land stewardship, and for the exchange of information between tribal elders and youth.

Interpretive information in multiple languages is available at recreation sites, with topics that may include:

- The native plants, wildlife, fish, and aquatic species and their habitats present in and around Fossil Creek, particularly special-status species such as common black-hawks, lowland leopard frogs, native fish, and Fossil springsnail. This knowledge encourages visitors to minimize disturbance of native species.
- The impacts of disease and non-native plant, fish, and aquatic species on ecosystems and how to prevent their introduction and spread.
- The prehistory, history, and contemporary tribal values associated with Fossil Creek. Information about archaeological site etiquette is readily available, and visitors gain an understanding of the tribal cultural history of the area, learning about tribal values and the importance of the corridor to living tribes and the need to approach Fossil Creek with respect. Information is available about the development, use, and decommissioning of the Childs/Irving power system, including how the Apache and Yavapai people were part of, and affected by, the power system.
- Resource protection related to visitor behavior, such as wilderness self-reliance; minimizing unauthorized trails; tree protection; not feeding wildlife; Leave No Trace; Pack-It-In, Pack-It-Out; and proper disposal of trash, human waste, ant killer, food remains, soap, oil, and other cooking wastes.
- The Wild and Scenic Rivers Act and national wild and scenic rivers system.
- Other topics related to Fossil Creek's river values and regionally-unique features, such as the Fossil Springs Botanical Area, geology/travertine, water processes, night sky, nocturnal species, wilderness, wild and scenic rivers, and Fossil Creek's designation as an Outstanding Arizona Water.
- Restoration activities and their role in promoting ecosystem function.

- The reasons for management activities, rules, and regulations and how visitors can help achieve the CRMP's management objectives.

Guidelines for Interpretation and Education

Any commercial uses (such as tours) of heritage-based sites should be limited to activities that are consistent with tribal interests, enhance the public's understanding of the resource, and protect or enhance the resource.

Management Approach for Interpretation and Education

Develop an interpretive plan for the Fossil Creek corridor as soon as possible after plan approval.

Use interpretative signage near the travertine dam formation reaches of Fossil Creek to describe the travertine dam depositional processes and explain how travertine dams have shaped the geomorphology and biology of Fossil Creek. Travertine interpretation is meant to protect and enhance travertine as a key component of the geology river value. Collaborative relationships for stewardship, protection, user community learning, and site design planning (such as for kayak put in/take out) can be used to protect and enhance travertine formations.

Environmental education activities related to biological resources may include snorkeling/snooping, wading, fishing, scenery viewing, hiking, wildlife viewing, bird watching, plant identification, and boating.

Interpret cultural resources in partnership with the Yavapai-Apache Nation and other interested tribes.

Provide interpretation related to Forest Service-supported and citizen science projects by youth and adults.

Outfitter and guide services may augment Forest Service and tribal public education efforts.

Provide interpretation and educational messaging using various types of media and in multiple languages. Emphasize portable components and adaptability to allow for maximum flexibility of use and location. Focus interpretation and education programs around facilities such as interpretive trails, viewing platforms, displays, signs, and audio hiking tours. Scheduled public tours and outreach programs may serve as methods of public engagement.

Chapter 4. Visitor Use and User Capacity

Introduction

User capacity can be defined as the maximum amounts and kinds of public use that a wild and scenic river can accommodate without degrading river values (IWSRCC 2018). Establishing user capacities is an important part of CRMP management direction and doing so will facilitate protection and enhancement of Fossil Creek's river values while providing for public use and enjoyment of the wild and scenic river. This chapter addresses user capacities in Fossil Creek as required by Section 3(d)(1) of the Wild and Scenic Rivers Act (WSRA). It summarizes the legal requirements and guidance related to addressing user capacities and then provides an overview of the existing kinds and amounts of use Fossil Creek receives. Finally, it describes the kinds and amounts of use Fossil Creek can accommodate without degrading river values.

Legal Requirements

WSRA does not define "user capacities," but requires the administering agency to protect and enhance the values for which the river was designated while providing for public recreation and resource uses that do not adversely impact or degrade those values (sections 1(b) and 10(a)). Guidelines[52] published by the secretaries of Interior and Agriculture in 1982 define "carrying capacity" (used interchangeably with "user capacity") as:

> The quantity of recreation use which an area can sustain without adverse impact on the outstandingly remarkable values and free-flowing character of the river area, the quality of recreation experience, and public health and safety.

These guidelines provide the following information related to addressing user capacity and link facilities with the protection of river values:

> **Management Plans:** Will state… the kinds and amounts of public use that the river can sustain without impact to the values for which it was designated...
>
> **Carrying Capacity:** Studies will be made during preparation of the management plan and periodically thereafter to determine the quantity and mixture of recreation and other public use which can be permitted without adverse impact on resource values of the river area. Management of the river area can then be planned accordingly.
>
> **Public Use and Access:** Public use will be regulated and distributed where necessary to protect and enhance (by allowing natural recovery where resources have been damaged) the resource values of the river area. Public use may be controlled by limiting public access to the river, by issuing permits, or by other means available to the managing agency through its general statutory authorities.
>
> **Basic Facilities:** The managing agency may provide basic facilities to absorb user impacts on the resource. Wild river areas will contain only the basic minimum facilities in keeping with the "essentially primitive" nature of the area. If facilities such as toilets and refuse containers are necessary, they will generally be located at access points or at a sufficient distance from the river bank to minimize their intrusive impact. In scenic and recreational river areas, simple comfort and convenience facilities such as toilets, shelters, fireplaces, picnic tables, and refuse containers are appropriate. These, when placed within the river area, will be judiciously located to protect the values of popular areas from the impacts of public use.
>
> **Major Facilities:** Major public use facilities such as developed campgrounds, major visitor centers, and administrative headquarters, will, where feasible, be located outside the river area. If such facilities are necessary to provide for public use and/or to protect the river resource, and location outside the river area is infeasible, such facilities may be located within the river area provided they do not have an adverse effect on the values for which the river area was designated.

[52] 47 Fed. Reg. 39453-39461 (1982).

Subsequently, a statutory amendment to WSRA in 1986 added the requirement for river managers to prepare a detailed CRMP that addresses user capacities. Section 3(d)(1) states:

> For rivers designated on or after January 1, 1986, the Federal agency charged with the administration of each component of the National Wild and Scenic Rivers System shall prepare a comprehensive management plan for such river segment to provide for the protection of the river values. The plan shall address resource protection, development of lands and facilities, **user capacities**, and other management practices necessary or desirable to achieve the purposes of this Act (emphasis added).

Recent litigation has focused on wild and scenic river capacity in terms of recreational use.[53] The 2008 Merced Decision (regarding user capacities in the revised CRMP for the portion of the Merced WSR in Yosemite National Park) has helped clarify addressing WSR user capacities. In the decision, the Court directed the Merced CRMP to:

1. Include "specific, measurable limits on use."
2. Discuss the maximum number of people that can be received in a river corridor.
3. Make an explicit tie between the kinds and amounts of visitor and other public use and the protection and enhancement of ORVs.
4. Make an explicit tie between the location and size of facilities in the river corridor and protection and enhancement of ORVs.
5. Describe an actual level of visitor use that will not adversely impact or degrade ORVs.
6. Specify an appropriate quantity of use based on an analysis of resource values and desired conditions, not necessarily previous or current use levels.
7. Include proactive rather than reactive measures; i.e. measures to trigger management actions before environmental degradation occurs.
8. Conduct periodic and on-going studies to determine whether the quantity and mixture of use leads to adverse impact on the resource values of the river area.

The Ninth Circuit also noted that "the plain meaning of the phrase 'address . . . user capacities' is simply that the [CRMP] must deal with or discuss the maximum number of people that can be received at a [WSR]… However, the plain meaning does not mandate 'one particular approach to visitor capacity.'"

The Fourth Circuit Court of Appeals issued an opinion on November 5, 2014 affirming a 2012 Forest Service CRMP for the Chattooga WSR capacity. The Court found that "[t]he Forest Service has provided a cogent justification for the remaining limits on Headwaters floating, supported by the record [including a maximum capacities report], and that justification is sufficient to sustain its decision under the [Administrative Procedures Act]."[54] In relevant part, the Court held floating is a "public use" of the recreational ORV of the river, not an "other use" subject to Section 10(a)'s substantial interference standard.[55] In so ruling, the Court emphasized a distinction in Section 10(a) between "public uses" of ORVs, which are implicitly subject to balancing by the river management agency to protect and enhance river values, and "other uses," which are subject to limitation only when they substantially interfere with public use of ORVs.[56]

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[53] See, for example, *Friends of Yosemite Valley v. Kempthorne*, 520 F.3d 1024 (9th Cir. 2008; "Merced Decision"); *American Whitewater v. Tidwell*, No. 8:09-cv-02665-MGL (D.S.C. July 30, 2013).

[54] *American Whitewater v. Tidwell*, No. 8:09-cv-02665-MGL (D.S.C. July 30, 2013) at 16.

[55] *Id*. at 21.

[56] *Id*. Also, in *Georgia ForestWatch v. Lint*, No.8:12-CV-3455-BHH (D.S.C. Sept. 29, 2015), the district court held in favor of the Forest Service in a Georgia ForestWatch's challenge to the same 2012 USFS management decision to allow noncommercial floating at issue in *American Whitewater*. In doing so, the district court stated the following: "At its base, the

Planning Context

In addition to the WSRA requirement that user capacities be addressed in the Fossil Creek CRMP, the Forest Service received numerous comments addressing public use in Fossil Creek throughout the CRMP development process. Many of these comments expressed concern over the impacts "too much" public use may have on natural and cultural resources and the recreational experience in Fossil Creek. Others expressed opposition to limitations that would reduce visitor access, specifically to the Childs recreation area on the Verde River and from the community of Strawberry, or restrict certain activities, such as swimming or boating. Comments were supportive of access for administrative uses, fire and emergency response, and search and rescue. These comments helped inform addressing user capacity in the CRMP.

Interagency Guidance for Addressing User Capacities

The Interagency Wild and Scenic Rivers Coordinating Council (IWSRCC) has developed guidance for addressing user capacities on wild and scenic rivers (IWSRCC 2018). Key definitions related to visitor use used throughout this chapter are as follows and are adopted from the IWSRCC guidance:

User capacity: The maximum amounts and kinds of public use that a WSR collectively or by analysis area can accommodate without degrading river values.

Public use: Visitor use and WSR-specific administrative use within a WSR corridor.

Visitor use: Human presence within a WSR corridor for recreational purposes, including education, interpretation, inspiration, and physical and mental health.

WSR-specific administrative use: Use within a WSR corridor by the river manager, including ranger patrols, maintenance activities, field research, staff visits to administer contracts or facilities, search and rescue, and interpretative programs for the purpose of protection or enhancement of river values.

Other use: Use within a WSR corridor other than public use, such as federally authorized mining, forestry, grazing, subsistence hunting and fishing, road use and management, administrative use for other than WSR purposes, and use on non-federal lands in a WSR corridor that have a potential to affect river values. Other use also includes any use on federal or non-federal lands that border upon or are adjacent to a WSR corridor that may substantially interfere with public use and enjoyment of river values.

The interagency guidance outlines a nine-step process for addressing user capacities. Table 4-1 provides a crosswalk between these recommended steps and the Fossil Creek CRMP. The remainder of this chapter will describe the existing kinds and amounts of public and other use in Fossil Creek, and, based on desired conditions and infrastructure and facilities provided by the CRMP, the maximum amount of public use that Fossil Creek is expected to be able to accommodate without degrading river values. Other uses are considered in identifying the baseline and current conditions for assessment of public use, but determining capacity for other use is not required and is not part of the public use capacity.

Table 4-1. Crosswalk between recommended steps to address user capacities and the Fossil Creek CRMP

Step to address user capacities (IWSRCC 2018)	Relevant section of Fossil Creek CRMP
1. Describe the baseline and current conditions of river values, the current amounts and types of use, and current management direction.	Baseline and current conditions of river values are described in detail in **Chapter 2: River Corridor Resources**. Existing kinds and amounts of public and other use are described in **this chapter (Visitor Use and User Capacity)**. Current management direction is summarized in **Chapter 1: Description of River Setting.**

plaintiff's main contention with the capacity analysis in this case appears to be that the Forest Service did not set enforceable capacity limits that trigger agency action before resource degradation occurs. However, there is no such requirement in the WSRA and the Court declines to read one into the statute" *Georgia ForestWatch* at 21.

Step to address user capacities (IWSRCC 2018)	Relevant section of Fossil Creek CRMP
2. Identify desired conditions for river values and classifications.	Desired conditions are described in **Chapter 3: Management Direction**. Desired conditions and associated standards, guidelines, and objectives are developed to ensure protection and enhancement of river values while providing for public use and enjoyment of Fossil Creek.
3. Identify the kinds of public use that the WSR corridor can accommodate.	**This chapter (Visitor Use and User Capacity)** identifies the kinds of public use that Fossil Creek can accommodate.
4. Identify measurable indicators for the desired conditions.	Indicators to measure river value conditions, and thus progress toward desired conditions, are described in **Chapter 6: Monitoring and Adaptive Management**.
5. Establish thresholds for each indicator.	Thresholds established to prevent degradation of river values are described in **Chapter 6: Monitoring and Adaptive Management**. Thresholds are framed as "soft" or "hard." Soft thresholds correspond with the point at which a given river value is at risk of adverse impact. Hard thresholds correspond with the point at which a given river value is at risk of degradation.
6. Identify triggers that elicit management response.	The thresholds described in step 5 also serve as triggers that elicit management response.
7. Identify management actions to take when triggers are reached.	Adaptive management actions associated with soft and hard thresholds are described in **Chapter 6: Monitoring and Adaptive Management**.
8. Determine the WSR corridor's user capacity.	**This chapter (Visitor Use and User Capacity)** identifies the maximum amount of each kind of public use the WSR corridor can accommodate without degrading river values.
9. Establish a monitoring and adaptive management approach.	The monitoring and adaptive management approach is described in **Chapter 6: Monitoring and Adaptive Management**.

Past and Present Kinds and Amounts of Public Use

This section provides historical context for human use in Fossil Creek and describes the past and present kinds and amounts of public use it receives, highlighting conditions at the time Fossil Creek was designated a wild and scenic river (2009) where relevant.

Fossil Creek has a long history of human use because of its year-round water availability in an arid region. Fossil Creek first became part of the human landscape thousands of years ago during the Archaic period. From about 7000 BCE through around 500 CE, people with a mobile hunting and foraging economy incorporated the Fossil Creek area into their lifeways. After 500 CE, people in the Fossil Creek area increasingly practiced agriculture and became less mobile. The well-watered and verdant confines of Fossil Creek were a good agricultural landscape and people settled down and built pit structures and above-ground masonry structures to live in and to store their produce. Around 1300 CE, agricultural social and economic networks shifted to places away from Fossil Creek and farming peoples moved away. However, around the same time, people with a foraging and hunting economy, similar to that of the earlier Archaic inhabitants, began to frequent the area. These people were the Apache and Yavapai, and despite the severe impacts of Euromerican colonization, they have lived in and maintained a connection with Fossil Creek to the present day. Fossil Creek is a holy place for the Apache and Yavapai.

In the early 1900s, the Childs-Irving hydroelectric power system was developed. This was the first such system in Arizona, facilitated the development of mines in nearby areas, and, for a time, provided a substantial amount of power to the city of Phoenix. Many Apache and Yavapai worked to construct and maintain the Childs-Irving system and lived in Fossil Creek until the 1950s. Until its decommissioning and removal in the early 2000s, the Childs-Irving system's infrastructure augmented people's attraction to Fossil Creek as a curiosity and, in the case of its flume, a recreation opportunity.

In more recent years, recreational, research, and tribal ceremonial activities became the predominant types of use in Fossil Creek, particularly after decommissioning of the Childs-Irving system. These types of use continue today.

This history highlights the nature and evolution of Fossil Creek as a cultural landscape, wherein humans and the environment have shaped each other for millennia. Today, the area remains important to a variety of people, as evidenced by recreation and Western Apache and Yavapai traditional and contemporary cultural values rising to the level of outstandingly remarkable components of the wild and scenic river system.

Kinds of Visitor Use

Fossil Creek provides opportunities for a variety of recreational activities and attracts visitors from local communities and around the state, country, and world. Many visitors come from desert regions of Arizona, particularly the Phoenix metropolitan area, seeking relief from the summer heat. Visitors enjoy the shade and cooler temperatures of the dense riparian canopy and the abundance of deep, clear pools in which to wade, swim, and play. The springs that feed Fossil Creek maintain constant water flow throughout the year and the high concentrations of calcium carbonate dissolved in the water give it a blue-green color, adding to the scenery and visitors' enjoyment of the area. Other recreational activities include kayaking and pack rafting; hiking; backpacking; wilderness appreciation; fishing; hunting; wildlife, fish, and nature observation; photography; bird watching; and historical site observation and interpretation, particularly related to remnants of the Childs-Irving system. Additionally, Fossil Creek is considered by the Western Apache and Yavapai as a Traditional Cultural Property, and the area is a place of special religious importance to these peoples.

Because the Childs-Irving hydropower system decommissioning represented a substantial change to the Fossil Creek landscape, this section addresses visitor use before, during, and after the decommissioning process.

Pre-Decommissioning

Prehistoric use is discussed above. More recently, Fossil Creek has a long history of recreational use. A 1993 report notes:

> Fossil Springs is a popular destination for hikers, attractions being the sudden emergence of 43 cfs [cubic feet per second] of spring water from the ground, the riparian vegetation, and the unique travertine formations. While most of the activity takes place above the diversion [dam], some people hike down the stream course. The stream is heavily used for swimming and picnicking below the bridge at Irving Power Plant (USDA 1993b, p. 261).

This report also notes that the segment of Fossil Creek downstream of the junction of FR 502/708 "receives only light use by those looking for a primitive experience" (p. 261).

A Forest Service planning effort in the early 2000s identified the most popular recreation activities in Fossil Creek as dispersed camping, swimming, day hiking, and wildlife/nature viewing. Other activities included partying, fishing, spiritual/meditation, backpacking, picnicking, and hunting (USDA 2004a).

Dispersed camping was a popular activity in Fossil Creek before decommissioning. Dispersed campsites were evaluated beginning in 1988. Campsites were primarily located where forest roads 708 and 502 provided easy access to Fossil Creek. The proximity of the towns of Pine and Strawberry influenced the location and intensity of camping, with campsite locations closer to these towns receiving more use. Surveys indicated unrestricted camping had substantially impacted many areas adjacent to Fossil Springs and Fossil Creek. The "engineering" of campsites and firewood collection had damaged soils, trees and shrubs. Repeated camping at some locations eliminated the natural vegetation, leaving areas either devoid of ground cover or infested with noxious weeds. Social trails and human waste were also observed. A dispersed campsite inventory in 2002 identified 211 campsites, most of which were located along Fossil Creek between Irving and Stehr Lake. Twenty-nine of these campsites were located in the Fossil Springs Botanical Area (USDA 2004a).

Decommissioning Period

A visitor study conducted before and after restoration of full flows (Hancock et al. 2007) documented changes in visitor use between 2004 and 2006. The most popular activities visitors reported are listed in table 4-2. This report acknowledges the difficulty of accurately distinguishing trends from the three years of data, but noted several

observations. For example, kayaking was not reported as an activity before the dam was decommissioned, but 12 percent of surveys after decommissioning reported kayaking as an activity. On the other hand, "fluming" (using the flume structure as a water slide) became unavailable as a recreation activity because of decommissioning.

Table 4-2. Recreational activities in Fossil Creek before and after restoration of flows (Hancock et al. 2007)

Visitor Activities	Before Restoration of Creek Flows (%)	After Restoration of Creek Flows (%)
Sightseeing	88	90
Walking	73	71
Swimming	65	49
Hiking (day use)	62	51
Wading	56	41
Watching wildlife	50	48
Picnicking	48	36
Photography	40	46
Camping near vehicle	34	26
Backpack camping	25	26
Hot springing	25	23
Driving for pleasure	24	44
Sunbathing	24	21
Meditation	22	29
Fluming	20	4
Partying	18	9
Fishing	18	7
Nature study	16	18
Reading for pleasure	13	16
Bird watching	13	13
Rock collecting/prospecting	12	7
Viewing Indian ruins	9	7
Target shooting	7	10
Writing for pleasure	4	4
Hunting	3	10
Mountain biking	2	8
Horseback riding	2	1
Kayaking	0	12

Post-Decommissioning

Visitor surveys that collected information on the types of use in Fossil Creek during the high-use (summer) season after decommissioning were conducted beginning the year of designation (2009) through 2012 (Rotert 2009a, 2011, 2012a, and 2013a). Although these surveys were conducted opportunistically (rather than using a randomized, repeatable study design), they are suggestive of the types of use occurring in Fossil Creek. The most popular activity documented in these surveys was swimming, with camping and hiking typically being the second- and third-most popular activities, respectively. Other reported activities included observing/exploring, OHV use, partying/socializing, relaxing/getting away, and kayaking/rafting. Although comparable visitor use data were not collected after 2012, subsequent observations of visitor behavior and public comments provided during the CRMP planning process indicate similar types of uses remain popular. Fossil Creek is also periodically host to a variety of education-oriented events such as environmental science school field trips, and is an important destination for members of area tribes for day use and ceremonial events.

Several interim management measures implemented since 2011 have changed the pattern and timing of some uses. Before 2011, access to Fossil Creek was essentially unrestricted and few facilities such as delineated parking areas and restrooms were available. This contributed to a proliferation of unauthorized roads and trails, vegetation and soil disturbance near the creek, and vehicle congestion along roads. Beginning in 2011, the Forest Service delineated specific parking areas and creek access points, rehabilitated areas impacted by unauthorized roads and trails and vegetation and soil disturbance, and initiated a capacity management system to control the number of vehicles in Fossil Creek at one time. The capacity management system was converted to a permit system in 2016, whereby visitors were required to reserve parking at a specific parking lot online or through a call center during

the high-use season (currently defined as April 1-October 1). Although these actions did not change the types of day use available, they focused use in specific areas to reduce resource impacts and allow some previously impacted areas to recover. Also in 2011, an approximately 4-mile portion of Forest Road 708 entering Fossil Creek from the town of Strawberry was administratively closed to public use because of safety concerns caused by road instability and repeated rock fall. This eliminated direct public road access to Fossil Creek from Strawberry and recreational motor vehicle use on this section of road.

Camping along Fossil Creek continued to be a popular activity after dam decommissioning; however, to reduce soil and vegetation disturbance resulting from unmanaged camping observed throughout the corridor, the location and timing of camping has been restricted in recent years. In 2010, the reach of Fossil Creek from the historic dam downstream to the Fossil Creek Bridge was closed to camping and a seasonal restriction was placed on camping in the remainder of the Fossil Creek area from April 1 to October 1. Camping was allowed in the Fossil Springs area and downstream of the Fossil Creek Bridge the remainder of the year and is available in areas around the corridor, including Stehr Lake and Childs, year-round.

Fossil Creek also provides opportunities for hunting and fishing. A 4.5-mile reach of the creek from the waterfall downstream to Sally May Wash is open to catch-and-release fishing for certain species, October through April. Fossil Creek and the surrounding area provides opportunities for hunting for various species, with hunting typically occurring in the fall, winter, and spring.

Amounts of Visitor Use

The amount of visitor use Fossil Creek receives varies substantially by location and the time of year. The vast majority of use occurs in approximately 30% of the length of the WSR corridor and within the recreational segment. Use is concentrated around recreation sites in a 5-mile reach between Mazatzal and the waterfall at the end of the Dixon Lewis (Waterfall) Trail (referred to as Middle Fossil) and in a 0.5-mile reach in the vicinity of Fossil Springs and the historic dam. The creek in Middle Fossil is directly accessible by road and the most common access to the Fossil Springs/historic dam area is via the Bob Bear (Fossil Springs) Trail. Use in the remaining 11 miles (70%) of the WSR corridor is very low. The wild segments are generally inaccessible because of rugged terrain and limited road and trail access, and little use occurs in the recreational segment between the waterfall at the end of the Dixon Lewis Trail upstream to just below the historic dam because access to the creek in this section is limited by terrain. Use in this latter area mostly occurs on the Flume Trail, which is located in the uplands and does not provide access to the creek.

The amount of visitor use Fossil Creek receives is distinctly seasonal, with most occurring in the spring and summer (generally May through September). Weekend and holiday use is typically higher than weekday use. Weather conditions also affect visitor use, with less use occurring on cooler, rainy days. Additionally, the corridor is occasionally closed for short periods because of wet roads or extended periods because of fire danger. Figure 4.1 compares average weekday and weekend/ holiday use observed in 2016-2019 during the high-use season. Hazardous weather and fire danger closures are excluded from this graph. Data availability for visitation in the low use season is limited so it is not included in the graph, but observations by managers indicate that visitation in March and October can be relatively high on weekends, holidays, and during spring break but low the rest of the time, and visitation in November, December, January, and February is consistently very low.

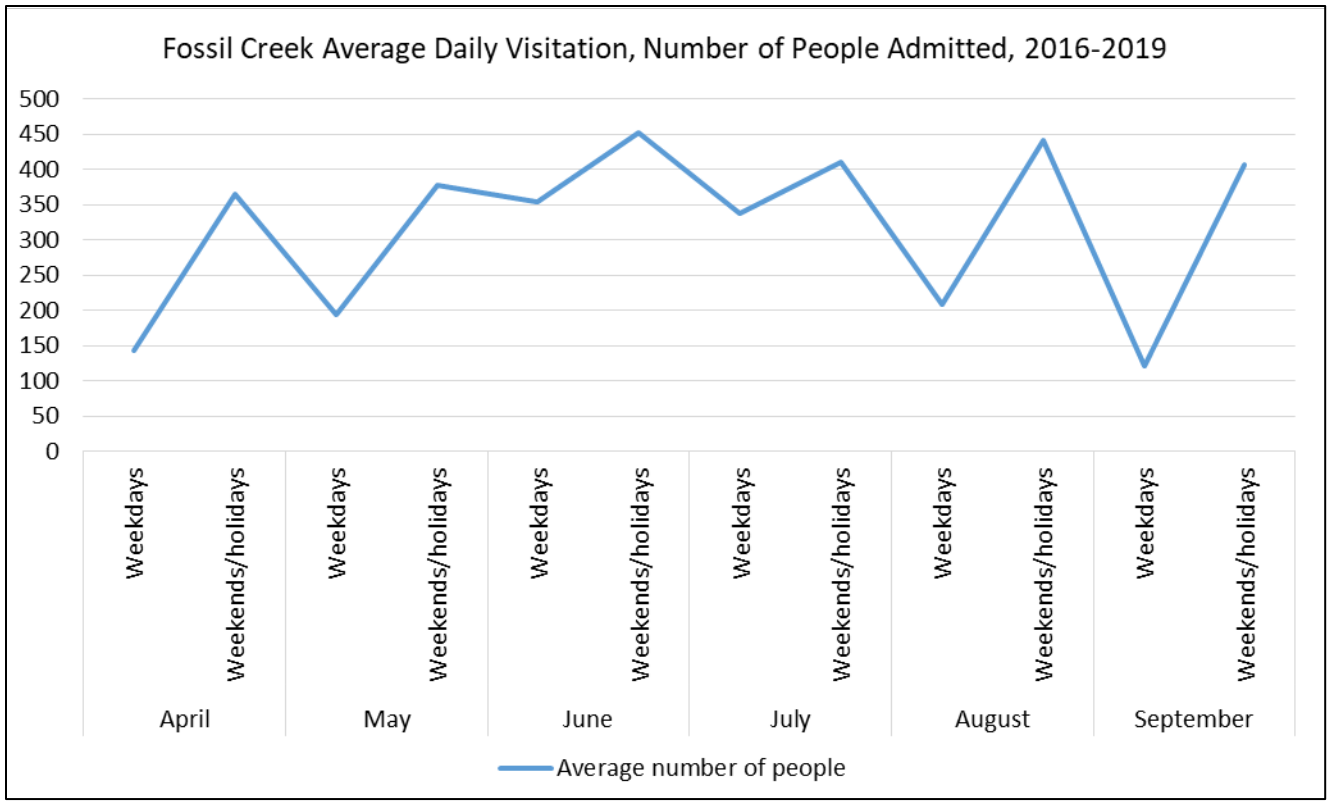

Figure 4-1. Average daily visitor use observed during the high-use season, 2016-2019. Closure dates are excluded.

Visitor use in Fossil Creek increased after restoration of full flows. This increase was likely influenced by expanded swimming opportunities, publications promoting Fossil Creek as a destination, and social media (DeSutter 2015). Trail registry data gathered between 1998 and 2002 showed between 1,604 and 3,716 visitors per year accessed the Flume Trail and between 5,922 and 28,976 visitors per year accessed the Fossil Springs Trail (Roughan 2003). In more recent years, visitor use data collection has mostly occurred during the high-use season. Figure 4-2 and table 4-3 display the estimated number of people and vehicles that visited Fossil Creek during the high use season from 2006 to 2019 (Rotert 2013b; DeSutter 2015; Smith 2016; Nichols 2017; Brown 2019). Estimated high-use season visitation increased from approximately 20,000 people per year in 2006 to approximately 80,000 in 2009 and to over 85,000 in 2011, with demand for access (discussed below) increasing substantially by 2015. In 2009, median visitation during the high-use season was 183 vehicles (551 people) per day on weekends and 52 vehicles (157 people) per day during the week. In 2011, median visitation during the high-use season increased slightly to 209 vehicles (630 people) per day on weekends and 60 vehicles (182 people) per day during the week. The highest number of vehicles observed in the river corridor in recent years occurred on September 5, 2011, when 364 vehicles (1,092 people) were present in the corridor (Rotert 2012a).

During the low use season, trail counters present on the Fossil Springs and Waterfall trails in 2016-2017 indicated that average daily use on these trails dropped below 20 people per day on each trail in November and below 10 people per day on each trail in December, January, and February (Nichols 2017).

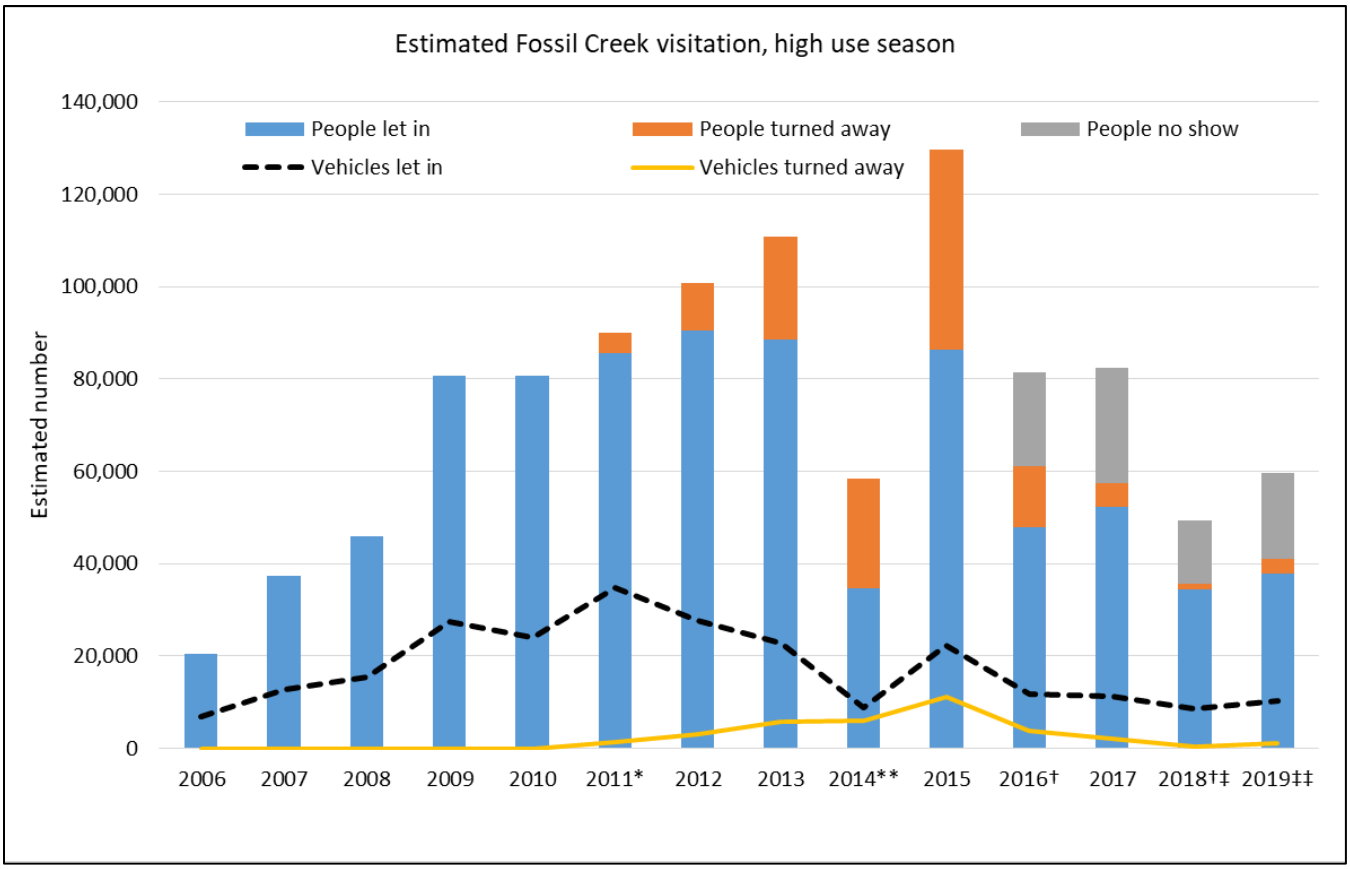

Figure 4-2. Estimated Fossil Creek visitation in the high use season, 2006-2019. See footnote 57 for figure notes.

Table 4-3. Estimated Fossil Creek visitation in the high use season, 2006-2019. See footnote 73 for table notes.

Year	Number of people let in	Number of people turned away	Number of people no show	Number of vehicles let in	Number of vehicles turned away
2006	20,480	0	N/A	6,942	0
2007	37,461	0	N/A	12,699	0
2008	45,939	0	N/A	15,573	0
2009	80,745	0	N/A	27,371	0
2010	80,718	0	N/A	24,081	0
2011*	85,486	4,463	N/A	34,685	1,275
2012	90,396	10,407	N/A	27,644	3,128
2013	88,552	22,224	N/A	22,764	5,713
2014**	34,602	23,911	N/A	8,895	6,147
2015	86,333	43,229	N/A	22,194	11,113
2016†	47,927	13,238	20,242	11,681	3,872
2017	52,301	5,079	24,957	11,192	2,067
2018†‡	34,444	1,154	13,698	8,509	422
2019‡‡	37,958	3,197	18,519	10,207	1,259

[57] *Capacity control began in 2011.
**Visitation numbers in 2014 are low because of vehicle counter malfunctions and because there was a complete closure of Fossil Creek for one month due to wildfire hazard.
†The permit system was used 2016-2019. Permits were required beginning in May 2016 and 2019 and in April 2017 and 2018.
†‡Fossil Creek was closed May 23-July 11, 2018 because of wildfire hazard.
‡‡In 2019, the Bob Bear (Fossil Springs) Trailhead was closed 7/1 - 8/31.

Before 2016, visitation numbers were calculated by applying a person-to-car ratio to the number of vehicles counted in the corridor. In 2016-2019, visitation numbers and the person-to-car ratio can be determined via data from the permit system. The person-to-car ratio observed in Fossil Creek increased from 2.95 in 2009 (Rotert 2009a) to 3.89 in 2013 (Rotert 2013b) to 4.1 in 2016 and 4.7 in 2017 (Nichols 2017). The person-to-car ratio decreased to 4.1 in 2018 and 3.7 in 2019. Because of the relatively high observed person-to-car ratio, and because most vehicles possess five seats, a person-to-car ratio of 5.0 is applied for purposes of determining current capacity and for future planning. Though this ratio is higher than often used in recreation planning, it is justifiable in this case because of actual observations and the tendency of Fossil Creek visitors to travel together because of the distance from population centers and rough road conditions.

Forest Service management of Fossil Creek has evolved to respond to increasing visitation. In 2011, the Forest Service initiated a capacity control system whereby vehicles were turned away from the corridor when all parking areas were full. From 2011 to 2015 the number of people turned away steadily increased (figure 4-2), which led to the implementation of a permit system during the high use season in 2016. This system established a set number of parking spaces available in the Fossil Creek corridor per day during the high-use season. Nine parking lots with a total of 148 parking spaces are available at time of plan approval, 115 of which are in Middle Fossil and 33 are at the Bob Bear (Fossil Springs) Trailhead. This existing parking provides access to Fossil Creek to approximately 740 persons at one time (PAOT) through the permit system. A decrease in visitation was observed after implementation of the permit system. Of note is the relatively high “no show” rate under the permit system (approximately 30%), with “no shows” occurring when a permit is reserved but the permit customer does not visit Fossil Creek and does not cancel the permit.

Also since 2011, the Forest Service has implemented a variety of other actions designed to improve recreation management in Fossil Creek. These actions have included delineating parking areas, improving creek access, improving toilet facilities, and restoring sensitive areas impacted by unmanaged use.

Understanding demand for visitor use in Fossil Creek is useful for determining trends and planning for future use. Total demand for access to Fossil Creek prior to implementing the permit system can be estimated by adding the number of people let in to Fossil Creek to the number of people turned away (table 4-4). Before 2011, all visitors were let in, so total visitation was presumably equivalent to demand. The number of vehicles turned away increased from 2011 to 2015, indicating increasing demand. Total demand for access to Fossil Creek cannot be reliably estimated for 2016-2019 because of the complicating effect of the permit system.

Table 4-4. Estimated recreational demand in the high use season, 2006-2019

Year	Demand (number of people)
2006	20,480
2007	37,461
2008	45,939
2009	80,745
2010	80,718
2011	89,949
2012	100,803
2013	110,776
2014*	58,513
2015	129,562
2016-2019**	-

*Visitation numbers in 2014 are low because of vehicle counter malfunctions a complete closure of Fossil Creek for one month due to wildfire hazard.
**Demand cannot be reliably calculated under the permit system.

Administrative Use

The IWSRCC considers WSR-specific administrative use to be a component of public use. WSR-specific administrative use in Fossil Creek includes use by Forest Service and other agency staff, partners, researchers, volunteers, law enforcement, and emergency responders.

The Forest Service workforce at time of designation of Fossil Creek as a Wild and Scenic River included resource specialists and recreation personnel who patrolled and picked up trash. With increasing visitation, the Forest Service increased recreation staffing at Fossil Creek year-round, with as many as nine employees during the high use months in recent years and fewer employees during the low use months. Facility maintenance (toilet cleaning and pumping) also occurs. In addition to operations at Fossil Creek, Forest Service volunteers collect water samples and employees, volunteers, or other partners may be present to support habitat monitoring, conduct visitor use surveys and complete projects and other activities. The total number of Forest Service employees and volunteers present in the WSR corridor varies and may be approximately 20 people on any given day.

Monitoring and research activities also occur in Fossil Creek. These activities were occurring at time of designation and continue today. Arizona Game and Fish Department monitors the native fish annually. The Bureau of Reclamation inspects the fish barrier. There have been numerous academic research projects in the wild and scenic river corridor focusing on natural and water resources (e.g. riparian vegetation, wildlife, macro-invertebrates, and water quality) as well as recreation-related topics such as human waste and visitor preferences. Personnel associated with monitoring and research usually number fewer than 10 persons at one time within the river corridor. Emergency situations, such as when the permanent fish barrier was damaged and allowed non-native fish into the upper reaches of Fossil Creek, required a larger number of individuals to repair the barrier and remove the non-native fish. These instances are unusual and are thus not counted in overall numbers.

Fossil Creek's visitors often require emergency assistance from ambulances, search and rescue, or tow trucks. This need existed at time of designation and incidents increased with increasing use; however, recent years have seen a decrease in emergency responses under the permit system (Nichols 2017). The need for emergency assistance is greatest during the high use season. Rescues may be accomplished using non-motorized means, motor vehicles, or helicopters depending on the location and nature of the incident. There is also frequent need for vehicle assistance due to break downs, flat tires, and accidents. The number of individuals providing emergency assistance may be approximately 20 people on any given day.

Other Use

The IWSRCC defines other use as "use within a WSR corridor other than public use, such as federally authorized mining, forestry, grazing, subsistence hunting and fishing, road use and management, administrative use for other than WSR purposes, and use on non-federal lands in a WSR corridor that have a potential to affect river values. Other use also includes any use on federal or non-federal lands that border upon or are adjacent to a WSR corridor that may substantially interfere with public use and enjoyment of river values." This section addresses other past, present, and reasonably foreseeable uses in Fossil Creek.

At time of designation, a privately owned land parcel totaling approximately 19 acres was present within the WSR corridor. The Forest Service acquired this parcel in 2016, so all lands within and bordering on the Fossil Creek WSR corridor are now under federal (Forest Service) jurisdiction. The closest non-federal lands are private parcels in the vicinity of the town of Strawberry approximately two miles from the WSR corridor. No existing activities on non-federal lands are known to be substantially interfering with public use and enjoyment of Fossil Creek's river values. Of future concern is groundwater withdrawal for municipal or other use, which has the potential to impact aquifers that provide the spring discharge that feeds Fossil Creek.

Other uses occurring on federal lands in and/or around the WSR corridor include motor vehicle use and routine maintenance on Forest Service system roads, utility corridor maintenance, livestock grazing, personal use fuelwood collection, vegetation and fire management, and mineral quarrying. These uses were all occurring at time of designation and are discussed in greater detail below.

Motor vehicle use and routine maintenance on Forest Service system roads are ongoing uses within and in the vicinity of the Fossil Creek WSR corridor. Maintenance includes grading and drainage work, facilitates continued public access to Fossil Creek, and protects water quality by supporting proper road drainage. Most motor vehicle use is directly related to accessing and administering the WSR corridor; however, some motor vehicle use is for public access to the Verde River/Childs (via FR 502) and Deadman Mesa (via FR 591) or utility maintenance. Motor vehicle use is not known to substantially interfere with public use and enjoyment of river values because it is either directly related to public access to the WSR corridor or is related to access to other areas of the forest and occurring at a relatively low level.

Several **utility corridors** exist within and in the vicinity of the Fossil Creek WSR corridor. These consist of an overhead 345-kV Western Area Power Administration (WAPA) transmission line, an overhead 69-kV APS line, and a buried Century Link fiber optic cable. The WAPA lines cross the WSR corridor in the vicinity of the Purple Mountain and Sally May recreation sites, and the APS line roughly parallels a portion of Middle Fossil. The fiber optic cable follows the alignment of FR 708. Maintenance of the power lines includes vegetation clearing and pole replacement, when necessary. Maintenance of the fiber optic cable includes excavation to reach the cable, as needed. Although the overhead power lines cause a substantial visual impact in portions of the WSR corridor and are present in a small portion of the Congressionally-established Mazatzal Wild Segment, they are long-time features of the landscape and as such are unlikely to substantially interfere with public use and enjoyment of river values.

Livestock Grazing is authorized on the Coconino and Tonto national forests as an existing use within the Fossil Creek area. Although grazing allotments overlap with the Fossil Creek WSR corridor, grazing within the WSR corridor itself is limited.

- **Coconino National Forest:** The Ike's Backbone and Fossil Creek allotments overlap with portions of the WSR corridor. In June 2017, the Ike's Backbone Allotment was closed to grazing; this allotment had not been grazed for more than 15 years prior to its closure. Portions of the Fossil Creek Allotment are grazed. Within the Fossil Creek Allotment, the Boulder Pasture, which overlaps a portion of the recreational segment, is grazed; the Upper Wilderness and Lower Wilderness pastures have not been grazed for approximately ten years due to removal of water sources associated with the power plants; and the Stehr Lake Pasture only functions as a trail-through pasture in the late winter or early spring. Three additional allotments are present within the larger Fossil Creek watershed but are distant from the WSR corridor: 13 Mile Rock, Hackberry/Pivot Rock, Baker Lake/Calf Pen.
- **Tonto National Forest:** The Deadman Mesa and Cedar Bench allotments overlap with portions of the WSR corridor. The Deadman Mesa Allotment, which overlaps with the majority of the WSR corridor, has not been grazed since the early 1990s. The Cedar Bench Allotment, a small portion of which overlaps with the downstream end of the Mazatzal Wild Segment, is grazed on an annual rotation. Three additional allotments are present within the larger Fossil Creek watershed but are distant from the WSR corridor: Cedar Bench, Hardscrabble, and Pine.

Livestock access to Fossil Creek is limited by fencing. Within the WSR corridor, a water lane exists in the Boulder pasture, allowing livestock potential access to the water; however, livestock have only used this water lane twice in approximately 15 years and are only in the pasture for a minimal amount of time (approximately 15 to 21 days) in the winter or early spring months. Feral cattle have been observed along the Verde River near the confluence with Fossil Creek, and these cattle may enter the lower portion of the Fossil Creek corridor. A removal effort is ongoing at time of plan approval. Livestock grazing is unlikely to substantially interfere with public use and enjoyment of river values because of its low level.

Personal use fuelwood collection may occur within and adjacent to the Fossil Creek WSR corridor. Outside of the WSR corridor and designated wilderness, cross-country motorized travel may be used for fuelwood collection. Within the corridor, no cross-country motorized travel is permitted. Personal use fuelwood collection is not known to substantially interfere with public use and enjoyment of river values.

Planned vegetation and fire management are routine activities undertaken by the Forest Service. Although these activities may take place in the vicinity of the Fossil Creek WSR corridor, they are not anticipated to substantially interfere with public use and enjoyment of river values because of their distance from the corridor and general goal of enhancing watershed and ecosystem function.

A limited amount of **mineral quarrying** occurs in the vicinity of the Fossil Creek WSR corridor. The purpose of this quarrying is to provide materials for road surfacing. The limited nature of this activity and distance from the WSR corridor make it unlikely that it would substantially interfere with public use and enjoyment of river values. No **mining claims** exist within and in the vicinity of the WSR corridor. The wild segments of the WSR corridor were withdrawn from locatable mineral entry with designation, and withdrawal of the recreational segment is sought.

These other uses are expected to continue into the future, and no additional uses are currently reasonably foreseeable. The management direction provided in Chapter 3 and the monitoring and adaptive management process described in Chapter 6 are intended to ensure that other uses do not substantially interfere with future public use and enjoyment of river values.

Future Kinds and Amounts of Use

It is anticipated that the kinds of use Fossil Creek currently receives will remain popular into the future. It is also anticipated that demand for access will continue to grow as Arizona's population increases and more people become aware of the area. In light of these expected trends, supporting future public use and enjoyment of Fossil Creek and protecting and enhancing its river values will require thoughtful management of visitor use. This section describes the approach the CRMP takes to managing visitor use in Fossil Creek and addresses the user capacity the CRMP establishes.

Capacity Framework

User capacity can be seen as consisting of three interconnected components: ecological, social, and infrastructure. Ecological capacity is the amount of use natural and cultural resources can sustain without adverse impact. Social capacity is the amount of use the social environment, which includes recreational experience and cultural values, can sustain without adverse impact. Infrastructure capacity is the built environment's physical ability to accommodate a certain amount of use.

The field of recreation ecology provides a framework for approaching capacity management in Fossil Creek in a way that simultaneously protects and enhances the river values and promotes public use and enjoyment of the river corridor, as required by the Wild and Scenic Rivers Act. Recreation ecology is the study of ecological changes associated with recreational visitation and the factors that influence visitor behavior (Marion et al. 2016). Studies indicate that most natural resource impacts from recreation occur at relatively low levels of use, and that the magnitude of additional impacts decreases as use increases (Marion 2016). Given this, several strategies can be used to minimize ecological and social impacts of recreational use, while continuing to provide visitor access. These strategies (adapted from Marion 2016) include:

1. Managing use levels (redistributing, discouraging, or limiting use at specific locations or times);
2. Modifying the location of use (concentrating or dispersing use; restricting certain types of use at specific locations);
3. Increasing resource resistance (constructing, reconstructing, and/or maintaining impact-resistant use areas);
4. Modifying visitor behavior (persuasive communication, interpretation, and/or education; prohibiting or requiring certain practices);
5. Closing and rehabilitating areas that are not needed or not sustainable.

The interconnected relationship between infrastructure, ecological, and social capacities has been clearly demonstrated in Fossil Creek. Before 2011, visitor use was essentially unconstrained, with growing amounts of parking and recreation occurring at unplanned, historically used locations. The result was increasing impact to natural and cultural resources and degradation of the social environment. Forest Service management evolved in response to these impacts by expanding infrastructure capacity by defining parking areas, improving toilet facilities, delineating creek access, and shifting use away from sensitive areas. To ensure infrastructure capacity was not exceeded, at times of high demand, public access into the WSR corridor was managed first with gates and then with the permit system. Corresponding reductions in adverse impacts (indicated by substantially less trash, vegetation recovery, fewer violations of regulations, and positive visitor feedback) suggest that the ecological and social components of Fossil Creek's user capacity are positively correlated with expanded infrastructure capacity. These observations further suggest that infrastructure capacity appears to be the limiting factor influencing the amount of visitor use Fossil Creek can sustain without exceeding ecological and social capacity.

By applying the principles of recreation ecology, it is anticipated that Fossil Creek could support more public use than the time of plan approval without degrading river values. Of the three components of capacity, management under the CRMP has the most direct control over infrastructure and related management tools (such as a permit system). The amount of parking available in the WSR corridor is the basic unit of infrastructure capacity. With this in mind, the location and nature of other infrastructure such as toilets, roads, trails, and amenities like picnic tables, combined with management tools such as a permit system, educational messaging, and rehabilitating impacted areas, will be implemented using the principles of recreation ecology to ensure environmental and social capacities are not exceeded. It must be noted, however, that the true magnitude of social and ecological capacity is inherently uncertain. Factors such as changing patterns of use and variable resource conditions may effectively increase or decrease these components of user capacity year-to-year. As a result, the CRMP establishes a monitoring program that will regularly evaluate the condition of the river values to reveal any issues that may suggest visitor use is not in alignment with Fossil Creek's capacity. If problems are detected, adaptive management will be used to address them.

User capacity is addressed in the context of three basic elements: units of use, location, and timing (Whittaker et al. 2010).

Units of Use

User capacity in Fossil Creek is addressed corridor-wide, but several units of use inform the corridor-wide capacity determination. These units of use consist of recreation site use, walk-in use, and administrative use. Recreation site use represents the majority of use Fossil Creek receives and includes both day use and overnight use in Middle Fossil and the Fossil Springs/Historic Dam area. Walk-ins account for walk-in visitors occasionally observed near the town of Strawberry and in the Mazatzal area and backcountry campers in the wild segments; capacities for walk-ins represent amounts of use anticipated to not impact river values. Administrative use includes use by Forest Service and other agency staff, partners, researchers, volunteers, law enforcement, and emergency responders.

The portion of the capacity calculation based on parking available at recreation sites assumes one vehicle per parking space and five people per vehicle (see additional discussion in the "Amounts of Visitor Use" section, above). The vehicle occupancy assumption is based on observations of vehicle occupancy in Fossil Creek and the number of seats present in most vehicles. The total number of parking spaces within recreation sites that provide camping will include the number of parking spaces needed to accommodate vehicles at campsites.

Location of Use

Because river values apply to all segments (wild and recreational) of the Fossil Creek corridor equally, user capacities are applied corridor-wide. In practice, most visitor use occurs at recreation sites and trails in the recreational segment (a small portion of the Fossil Springs/Bob Bear trail passes through the Fossil Springs Wild Segment, and the Mazatzal and a portion of the Purple Mountain recreation sites are located in the Mazatzal Wild

Segment). During the high-use season, visitors often park at one recreation site and walk to another. Administrative use and walk-ins could occur anywhere within the Fossil Creek corridor.

Timing of Use

User capacities are discussed in terms of the number of vehicles at one time and an estimated number of persons at one time (PAOT). These numbers indicate the number of vehicles or persons that may be present in the Fossil Creek corridor at a given time. Actual visitor use currently differs on a seasonal basis, and this pattern is anticipated to continue. From April through September, recreational use is highest, with maximum visitation occurring on weekends and holidays. From October through March, recreational use is substantially lower. Thus, it is likely that actual visitation will only approach capacity on weekends and holidays during the high use season.

Fossil Creek User Capacity

As described in the “Capacity Framework” section above, user capacity in Fossil Creek is primarily determined by parking available at recreation sites. The principles of recreation ecology will be applied in designing Fossil Creek’s physical environment and management strategies to ensure that river values are protected. In addition, Chapter 3 provides management direction to support protection and enhancement of river values, and Chapter 6 describes the monitoring and adaptive management strategy.

Kinds of Use

It is anticipated that the Fossil Creek corridor can continue to support the kinds of use visitors engage in at the time of plan approval (see the “Past and Present Kinds and Amounts of Use” section above) without degrading river values. However, because of the potential for adverse impacts to be caused by certain kinds of use, the CRMP limits camping, motorized watercraft, and through traffic on FR 708. Additionally, if monitoring indicates that certain types of use are adversely impacting river values, adaptive management will be used to mitigate those effects. Based on impacts observed in the past, the amount of camping occurring in Middle Fossil and the Fossil Springs area will be limited; the specifics of these limitations are discussed below. Use of motorized watercraft is prohibited within the corridor to limit disturbance to wildlife, visitors, and travertine formations and to prevent motorized incursions into the Mazatzal Wilderness. The currently closed portion of FR 708 may be repaired and reopened, but the amount of through traffic will be limited during the high-use season to minimize congestion in the canyon and dust/noise resulting from motor vehicle use.

Amounts of Use

This CRMP establishes a total long-term corridor-wide user capacity of 212 vehicles and approximately 1,120 PAOT. This capacity is comprised of 202 public vehicles (approximately 1,040 PAOT) based on the amount of potential parking, 10 administrative vehicles (approximately 50 PAOT) based on the number of administrative personnel anticipated to be needed to adequately manage recreational use and protect river values, and 30 PAOT for incidental walk-ins.

The CRMP includes the potential for increasing visitor numbers over time because Fossil Creek presents an outstanding opportunity to connect a broad diversity of visitors with a wild and scenic river on public lands. When the CRMP is first implemented, visitor numbers will remain the same as those existing under the permit system at time of plan approval (148 public vehicles/approximately 810 PAOT, including administrative use). Future visitor number increases would occur incrementally and be held to the following criteria:

1) A determination is made based on collaborative monitoring data assessment, professional judgment of resource professionals, and on-the-ground observations of managers that river values would continue to be protected with additional visitor use and the infrastructure necessary to support that use;
2) An ongoing capacity to conduct monitoring, assess monitoring data, and implement adaptive management actions is maintained; and
3) Facilities and infrastructure that are able to support higher amounts of use are established.

Each incremental increase in visitor numbers will require additional monitoring of the river values using the monitoring plan in Chapter 6 to determine if use at that level is continuing to protect river values. Visitor numbers may be decreased at any time as an adaptive management action. The process of increasing or decreasing visitor numbers is described in more detail in Chapter 6.

Up to ten designated campsites will be divided amongst Mazatzal, Purple Mountain, Sally May, Homestead, Tonto Bench, and/or Irving and be available year-round. Up to three administrative campsites at Cactus Flat and up to four designated campsites at the Rim Trailhead will be available year-round. Up to three designated campsites will be available in the Fossil Springs area year-round. All ten designated campsites in Middle Fossil may be established at one recreation site, or they may be dispersed among multiple recreation sites, depending on what arrangement is determined to best meet management and river value protection needs. Until designated campsites are established, dispersed camping will continue to be allowed during the low-use season downstream of the Fossil Creek Bridge and upstream of the historic dam. Dispersed backcountry camping will be allowed in the wild segments beginning 1/4 mile upstream of the Bob Bear Trail in the Fossil Springs Wild Segment and 1/4 mile downstream of the Mazatzal recreation site in the Mazatzal Wild Segment. Camping for administrative activities and special events may occur throughout the WSR corridor and will be authorized on a case-by-case basis.

Adaptive Management

The monitoring and adaptive management plan will allow managers to detect potential adverse impacts resulting from visitor use early and adjust management actions to reduce these impacts in order to protect river values. If monitoring indicates visitor use levels may be adversely impacting river values, a variety of actions may be taken to reduce these impacts. These actions, which are discussed in detail in Chapter 6, may include increasing management presence, education efforts targeted at addressing observed impacts, temporary site closures, infrastructure improvement, restoration actions, or temporary or long-term reductions in visitor numbers.

Chapter 5. Management Actions

Introduction

This chapter describes management actions authorized by this CRMP. These actions are intended to provide a flexible approach to managing Fossil Creek that protects and enhances the river values, makes progress toward the desired conditions described in Chapter 3, and supports effective management of recreational use. Additionally, this chapter describes the Wild and Scenic Rivers Act Section 7 analysis process required for future water resources projects proposed in the WSR corridor, and provides a list of management suggestions made by commenters during the 2018-2019 notice and comment period. The Record of Decision document provides rationale for these actions.

Actions Authorized by the CRMP

The CRMP authorizes the following management actions. In addition, it authorizes the adaptive management actions and approach described in Chapter 6. This section describes the approach to implementing these actions.

Managed Entry and Site Administration

The permit system[58] implemented as an interim measure in 2016 will be formally adopted. This system could be modified or removed if determined to be unnecessary or if more effective management tools become available. Options for local or on-site permit acquisition may be pursued if current limitations are overcome (see footnote). Permits for day use will be required to park at recreation sites in the Fossil Creek area during the high-use season, which at time of approval of the CRMP is April 1 – October 1. The dates when permits are required may be changed to accommodate changing use patterns, administrative considerations, or river value protection. The number of permits available will correspond with the number of parking spaces available. Separate permits for camping may be required once designated campsites are established.

In the near term the Forest Service will continue to oversee operations and maintenance of Fossil Creek. Opportunities for partnerships, concessionaires, or other options to share operations and maintenance activities may be pursued in the future.

Implementation

The permit system will continue to be in place during the high-use season. The permit system will be adjusted to reflect incremental changes in parking spaces if and when those changes are implemented.

Motor Vehicle Access and Roads

Public motor vehicle access will continue to be available on Forest Road (FR) 708 from State Route (SR) 260 near Camp Verde. Additionally, if determined to benefit management of Fossil Creek and funding is available for repairs and maintenance, public motor vehicle access into the Fossil Creek canyon on FR 708 from SR 87 in Strawberry may be restored to all vehicles once repair of the 4.1-mile closed section is completed (figure 5-1). Until these conditions are satisfied, the 4.1-mile closed section will remain closed to public motor vehicle use; however, this section of road will continue to be available for emergency response and utility maintenance.

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[58] The term “permit system” is used to describe a system of managed entry in which visitors are required to obtain a permit to access Fossil Creek. Generally speaking, permits for access to an area may be reserved ahead of time and/or may be available on-site or at another physical location, depending on management capacity, technological means, and local considerations. Currently, permits for Fossil Creek are available by reservation only. This is because technological limitations (specifically network connectivity), limited management capacity, and the remoteness of Fossil Creek preclude providing permits on-site or at another physical location. However, the CRMP encourages enhancement of the Fossil Creek permit system by implementing options for obtaining permits that do not require an advance reservation if existing limitations are overcome.

On designated roads, ground-disturbing activities and use of equipment may occur. Maintenance (including grading, improving drainage features, and maintaining vegetation and utilities) and hazard mitigation activities (including rock scaling) may be necessary within or adjacent to the road prism and would be conducted as needed. A particular focus of maintenance on FR 708 will be to improve segments of the road that are problematic in wet weather in order to reduce the effects of vehicle travel, improve public safety, and reduce the need for closure during wet conditions. Additionally, FR 708 will continue to receive maintenance necessary to support continued operation of the fiber optic cable that follows the alignment of the road. If possible, road maintenance agreements with utilities or county governments will be pursued.

Actions needed to stabilize and mitigate hazards along a 1.3-mile section of FR 708 between the Bridge and Dixon Lewis (Waterfall) Trailhead are authorized. Based on initial assessment in Romero 2014, actions may include:

- Low yield blasting to remove large unstable rocks
- Scaling to remove small unstable rocks
- Targeted spot bolt placement to stabilize large blocks
- Local shotcrete application to stabilize high risk sections of rock face
- Installation of rockfall netting to capture/convey residual unstable material
- Installation of rockfall barriers or debris fences along toe of slope to keep material conveyed by rockfall netting from entering the road prism
- Road bed/fill slope stabilization

Re-opening the currently closed section of FR 708 will require a number of hazard mitigations and road prism improvements. Potential mitigations and improvements are described in Romero 2014; however, this report notes an expanded field exploration and better hazard mapping would be required prior to implementation of the remediation strategies. In the interim, road bed stabilization and drainage improvements may be implemented at a level required to mitigate runoff and sedimentation and support long-term sustainability and continued maintenance of utility corridors on the currently closed section of FR 708.

Approximately 0.3 miles of National Forest System roads will be decommissioned (figure 5-1). These roads are FR 9139L, which was designated for administrative use only, and FR 9139G, which was designated for use by all vehicles on the Coconino NF motor vehicle use map.

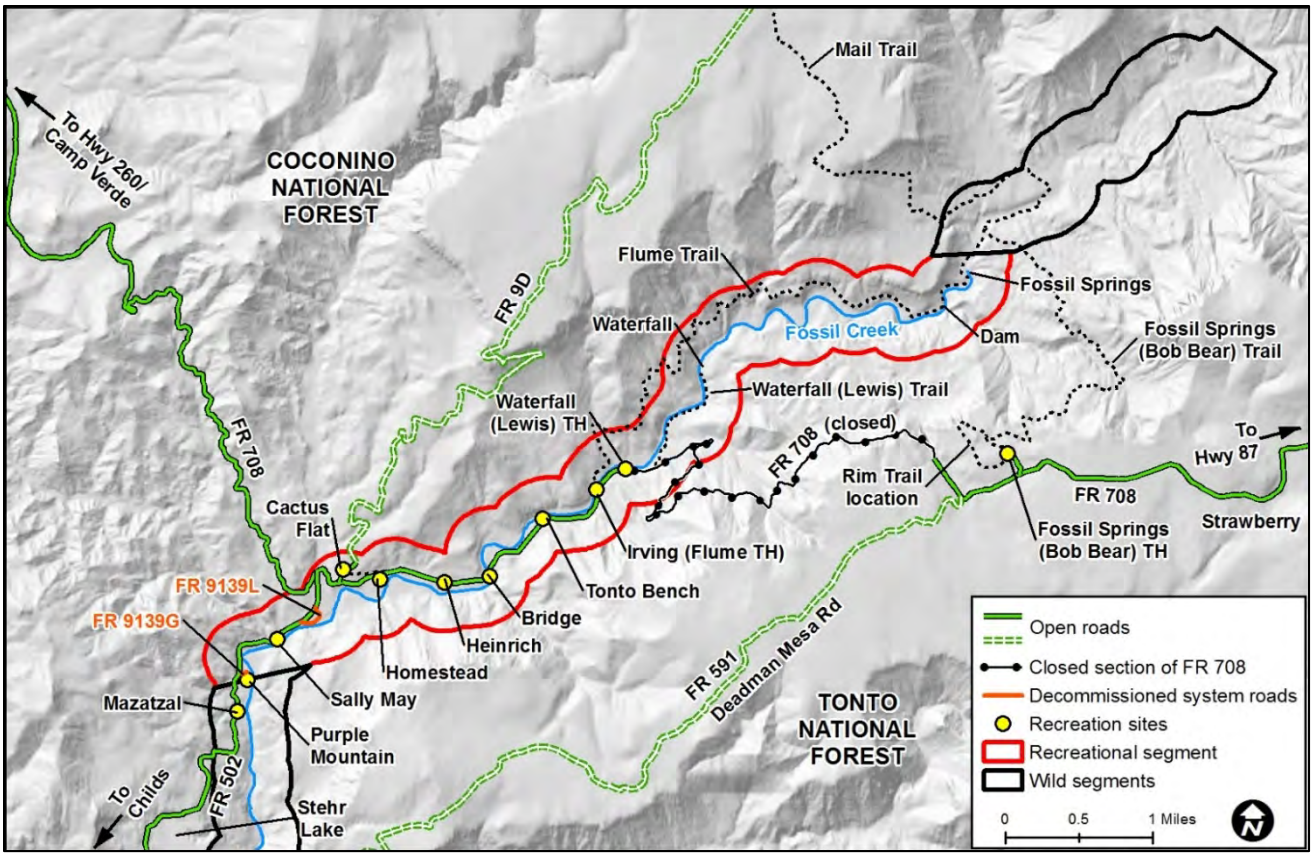

Figure 5-1. Map of roads in the Fossil Creek area

Implementation

At time of approval of the CRMP, motor vehicle access to Fossil Creek via FR 708 from SR 260 will continue. Emergency responders and utility personnel will continue to be allowed to use the closed section of FR 708 and minimal maintenance to provide emergency responder and utility personnel access and reduce erosion on this section of road may occur. The CRMP approves work needed to repair and reopen the closed section of road; however, doing so will require that adequate funding is available for repair and maintenance.

Decommissioned system roads will be removed from the motor vehicle use map (MVUM) in the revision of the MVUM following approval of the CRMP.

Recreation Site Names, Availability, and Amenities

The CRMP authorizes the Fossil Creek recreation sites in table 5-1. Figure 5-2 shows the locations of these recreation sites in the Fossil Creek corridor, and Appendix B includes more detailed maps of each recreation site. A total of approximately 34 acres of developed recreation areas and 24 acres of recreation dispersal areas is encompassed by these recreation sites.[59] The precise type, location, and arrangement of amenities described in table 5-1 within recreation sites will be determined after approval of the CRMP through a separate site design process, and these recreation site components may be adapted over time to address changing needs. Recreation

[59] The term “recreation site” refers to the combined developed and dispersed recreation areas. Developed recreation areas are those areas within recreation sites with the most concentrated development, such as parking and toilets. Developed recreation areas may be disturbed by machinery, building of infrastructure, presence of vehicles, and use by visitors. Recreation dispersal areas are typically adjacent to developed recreation areas or trails where visitors recreate along the creek. In recreation dispersal areas, effects of visitors (ground disturbance, noise disturbance, trash, etc.) are anticipated but no major machinery or infrastructure will be used or built. Minor infrastructure or actions such as signage, hardened trails and armored creek access, and restoration may occur.

site design should be a collaborative process. The number of parking spaces at each recreation site may be adjusted slightly to address management considerations (such as parking lot design); however, the amounts of parking available at each site listed in table 5-1 will serve as a guide for the size of parking areas this CRMP authorizes. Additionally, the total number of parking spaces available across all recreation sites if all recreation sites are developed will not exceed the total number described in this CRMP (202; see the "Future Kinds and Amounts of Use" section of Chapter 4). Parking areas and creek access trails within recreation sites may be armored using existing natural bedrock, permeable pavement, or other materials to reduce erosion potential and increase site sustainability. Runoff retention basins and other drainage features may also be constructed. Barriers such as fencing or rocks may be strategically placed at recreation site boundaries where needed to minimize resource effects outside of the recreation sites. The names of the Waterfall and Fossil Springs trailheads are changed to Dixon Lewis and Bob Bear trailheads, respectively.

Table 5-1. Fossil Creek recreation sites approved by the CRMP

Site	Features
Mazatzal	Approximately 4 parking spaces; amenities such as trash receptacles, sign kiosks, toilet, bike racks; access to Mazatzal Wilderness; possible site of designated camping*.
Purple Mountain	Approximately 6 parking spaces; amenities such as trash receptacles, sign kiosks, toilet, bike racks; possible site of designated camping*.
Sally May	Approximately 10 parking spaces; amenities such as trash receptacles, sign kiosks, toilet bike racks; possible site of designated camping*.
FR 708/502 Junction	Temporary parking; amenities such as vault toilet, sign kiosks, visitor contact station.
Cactus Flat	Possible future new recreation site with approximately 50 parking spaces, some of which may accommodate stock trailers; amenities such as interpretive displays, toilet, trash receptacles, picnic tables, and bike racks; possible site of administrative campsites. Creek access is not available immediately adjacent to this recreation site, so developing a means of providing visitors who park at Cactus Flat with safe access to other recreation sites will need to occur concurrently. Such means may include improved trail connectivity or enhanced transportation options such as a local shuttle. Establishing these means may require additional NEPA analysis.
Homestead	Upper/lower loops: approximately 25 parking spaces; amenities such as toilet, sign kiosks, trash receptacles, picnic tables, shelters, bike racks; possible site of designated camping*. West loop: prioritized for tribal use as needed; toilet available for all use. Potential for portion of area available for group use (e.g. camping for school groups).
Heinrich	Host/administrative site with overnight accommodations, toilet, and storage facilities. Possible future new recreation site with approximately 5 parking spaces; amenities such as sign kiosks, short interpretive trail and/or canopy walk, toilet, and trash receptacles. No public river access.
Fossil Creek Bridge	At time of decision, site will contain approximately 10 parking spaces. Site may be expanded to approximately 15 parking spaces in the future. Amenities such as toilet, sign kiosks, trash receptacles, bike racks.
Tonto Bench	At time of decision, site will contain 21 parking spaces. Parking will be reduced to approximately 15 parking spaces. Amenities such as toilet, sign kiosks, trash receptacles, bike racks; possible site of designated camping*.
Irving	Approximately 18 parking spaces. Amenities such as toilets, sign kiosks, trash receptacles, picnic tables (including group sites), shade ramadas, and bike racks possible on both sides of creek. Possible site of designated camping*. Flume trailhead.
Dixon Lewis (Waterfall) Trailhead and Trail	Approximately 21 parking spaces; amenities such as toilet, sign kiosks, trash receptacles, picnic tables, bike racks; creek access points to creek along the trail.
Bob Bear (Fossil Springs)/ Rim Trailhead	Combined parking for existing Bear Trailhead and new Rim Trailhead. Approximately 30 parking spaces, plus 3 stock trailer spaces with corrals. Amenities such as toilet, sign kiosks, trash receptacles, picnic tables, bike racks. Possible site of designated camping.
Fossil Springs area	Accessible via foot trails. Alternative toilet may be constructed in the future if needed. Designated camping may be established at one or more of the locations shown in Appendix A, figure A-2.
East welcome station	Visitor contact station, with possibility of improved entry area and signage.
Other recreation site infrastructure	Short interpretive trail and/or canopy walk possible at Heinrich. Shade structures with interpretive information possible along FR 708.

*Designated public campsites may be spread among some or all of the specified recreation sites in Middle Fossil, or may be limited to one recreation site. See additional discussion in the "Types of Use" section below.

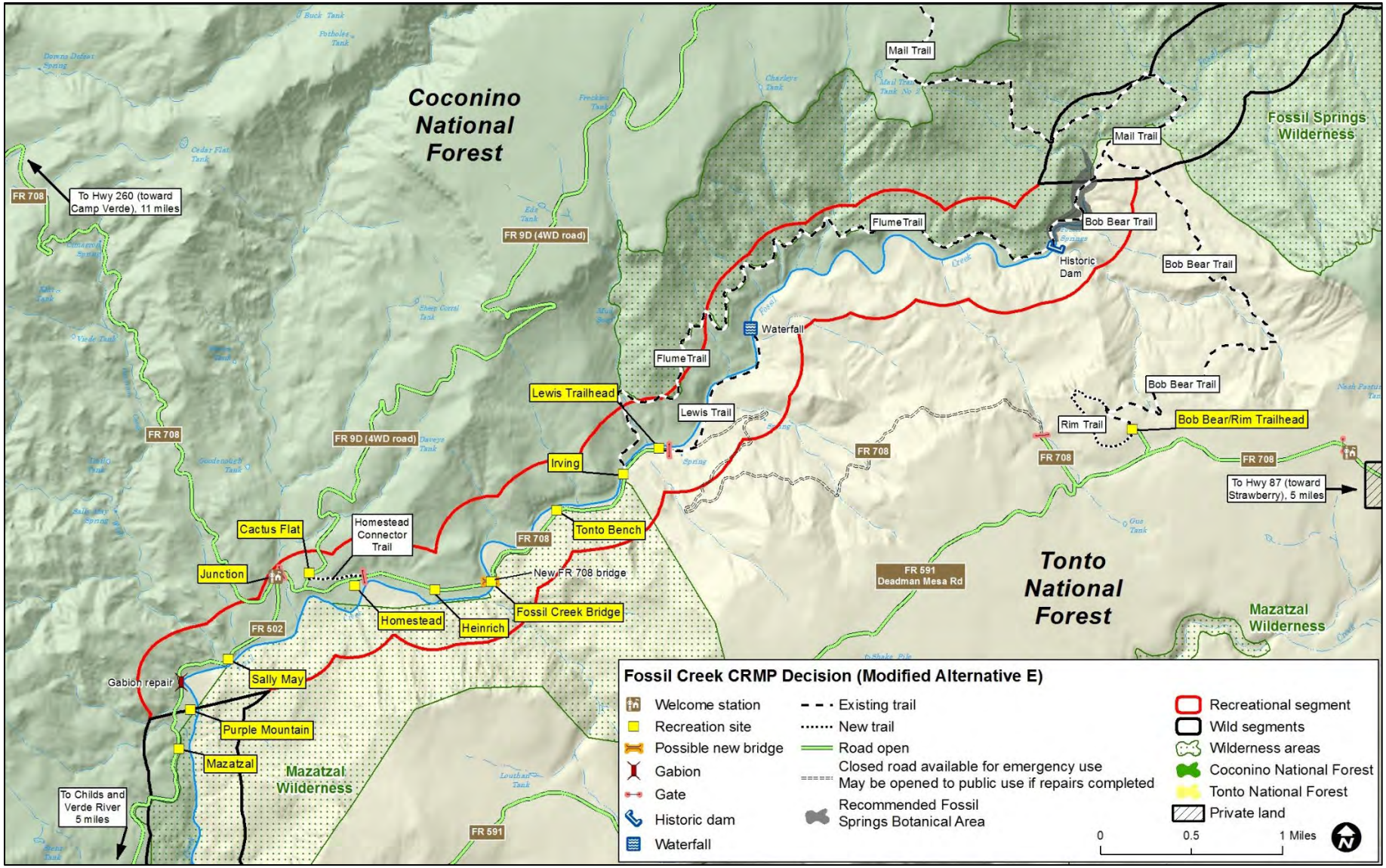

Figure 5-2. Recreation sites, roads, trails, and other features authorized by this CRMP

Implementation

Priority infrastructure development to accommodate the levels of use occurring at time of CRMP approval will be a host/administrative site at Heinrich; any additional toilets that are needed; creek access routes; improvement of the design, drainage, and surfacing of existing parking lots; and kiosks and signage.

Development of new facilities and infrastructure will be necessary in order for visitor numbers to be increased (see the "Future Kinds and Amounts of Use" section of Chapter 4). Development of new facilities and infrastructure associated with increasing visitor numbers (specifically at Cactus Flat, Heinrich, and Fossil Creek Bridge) will occur incrementally and be held to the following criteria:

1) A determination is made based on collaborative monitoring data assessment, professional judgment, and management observations that river values would continue to be protected with additional infrastructure; and
2) An ongoing capacity to conduct monitoring, assess monitoring data, and implement adaptive management actions is maintained.

Other Infrastructure Construction

The CRMP authorizes building a new vehicle bridge across Fossil Creek on FR 708 and augmenting an existing gabion along FR 502. Locations of these features can be seen in figure 5-1.

Fossil Creek bridge: The CRMP approves replacing an existing vehicle bridge across Fossil Creek on FR 708 by building a new bridge adjacent to the existing bridge. The original bridge, which is listed on the National Register of Historic Places, will be retained. If the Forest Service determines that removal of the original bridge is necessary in the future, the proper clearance process will be followed. The new bridge has the following specifications:

- Abutments will be outside of the ordinary high water mark of Fossil Creek.
- The bridge footprint, abutment to abutment, will be approximately 7,200 square feet.
- The construction footprint, including new roadway alignments at the approaches, will be approximately 19,800 square feet.
- The bridge will be designed to pass the 100-year flood event with a minimum of two feet of clearance above the water level.

Fossil Creek bridge implementation: Construction of the new bridge is anticipated to occur soon after the CRMP is approved, depending on funding availability. Use of equipment within the ordinary high watermark of Fossil Creek is not anticipated. Construction activities are anticipated to occur over 150-270 days.

FR 502 gabion: The CRMP approves actions to protect FR 502 from erosion by high flows in Fossil Creek at the location of the existing gabion between the Sally May and Purple Mountain recreation sites. Actions may consist of placing large boulders in the stream channel immediately adjacent to the downstream side of the existing gabion and/or extending the downstream side of the gabion with rock-filled wire baskets similar to those used in the current gabion's construction. If the existing gabion is repaired and extended, approximately 180 linear feet of stream channel (amounting to approximately 1,300 square feet of disturbance area) would be affected.

FR 502 gabion implementation: Actions related to the FR 502 gabion are anticipated to occur soon after the CRMP is approved. Placing boulders to augment the existing gabion may occur first; if this does not address the erosion issue, extending the gabion may occur. If possible, boulders will be sourced locally and placed in the stream channel with equipment operating from the road; however, use of equipment in the stream channel may be required. Construction activities are anticipated to occur over 30-45 days, and will occur at baseflow conditions (so streamflow is not directly affecting the construction site).

Types of Use

Management of Fossil Creek under the CRMP will provide for a full range of **river-related recreational opportunities**, such as swimming, hiking, boating, exploring wilderness and cultural features, and viewing scenery, wildlife, fish, and plants/wildflowers, year-round. Hunting and fishing will continue to be available in accordance with Arizona Game and Fish Department regulations. Equestrian and bicycle use will continue to be available on certain trails. Bicycle use will continue to be available on National Forest System roads in vicinity of corridor.

The CRMP authorizes future establishment of up to ten designated **campsites** at Mazatzal, Purple Mountain, Sally May, Homestead, Tonto Bench, and/or Irving; up to three administrative campsites at Cactus Flat; up to four designated campsites at Bob Bear/Rim Trailhead; and up to three designated campsites in the Fossil Springs area. Dispersed backcountry camping will continue to be allowed in wild segments beginning 1/4 mile upstream of the Bob Bear Trail in the Fossil Springs wild segment and 1/4 mile downstream of the Mazatzal recreation site in the Mazatzal wild segment. The location of designated campsites will be determined through the recreation site planning process. All ten designated campsites in Middle Fossil may be established at one recreation site, or they may be dispersed among multiple recreation sites, depending on what arrangement is determined to best meet management and river value protection needs. Designated campsites in the Fossil Springs area may be established at one or more of the locations shown in Appendix B, figure B-2.

The CRMP does not provide for separate **scenic driving** permits during the high-use season. During the high-use season, visitors who desire to drive into the Fossil Creek corridor will be required to have a day use permit. Because access is not restricted during the low-use season, no restriction on scenic driving will exist during this time.

A needs assessment and prospectus for **outfitter/guide use** in the Fossil Creek corridor will be completed separately as necessary. This process will evaluate the appropriate types, locations, and amounts of permitted uses. Outfitter/guide use will not increase visitor numbers beyond maximum corridor capacity.

The CRMP provides for **research, educational, and volunteer opportunities** throughout the Fossil Creek corridor. Minor amounts of ground disturbance may be associated with research activities. Use associated with these activities will not increase visitor numbers beyond maximum corridor capacity.

Implementation

Day use, research, educational, and volunteer opportunities will continue to be available immediately upon approval of the CRMP. Specific requests for research, educational, and volunteer activities will be evaluated as they are proposed, and permitted, if appropriate, based on this evaluation. A needs assessment and prospectus for outfitter/guide use will be completed in the future as necessary.

Until designated campsites are established, dispersed camping will continue to be allowed during the low-use season downstream of the Fossil Creek Bridge and upstream of the historic dam. Once designated camping is established, it may be available year-round.

Non-Motorized Trails

The CRMP authorizes an expanded trail system in and around the Fossil Creek corridor (figure 5-2). The heavily used 0.9-mile Waterfall Trail will be designated as an official National Forest System trail open to foot travel and be re-named the Dixon Lewis Trail. The existing 4-mile Fossil Springs Trail will remain open to foot and equestrian travel and be re-named the Bob Bear Trail. The existing 4.5-mile Flume Trail will remain open to foot and equestrian travel. Two new trails will be constructed—a 0.3-mile connector trail between Cactus Flat and Homestead open to foot, equestrian, and bicycle use if parking is implemented at Cactus Flat; and the Rim Trail, which will be a one-mile loop trail on the canyon rim near the Bob Bear Trailhead and be open to foot, equestrian, and bicycle use. Additionally, the CRMP authorizes delineation and improvement (activities such as rock work, drainage, and signage) of a total of approximately one mile of trails from parking areas to creekside locations.

Implementation

The Dixon Lewis, Bob Bear, and Flume trails will continue to be available for use immediately upon approval of the CRMP. Construction of the Cactus Flat-Homestead connector and Rim trails will occur in the future as funding is available. Construction of the Cactus Flat-Homestead connector will occur if a parking area is constructed at Cactus Flat. Delineation of creek access trails will be completed as needed or in association with other recreation site improvements.

Restoration

Unauthorized trails, bare areas outside of recreation sites, decommissioned system roads, and unauthorized roads will be restored with a variety of methods such as using vegetation or other materials to discourage use and encourage natural revegetation; surface scarification, seeding, and temporary barriers; or other techniques likely to be effective. Approximately 35 acres of bare areas[60], 4 miles of unauthorized trails, 0.8 miles of unauthorized roads, and 0.3 miles of decommissioned system road are planned for restoration (figure 5-3). Additional restoration of new disturbance within and around the Fossil Creek corridor is possible as an adaptive management action, as described in Chapter 6.

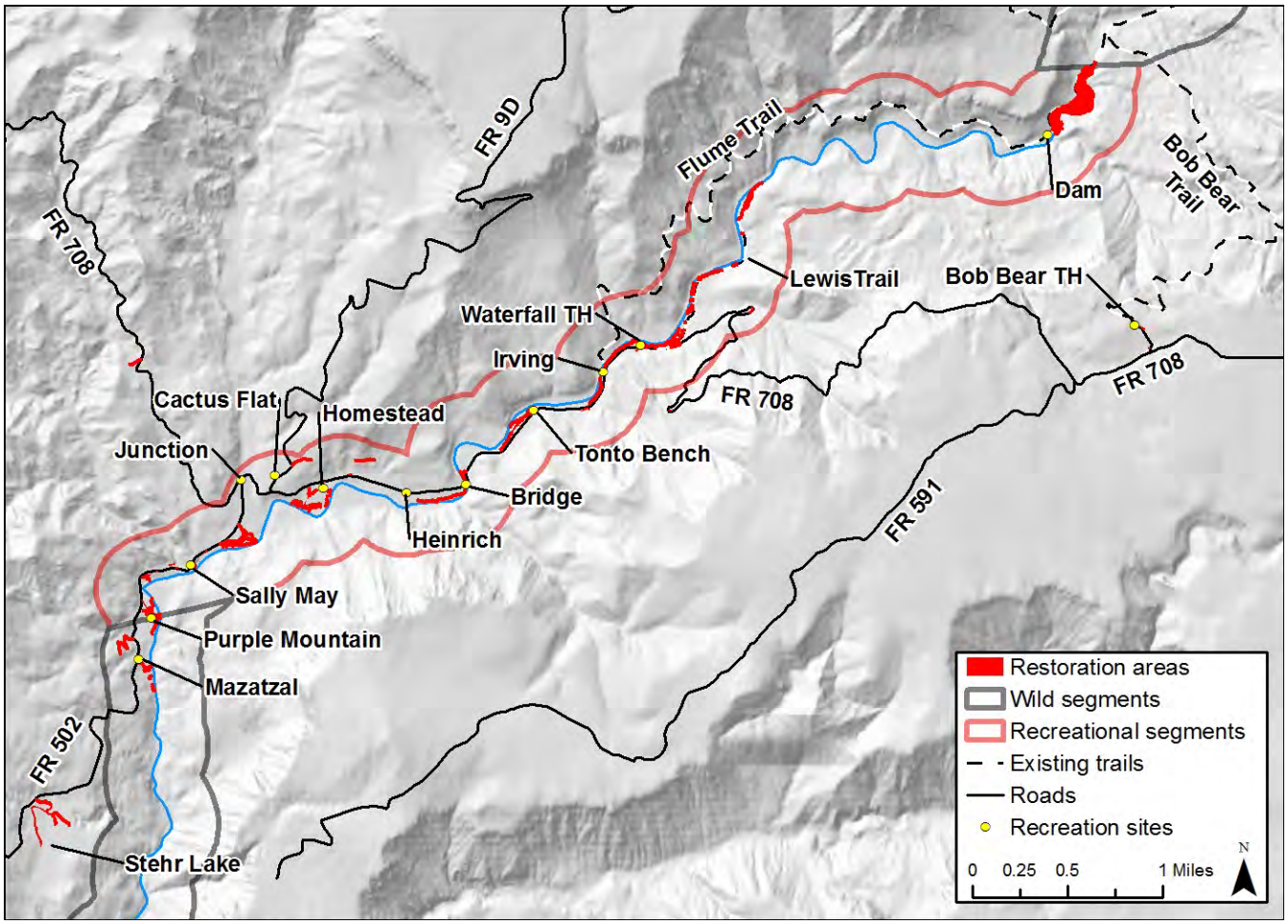

Figure 5-3. Restoration areas in and around the Fossil Creek corridor

[60] In some cases, only a portion of the area within the 35 acres identified for restoration will have restoration actions implemented. For example, the large area shown in figure 5-3 near Fossil Springs encompasses numerous unplanned trails and campsites. In this area, trails and campsites that are not needed for camping as authorized by the CRMP will be restored, but the amount of restoration encompass less area than indicated in figure 5-3. These areas of disturbance were included within the larger area for purposes of analysis.

Implementation

Restoration activities will be prioritized in areas with hydrological connectivity with Fossil Creek, or sensitive cultural or natural resources, or where disturbance is adversely affecting achievement of management objectives.

Section 7 Analysis

Section 7 of the Wild and Scenic Rivers Act directs federal agencies to protect the free-flowing condition and other values of wild and scenic rivers. A Section 7 determination is required for any water resources project[61] proposed within or below, above, or on a stream tributary to Fossil Creek. The Section 7 analysis will determine whether a proposed water resources project within Fossil Creek would have a "direct and adverse" effect on Fossil Creek or whether a proposed water resource project below, above, or on a stream tributary would "invade" Fossil Creek or "unreasonably diminish" its river values. More guidance on the Section 7 process can be found in the IWSRCC technical report *Wild & Scenic Rivers Act: Section 7* (IWSRCC 2004).

A Section 7 analysis has been completed for the two water resources projects authorized by the CRMP (bridge and gabion). Future water resources projects proposed within or below, above, or on a stream tributary to Fossil Creek will be subject to the appropriate Section 7 analysis described in current guidance.

Management Actions Suggested by Commenters

During the 2018-2019 Notice and Comment period, commenters provided a variety of management suggestions of an operational nature. This section includes a list of these management suggestions. The CRMP does not require implementation of actions on this list; instead, they are included as possible tools that may be helpful for managing Fossil Creek and protecting and enhancing the river values. This list is by no means exhaustive. Comment numbers in parentheses indicate the source of the suggestion and correspond with comment numbers in Appendix G of the EIS.

- Open the Strawberry gate at first light each day (instead of at 8:00 am) to allow people to hike the Fossil Springs Trail at a cooler time of day. (AC-07)
- Provide an overnight parking permit during peak season to allow backpackers to park overnight. (AC-11)
- Give priority parking to whitewater boaters at the Dixon Lewis (Waterfall) Trailhead and the Fossil Creek Bridge. (AC-12)
- Provide access, including creek access, to Fossil Creek to those with mobility issues. (AC-19)
- Use volunteers to help manage or staff the area. (RM-05)
- Close Fossil Creek one weekend per month to the public so volunteers can pick up trash, clean restrooms, and complete other projects. (RM-06)

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[61] Water resources projects are proposed in the bed or banks of a designated river or congressionally authorized study river and are proposed by a federal agency or require some type of federal assistance such as a permit, license, grant, or loan. Water resources projects include any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act, or other construction of developments that would affect the free-flowing characteristics of a wild and scenic or congressionally authorized study river. Water resources projects may include dams, water diversion projects, fisheries habitat and watershed restoration/enhancement projects, bridges and other roadway construction/ reconstruction projects, bank stabilization projects, channelization projects, levee construction, recreation facilities such as boat ramps and fishing piers, and activities that require a 404 permit from the Army Corps of Engineers.

"Bed or banks" is limited to the area within the ordinary high water mark of the river. The ordinary high water mark is defined in 33 CFR Part 328.3(c)(6) as "…that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

- To reduce the number of permits that go unused, prohibit people from obtaining a permit the next season if they are a no-show or a no-cancel. (PM-02)
- Provide the public an opportunity to report vandalism or littering through a phone application. The tool could provide details for enforcement. (RM-07)
- When establishing camping infrastructure, consider providing consistent design that offers a primitive visitor experience, with tent pads, picnic tables, restrooms, and trash receptacles. (RM-25)
- Require use of WAG bags for camping in the Fossil Springs area. (RM-27)

Chapter 6. Monitoring and Adaptive Management

Introduction

This chapter provides the monitoring and adaptive management plan for the Fossil Creek Wild and Scenic River (WSR). A monitoring strategy is a key element of a comprehensive river management plan (CRMP) and is important to helping ensure visitor use does not degrade river values (IWSRCC 2002; IWSRCC 2018). The purposes of this plan are to: 1) provide an adaptable framework for evaluating the effects implementing the CRMP has on Fossil Creek's river values; 2) reveal any need to adapt management to protect river values and maintain or make progress toward desired conditions outlined in Chapter 3; 3) determine whether actions to implement components of the CRMP, such as infrastructure development or visitor number increases, are appropriate; and 4) outline a variety of adaptive management actions the Forest Service may take to address adverse impacts that are detected.

Plan Development

This monitoring and adaptive management plan has been developed collaboratively. Stakeholder and public participation throughout the planning process have helped define river values, determine desired conditions, and identify management concerns. Engagement with subject matter experts in other agencies and organizations, especially through the Verde Front's Fossil Creek Working Group, has helped inform monitoring indicators and thresholds and the overall structure and implementation strategy of this plan. This collaborative process should continue with implementation of this plan.

Structure of the Plan

The monitoring and adaptive management plan is critical to ensuring the Forest Service meets its management requirements under the Wild and Scenic Rivers Act (WSRA). WSRA mandates protection of river values via a "nondegradation and enhancement" policy.[62] Degradation and enhancement are not specifically defined by the WSRA; however, protection is considered to be the elimination of adverse impacts on river values (IWSRCC 2002). However, "adverse impacts" are not defined, either. As a result, specific definition of adverse impact, degradation, protection, and enhancement with respect to the river values falls to the CRMP. General definitions of these terms for each river value are provided in Chapter 2, "River Corridor Resources." The monitoring plan in this chapter then provides indicators and associated metrics for each river value to determine its condition, specific thresholds that correspond with points at which adverse impact or degradation are threatened, and adaptive management actions that may be taken if thresholds are reached. Indicators were selected based on their relationship to river values, ease of measurement, precision, sensitivity to management under the CRMP, and, when possible, their ability to provide information about multiple river values. For each indicator, threshold(s) were identified that signify degrees of movement toward degradation of river values. Soft thresholds represent the point at which adverse impacts may be at risk of occurring. Hard thresholds represent the point at which adverse impacts pose a more serious threat to the condition of river values, threatening degradation. The thresholds are decision points that indicate, barring mitigating circumstances, adaptive management action(s) is warranted to ensure protection of river values. In some cases, only one threshold is defined. Some components of the monitoring plan may need to be adjusted in the future as better data are collected; the process for modifying the plan is described in the "Future Plan Modification" section below.

In the plan, monitoring and adaptive management related to multiple river values, specifically, monitoring plan implementation and unplanned bare soil, are presented first. The remainder of the plan is organized by river value

[62] WSRA §1(b) states that wild and scenic rivers "…shall be protected for the benefit and enjoyment of present and future generations." §3(d)(1) requires that CRMPs "…provide for the protection of river values." §10(a) requires that wild and scenic rivers "be administered in such a manner as to protect and enhance the [river] values…." This latter provision is interpreted as the nondegradadtion and enhancement policy (IWSRCC 2002).

(water, biological, geology, recreation, and cultural values). In this portion, monitoring and adaptive management prescribed by the CRMP are described for each river value and other existing monitoring efforts or regulatory processes related to the river values (e.g. fish species monitoring) are summarized when applicable.[63] Table 6-1 summarizes indicators included in the plan, measurement frequency, and associated river values. Table 6-2 provides a calendar of monitoring activities for the first six years of CRMP implementation. Changes in management such as increases in visitor numbers or implementation of adaptive management actions may necessitate greater measurement frequency.

Table 6-1. Fossil Creek monitoring plan topics, frequency, and connected river values

Monitoring topic	Measurement frequency (once conditions at time of decision are obtained)	Connected river value
Monitoring and adaptive management plan implementation tracking	Annually	All
Bare soil	Annually	All
Stream flow	Annually	All
Potential for delivery of sediment or fecal matter to Fossil Creek	Annually	Water
Common black-hawk occupied territories	Every 3-5 years. If threshold reached, or adaptive management implemented, monitoring in following breeding season	Biological
Fossil springsnail habitat condition	Periodically or when an activity at an occupied spring results in habitat impacts	Biological
Fossil springsnail populations	At least every third year	Biological
Aquatic macroinvertebrate Index of Biological Integrity	Annually	Biological
Cass A or E non-native plant species	1/3 of corridor each year	Biological
Impacts to travertine dams attributable to visitor use	At least annually; twice a year or seasonally if possible	Geology
Visitor use data	Annually	Recreation
Visitor satisfaction	At least every 5 years. Conduct surveys within 2 years of major adaptive management actions	Recreation
Opportunity for river-based recreation	Annually	Recreation
Satisfaction of traditional cultural practitioners	Annually	Cultural Values
Visitor use impacts at specific cultural sites	Annually. If no impacts are observed for two consecutive monitoring cycles, the monitoring interval will be increased to once every three years. Annual monitoring will recommence if impacts are observed.	Cultural Values

Table 6-2. Calendar of annual monitoring, years 1-6

Monitoring topic	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Monitoring and adaptive management plan implementation tracking	X	X	X	X	X	X

[63] The CRMP is not the authority requiring these other monitoring efforts and regulatory processes; their inclusion in this document is simply to provide context related to other efforts or requirements that may support protection or contribute to understanding of the river values.

Monitoring topic	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Bare soil	X	X	X	X	X	X
Stream flow	X	X	X	X	X	X
Potential for delivery of sediment or fecal matter to Fossil Creek	X	X	X	X	X	X
Common black-hawk occupied territories	X			X		
Fossil springsnail habitat condition[1]	X			X		
Fossil springsnail populations	X			X		
Aquatic macroinvertebrate Index of Biological Integrity	X	X	X	X	X	X
Cass A or E non-native plant species[2]	X	X	X	X	X	X
Impacts to travertine dams attributable to visitor use[3]	X	X	X	X	X	X
Visitor use data	X	X	X	X	X	X
Visitor satisfaction[4]	X					X
Opportunity for river-based recreation	X	X	X	X	X	X
Satisfaction of traditional cultural practitioners	X	X	X	X	X	X
Visitor use impacts at specific cultural sites[5]	X	X			X	

[1]Fossil springsnail habitat condition to be monitored periodically or when an activity at an occupied spring results in habitat impacts
[2]Monitor 1/3 of the river corridor for Class A or E non-native plant species each year
[3]Monitor travertine at least annually; twice a year or seasonally if possible
[4]Monitor visitor satisfaction at least every 5 years. Conduct surveys within 2 years of major adaptive management actions
[5]Monitor visitor use impacts at specific cultural sites annually. If no impacts are observed for two consecutive monitoring cycles, the monitoring interval will be increased to once every three years. Annual monitoring will recommence if impacts are observed.

Adaptive Management

Adaptive management refers to a "rigorous approach for learning through deliberately designing and applying management actions as experiments" (Murray and Marmorek 2003). Adaptive management is a structured decision process that promotes flexible decision making that can be adjusted in the face of uncertainties or disagreements as outcomes from management actions become better understood (SDR 2018). Adaptive management is particularly well suited when decision making is iterative through time, as is provided for by the CRMP with incremental changes to infrastructure and visitor numbers. Monitoring is an essential element of adaptive management, so monitoring and adaptive management are presented together in this chapter. The Interagency Wild and Scenic Rivers Coordinating Council identifies adaptive management as a critical tool for managing user capacity in wild and scenic rivers (IWSRCC 2018).

The adaptive management actions described in this plan are intended to facilitate protection and enhancement of Fossil Creek's river values by providing managers flexibility and efficiency in their response to unanticipated effects of management actions and changing environmental and social conditions. Example adaptive management actions are associated with each monitoring indicator.

Plan Implementation

A structured collaborative and, where possible, citizen science-based approach to monitoring, assessing monitoring data, recommending and implementing adaptive management actions and components of the CRMP, and documenting the process should be used. Partners, community members, and subject matter experts can lend valuable expertise and institutional knowledge to this process, and a broad-based approach can increase capacity, promote innovation, develop a shared sense of stewardship, and build trust in the management of Fossil Creek. This collaborative process will be described separately from this CRMP. Separate research related to the river values is encouraged, as it will further understanding of the Fossil Creek environment and facilitate interpretation of monitoring data and refinement of this monitoring plan. However, this plan does not prescribe specific research.

The process of implementing components of the CRMP, monitoring, and adaptive management is iterative (figure 6-1):

1. Implementation of the CRMP will begin with actions to protect and enhance river values, with visitor numbers held at levels existing at the time of the CRMP decision. These actions may include recreation site and transportation infrastructure enhancements and restoration. These actions will be subject to resource protection measures (described in Appendix A) in order to minimize anticipated impacts.
2. Monitoring will be conducted to evaluate the effects of management actions on the river values and help determine whether river values are protected.
    a. If assessment of monitoring data indicates Fossil Creek's river values are protected under the current management, that management will continue, or additional actions such as increasing visitor numbers may be implemented. Any increases in visitor numbers will be held to the following requirements:
        i. A determination is made based on collaborative monitoring data assessment, professional judgment of resource professionals, and on-the-ground observations of managers that river values would continue to be protected with additional visitor use and the infrastructure necessary to support that use;
        ii. An ongoing capacity to conduct monitoring, assess monitoring data, and implement adaptive management actions is maintained; and
        iii. Facilities and infrastructure that are able to support higher amounts of use are established.
    b. 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.
3. Additional monitoring using the CRMP's monitoring plan will be conducted to assess effects of ongoing management actions or whether adaptive management actions are supporting the elimination of adverse impacts.
4. If assessment of monitoring data indicates adverse impacts are no longer occurring, management activities as modified by adaptive management actions will continue. However, if assessment of monitoring data indicates adverse impacts are continuing to occur, or if the data indicate movement toward a hard threshold, additional adaptive management actions will be implemented.
5. Each set of adaptive management actions will be followed by additional monitoring using the CRMP's monitoring plan.

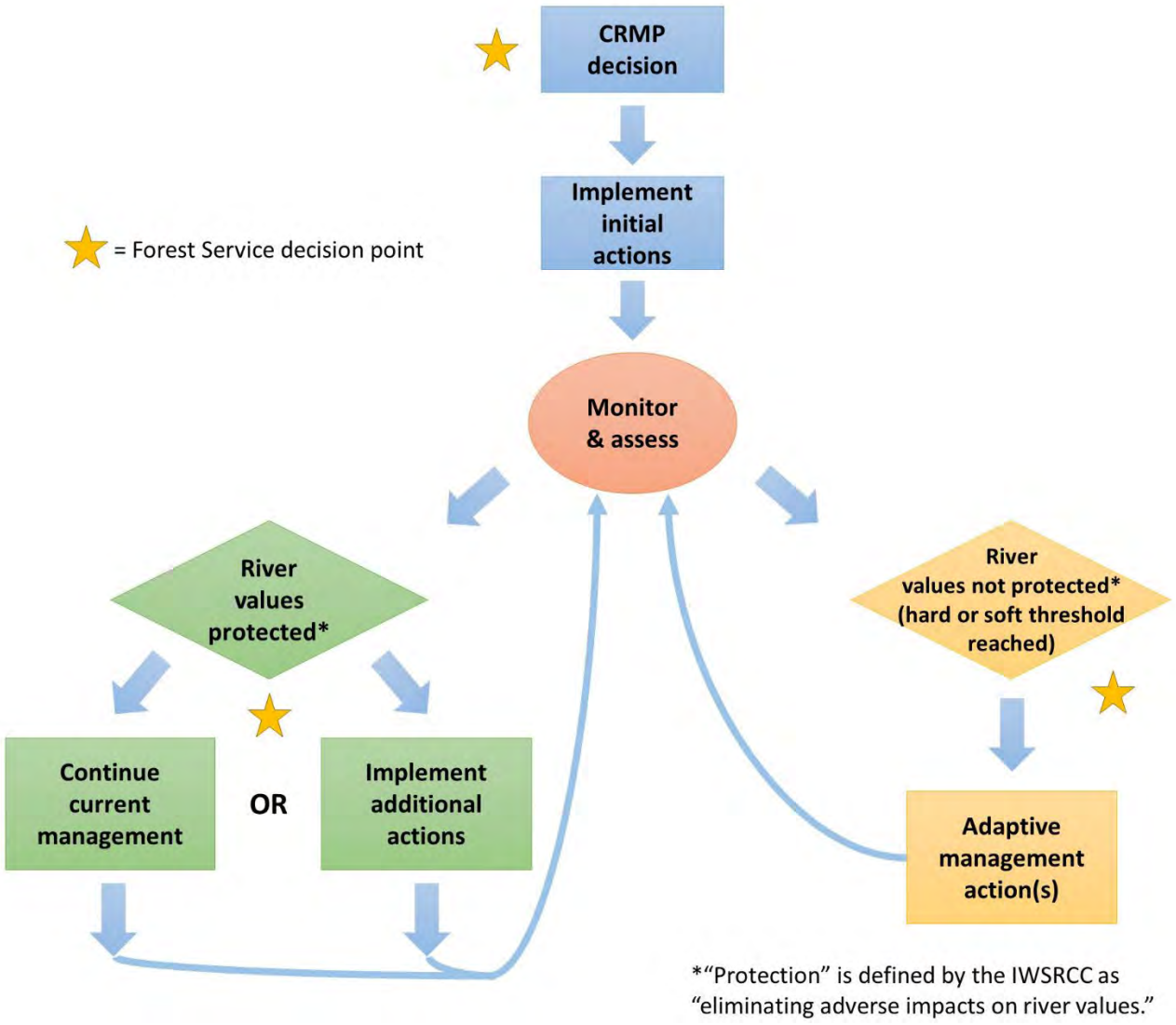

Figure 6-1. Fossil Creek CRMP implementation, monitoring, and adaptive management cycle

Several possible adaptive management actions are listed for most indicators; however, not all actions must be implemented at once. Generally, a less restrictive or intensive action or group of actions should be implemented first, and more restrictive or intensive actions taken if the initial actions do not achieve the desired result. Adaptive management actions for hard thresholds are typically more management intensive; however, if a hard threshold is reached, less restrictive adaptive management actions associated with soft thresholds may also be used if anticipated to be successful. Additionally, if a soft threshold is reached, a more intensive adaptive management action associated with a hard threshold may be taken if doing so is determined to be the best option for addressing the adverse impact. While adaptive management actions would typically be implemented following assessment of monitoring data, if at any point an action must be taken to prevent river value degradation, doing so will not be dependent on waiting for the end of the monitoring data assessment period.

When assessing monitoring data, it is important to consider the impact factors outside of management control such as floods, fire, climate change, or drought that may be having on resource conditions. Adaptive management prescribed by this plan is intended to respond to adverse impacts caused by visitor use and management activities because these factors are controlled by the CRMP. Understanding the influence of other factors such as drought will help managers determine whether adverse impacts are caused by factors under the control of the CRMP, by other stressors, or by a combination of factors. This understanding will help determine the best approach to implementing the CRMP and adaptive management.

Future Plan Modification

The monitoring plan may be modified if more effective or efficient monitoring methodologies become available; if changes to objectives, indicators, metrics, measurement and assessment frequencies, or thresholds are needed as understanding of the river values improves; to more effectively answer monitoring questions; or to better ensure protection of river values. In particular, where additional monitoring of conditions for certain indicators is needed to establish conditions at time of CRMP approval, thresholds may need to be adjusted in response to the findings. Assessing the need for modifying the monitoring plan should occur at established intervals and be completed in collaboration with appropriate partners, community members, and subject matter experts. Any modifications will be documented in the project file and the CRMP will be updated administratively.

Monitoring and Adaptive Management for Multiple River Values

This section contains monitoring and adaptive management that applies to multiple river values, specifically monitoring plan implementation and unplanned bare soil.

Monitoring and Adaptive Management Plan Implementation

Management of Fossil Creek under the CRMP represents a substantial shift from a relatively unmanaged but heavily used area to an environment where visitor use is managed under a comprehensive set of guiding principles. Although the implementation of interim measures in the years leading up to completion of the CRMP marked the beginning of this shift, there is uncertainty about how Fossil Creek's river values will respond to changing management, particularly changes in visitor numbers. As a result, implementing the monitoring plan is critical to supporting broader CRMP implementation by detecting unanticipated effects and informing the appropriateness of management actions or the need for corrective action. This indicator (table 6-3) tracks monitoring plan implementation and links the ability to implement components of the CRMP (such as increasing visitor numbers) to the completion of monitoring as planned and to anticipated capacity to conduct monitoring, assess monitoring data, and implement adaptive management actions in the coming year. Additionally, this indicator includes assessment of the need to update the monitoring plan to improve its efficiency or effectiveness.

Table 6-3. Monitoring and adaptive management plan implementation tracking

Plan Element	Detail
Objective	Conduct monitoring according to the Fossil Creek CRMP monitoring plan in order to protect river values, inform CRMP implementation, and highlight the need for adaptive management actions. Maintain capacity to conduct monitoring, assess monitoring data, and implement adaptive management actions. Monitoring plan continues to be efficient and effective.
Indicator	Implementation of the monitoring plan; capacity for plan implementation, data assessment, and adaptive management in the coming year; need to update the monitoring plan.
Metric	Answers to the following questions: Was monitoring implemented as planned in the past year? Are funding and personnel available to implement the monitoring plan and assess monitoring data in the coming year? Are funding and personnel available to implement adaptive management actions, if needed? Are updates to the monitoring plan needed to increase the plan's efficiency or effectiveness?
Measurement Frequency	Every year.
Assessment Frequency	Every year.
Threshold	Monitoring was not implemented as planned in the past year or funding/personnel are not anticipated to be available to implement the monitoring plan, assess monitoring data, or implement adaptive management actions in the coming year. New science, methodologies, or understanding of the river values are available that would improve the plan's efficiency or effectiveness but are not reflected in the monitoring plan.
Adaptive Management Actions	Investigate factors contributing to reaching the threshold. Accordingly, one or more adaptive management actions such as the following may be taken: • Pursue funding (such as grants or fees) to expand capacity. • Pursue partnerships to expand capacity.

Plan Element	Detail
	• Pursue technological tools that may increase capacity or efficiencies. • Do not implement components of the CRMP (such as visitor number increases) that have the potential to adversely impact river values until implementation of the monitoring plan is possible. • Update the monitoring plan to include the best available science and methodologies.
Expected Outcomes	Monitoring and adaptive management capacity are adequate and allow for CRMP implementation. If capacity is inadequate, actions are not taken that have the potential to adversely impact river values. The monitoring plan efficiently and effectively indicates the condition of the river values.
Indicator of Success	Monitoring, data assessment, and adaptive management are conducted as planned, thereby supporting implementation of the CRMP and protection of river values, and informing management changes. The monitoring plan uses the best available science and methodologies.

Bare Soil

Management of Fossil Creek under the CRMP is designed to promote visitor use within planned recreation sites (which include both developed and dispersed recreation areas), roads, and trails and maintain areas outside of these locations (refugia) in a condition that is relatively undisturbed by visitor use. Detecting areas of bare soil such as unauthorized trails outside locations of planned visitor use will serve as an early indicator of effects caused by visitor use that, if allowed to persist, may adversely impact water quality, key habitat components such as functioning riparian areas and travertine deposition, and cultural values. Bare soil monitoring is designed to detect impacts well before they reach the point at which they cause declines in riparian function, so adaptive management actions are tied to bare soil monitoring rather than less sensitive monitoring approaches such as riparian function assessments.

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 that are impacted by the condition of refugia areas. To accomplish this, 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 will be monitored (table 6-4). Data will be further classified by vegetation type (riparian, mesquite bosque, or upland) and proximity to occupied common black-hawk nest sites. Proximity to common black-hawk nest sites (defined as within 300 yards of nests) will be used for early detection of visitor use that may adversely impact common black-hawk habitat and populations, because this species is a key component of the biological ORV and an indicator for potential impacts to other species. Additionally, bare soil monitoring within specific culturally sensitive sites will be used to ensure visitor use is not adversely impacting these sites. Monitoring of culturally sensitive sites is described fully in table 6-16 in the Western Apache and Yavapai Tradition and Contemporary Cultural Values section. Bare soil monitoring should be completed in conjunction with dispersed recreation BMP monitoring (table 6-5) to provide additional information about potential water quality impacts.

When collecting and assessing monitoring data, bare soil resulting from natural events will be distinguished from disturbance resulting from visitor use. For example, floodplains scoured by flooding or bare patches of uplands where vegetation has been affected by drought will be excluded from the results.

Table 6-4. Bare soil monitoring and adaptive management

Plan Element	Detail
Objective	Minimize disturbance from visitor use in refugia areas outside of planned recreation sites, roads, and trails.
Indicator	Unauthorized trails or other bare soil resulting from visitor use outside of planned recreation sites, roads, and trails, classified by vegetation type, hydrological connectivity to Fossil Creek, and proximity to springs and occupied common black-hawk nest sites.
Metric	Acres and/or miles, location, and hydrological connectivity to Fossil Creek of bare soil caused by visitor use, including distance from occupied common black-hawk nest sites.
Measurement Frequency	Initial data are collected to assess the extent of bare soil at the time of decision, then at least every year, at a minimum at the end of the high-use season.

Plan Element	Detail
Assessment Frequency	At least every year.
Soft Threshold	New unauthorized trails or other areas of bare soil caused by visitor use are detected in refugia areas.

Adaptive Management Actions	One or more adaptive management actions such as the following may be taken:
	• Investigate factors contributing to visitors recreating outside of recreation sites (such as through observations of visitor behavior and distribution or formal or informal visitor surveys; see table 6-12) to determine what adaptive management actions are most likely to be effective at encouraging recreational use within planned recreation sites, roads, and trails. Accordingly, actions such as the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation.
	  • Increase signage, education and outreach efforts, or ranger presence.
	  • Improve amenities (such as toilets, picnic areas, and creek access points) within recreation sites to encourage use within recreation site boundaries.
	  • Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing.
	  • Adjust the timing, location, or management (such as through permitting) of camping or other types of use.
	  • Improve road and trail construction and/or maintenance.
	  • Change permit terms for outfitters/guides or other special uses if the permitted activities are found to be increasing bare soil in refugia areas.
	• Restore unauthorized trails or other human-caused bare soil in refugia areas using passive or active techniques, with priority given to locations that are hydrologically connected to Fossil Creek, near springs, or within 300 yards of common black-hawk nest sites.
	• If unauthorized trails or bare soil resulting from visitor use are detected within 300 yards of common black-hawk nests, conduct nest monitoring (see table 6-6) in the breeding season following implementation of adaptive management actions to assess changes in nesting status.

Hard 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.

Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken:
	• Actively restore unauthorized trails or other bare soil areas in refugia areas.
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use.
	  • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.
	  • Reduce corridor-wide visitor numbers.
	• Relocate portions of roads or trails contributing to impacts.
	• Implement short- or long-term closures of specific location(s) or specific kinds of use (such as camping) within the WSR corridor.

Expected Outcomes	Unauthorized trails or other areas of bare soil caused by visitor use in refugia areas are detected and eliminated. Visitor use occurs within planned locations and does not result in new impacts to refugia areas.
Indicator of Success	Bare soil in refugia areas that can be attributed to visitor use is absent or decreases year-to-year.

Other Monitoring Related to Multiple River Values

Road Condition Assessments

The condition of National Forest System roads is assessed formally and informally. Road condition information will be used to prioritize maintenance and other actions to reduce road impacts within the WSR corridor.

Monitoring and Adaptive Management for Specific River Values

This section contains monitoring and adaptive management that applies to specific river values (water, the biological ORV, geology ORV, recreation ORV, and traditional and contemporary cultural values ORV). Additionally, when applicable, it summarizes other existing monitoring efforts or regulatory processes related to the river values. Finally, it summarizes other general monitoring that occurs in the Fossil Creek area that may provide useful context when assessing monitoring data related to the river values.

Water

Monitoring prescribed by the CRMP is intended to support detection of conditions that may adversely impact key components of Fossil Creek's water. In addition to the monitoring described below, bare soil monitoring described in the "Monitoring and Adaptive Management for Multiple River Values" section above directly relates to factors that may adversely impact Fossil Creek's water. Separate requirements such as the WSRA Section 7 analysis process that also facilitate protection of the water river value are described in this section.

Water Quantity

Flow data from the USGS stream gage located at the Fossil Creek Bridge (no. 09507480) will be 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). 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.

Water Quality

WSRA requires the Forest Service to protect Fossil Creek's water quality as a component of its river values. Water quality is affected by many variables within a watershed including land use, soil and vegetation conditions, and climate. The CRMP will assess potential impacts to water quality through bare soil monitoring (table 6-4) and dispersed recreation impact monitoring (table 6-5). These indicators are 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 indicators such as water-borne sediment and fecal bacteria that reflect pollution that is already occurring and that may be influenced by factors not related to visitor use.

Dispersed recreation impact monitoring is used to evaluate undeveloped recreation areas that tend to have concentrated use by humans. This monitoring is related to the Forest Service's National Best Management Practices Program.[64] This indicator focuses on the streamside environment, delineated as an Aquatic Management Zone or AMZ, to look 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. The CRMP designates Fossil Creek's AMZ as 100 feet from either edge of the perennial portion of Fossil Creek and intermittent stream channels in the WSR corridor. This indicator will be applied to unplanned dispersed recreation areas such as social trails, camping areas, and other areas where evidence of unplanned human use occurs within the AMZ, as well as planned dispersed recreation areas, although it is expected that some unavoidable impacts to the streambank and human-induced erosion will occur through accommodating visitor use in these areas.

Dispersed recreation impact monitoring should be implemented in conjunction with bare soil monitoring (table 6-5). Bare soil monitoring will support detecting streambank impacts that may influence the findings of the dispersed recreation monitoring and determining appropriate adaptive management actions.

[64] See https://www.fs.fed.us/naturalresources/watershed/bmp.shtml

Table 6-5. Water quality monitoring and adaptive management – dispersed recreation impacts

Plan Element	Detail
Objective	Minimize impacts to human health and aquatic resources. Adhere to the Clean Water Act by identifying and addressing conditions that could lead to a violation of state water quality standards.
Indicator	Potential for delivery of sediment or fecal matter to Fossil Creek.
Metric	Presence of erosion and/or waste deposition caused by visitor use.
Measurement Frequency	At least every year after the end of the high-use season.
Assessment Frequency	At least every year.
Soft Threshold	Evidence of sediment transport or visitor use-related waste within the AMZ but not reaching Fossil Creek.
Adaptive Management Actions	Investigate factors contributing to the presence of these impacts to determine what adaptive management actions are most likely to be effective. Accordingly, one or more adaptive management actions such as the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation. • Increase signage, education and outreach efforts, or ranger presence to emphasize proper waste management and minimize impacts in the AMZ. • Improve maintenance of toilet facilities. • Install pet waste stations. • Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing. • Adjust the timing, location, or management (such as through permitting) of camping or other uses. • Improve road and trail maintenance. • Change permit terms for outfitters/guides or other special uses if the permitted activities are found to be increasing bare soil or human waste in the AMZ. • Stabilize areas of active erosion caused by visitor use using a variety of techniques such as re-contouring, installing structures to reduce runoff energy, and/or seeding/mulching.
Hard Threshold	Evidence of sediment from erosion or waste caused by visitor use reaching Fossil Creek.

Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken:
	• Improve sanitation facilities, such as trash receptacles and the number/location of toilets.
	• Require use of portable toilet kits (such as “WAG bags”) at specific locations within the corridor (such as the waterfall or Fossil Springs area).
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use.
	  • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.
	  • Reduce corridor-wide visitor numbers.
	• Relocate portions of roads or trails contributing to impacts.
	• Implement short- or long-term closures of specific location(s) or specific kinds of use (such as camping) within the WSR corridor.

Expected Outcomes	Incidences of erosion caused by visitor use are addressed, actions are taken to minimize incidences of visitor use-related waste deposition, and water quality standards are maintained.
Indicator of Success	Arizona Department of Environmental Quality water quality standards and beneficial uses are maintained.

Other Water Protections

Other existing factors that will contribute to protection of Fossil Creek’s water include the WSRA Section 7 analysis process, existing and future water rights, surface water quality monitoring conducted by ADEQ, and

Forest Service Manual groundwater resource development requirements. Additionally, other water quality indicators may be relatively easy to monitor simultaneously with monitoring prescribed by the CRMP and be used to supplement assessment of the effects of management and use on Fossil Creek's water quality. Other indicators may include temperature, pH, and suspended sediment concentration.

Section 7 Analysis

Section 7 of the Wild and Scenic Rivers Act directs federal agencies to protect the free-flowing condition and other values of wild and scenic rivers. A Section 7 determination is required for any water resources project proposed within or below, above, or on a stream tributary to Fossil Creek. The purpose of the Section 7 analysis is to determine whether a proposed water resources project within Fossil Creek would have a "direct and adverse" effect on Fossil Creek or whether a proposed water resource project below, above, or on a stream tributary would "invade" Fossil Creek or "unreasonably diminish" its river values. More guidance on the Section 7 determination process can be found in the Interagency Wild and Scenic Rivers Coordinating Council technical report *Wild & Scenic Rivers Act: Section 7* (IWSRCC 2004). Any future actions in Fossil Creek that qualify as water resources projects are subject to a Section 7 analysis. Any proposed water resources projects that are found to have a direct and adverse effect on Fossil Creek or invade or unreasonably diminish its river values would need to be re-designed to mitigate these effects or rejected.

Water Rights

The Forest Service holds a state instream flow water right for the reach of Fossil Creek from approximately one-half mile above the historic Fossil Springs dam to the confluence with the Verde River. This right provides for monthly instream flows, ranging from 42.5 cfs in September to 51 cfs in February, totaling 33,280 acre feet per year. The right is intended to provide water for wildlife, including fish, and recreation. Additionally, WSRA expressly reserves waters for the federal government in order to achieve the purposes of WSRA, i.e. protecting river values. The Forest Service will quantify stream flows required to protect river values in order to claim this federal reserved water right. This right may result in protection of flows greater than those protected by the state-based right.

Groundwater Development

Water quantity will continue to be protected from groundwater development on Forest Service-managed lands that could impact surface flow as directed by the regional supplement (2500-2001-1) to Forest Service Manual 2500, Chapter 2540, Water Uses and Development. This supplement identifies a process for screening and approving proposals for development of groundwater resources on Forest Service-managed lands. Most importantly, it specifies that proposals to pump or transport water must not impair National Forest System resources.

As described in Chapter 2, development of a production well in the vicinity of Fossil Springs to supply water to local communities would likely impact discharge at Fossil Springs. Because of this potential and associated adverse impacts to Fossil Creek's ORVs if spring discharge is reduced, the Forest Service should participate in any local and/or state planning processes related to groundwater development in the Fossil Creek area.

Biological ORV

The indicators monitoring for the biological ORV will focuses on are common black-hawk populations, Fossil springsnail populations and habitat, and aquatic macroinvertebrates. These species and habitats are, by proxy, indicators for many wildlife groups; their ability to thrive in Fossil Creek is an indicator that conditions are acceptable for other, unmonitored species. Other monitoring in this chapter, in particular bare soil (table 6-4) and dispersed recreation impact monitoring (table 6-5), addresses habitat indicators.

Common Black-Hawk Pair Occupancy

Common black-hawks in Fossil Creek are used as an indicator for the biological ORV because: 1) they are susceptible to disturbance that may result from high levels of recreational use; 2) they are a top-level predator that thrives on native prey; 3) in Fossil Creek, abundant native prey (fish) is available to black-hawks, unlike all other

perennial system in the Verde Valley (Etzel et al. 2014); 4) they are a good indicator for other canopy nesting, riparian obligate bird species (e.g. summer tanager, warbling vireo, brown-crested flycatcher); and 6) the Fossil Creek population represents reference condition (for comparison to other southwest populations) since nesting and food availability along Fossil Creek reflect historic conditions, compared to other perennial streams in the Verde Valley, where non-native species dominate black-hawks' diets. Therefore, Fossil Creek is important as a comparison site for studies and monitoring of black-hawks in other parts of their range.

Increasing levels of recreation between the time when full flows were restored and interim management visitor capacity control was implemented raised concern when several common black-hawk (COBH) nest areas near popular recreation sites (Waterfall and Fossil Springs) were abandoned (Johnson et al. 2012). Black-hawks characteristically nest in remote, pristine habitat, but can habituate to low levels of human activity, such as around buildings bordering nest areas, ranching operations, and homesteads (Schnell et al. 1988). However, in one study, a parking lot built in a nest area caused nest abandonment within the first year, nonuse in the second year, a month-long postponement of egg-laying in the third year, and eventually permanent abandonment (Schnell 1994). In Aravaipa Canyon a nestling prematurely fledged, resulting in nest failure when visitors camped overnight 46 meters from a nest tree (Schnell 1994). Matt Johnson, Northern Arizona University biologist contracted to conduct black-hawk surveys in Fossil Creek, has stated that black-hawks start displaying disturbance responses (calling, flying, flushing from nest) when surveys get within 200 meters of a black-hawk nest (M. Johnson, pers. obs.).

Because of the length of Fossil Creek, the spatial distribution of recreation sites, and the presence of refugia between recreation sites, there should be ample suitable, undisturbed habitat for black-hawks to nest. Black-hawk nest sites in Fossil Creek that have remained occupied over the years are those that were established in refugia areas located in between high use recreation sites (Johnson et al. 2012). However, because black-hawks appear to be susceptible to human disturbance and at least two known nesting areas were abandoned at the two highest use areas (Waterfall and Fossil Springs), black-hawks are considered an early indicator of the effects of management, visitor use levels, and visitor use distribution among and in between recreation sites. Active COBH territories within close proximity to high use recreation sites (such as Fossil Springs, Waterfall, and Irving) will be more frequently monitored since territories at those locations are the most at risk for disturbance resulting in possible abandonment and are more easily accessed for cost-effective monitoring (table 6-6). Additionally, bare soil monitoring (table 6-4) will be used to detect impacts of visitor use in refugia areas generally and in the vicinity of COBH nests specifically.

Black-hawk monitoring has occurred during seven field seasons 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 described here as well as where monitoring is likely needed. COBH nest monitoring began in 2005, but the survey areas varied among years. The area from Fossil Springs to just downstream of Irving was monitored consistently and over the longest period (2005, 2006, 2007, 2009, 2011, and 2019). Surveys between 2005 and 2011 showed a decreasing trend in regular COBH territories between Fossil Springs and Irving. In 2009, surveys were conducted from Fossil Springs downstream to 0.5 mile below Mazatzal. It was discovered during the 2009 breeding season monitoring that two regular territories, near Fossil Springs and the Waterfall, had been abandoned. The area surveyed in 2011 was further extended downstream 1.5 miles below Mazatzal. Monitoring in 2019 detected lower COBH numbers than 2011; however, the 2019 surveys were completed later in the year than is ideal, which may have contributed to lower numbers. Lower prey availability resulting from flooding may also have contributed to lower numbers (Johnson and Calvo 2020). Additional monitoring is needed to establish COBH occupancy under current management.

Monitoring at the segment-wide level should occur every five to ten years in the future but is expensive due to inaccessible and rugged portions of the reach and the number of visits required to find nests and monitor fledgling survival. Due to this expense, segment-wide monitoring will not be feasible at the frequency at which monitoring data will be needed to detect black-hawks' responses to changes in recreation levels/distribution or to make management changes in a timely manner. Therefore, a more rapid assessment monitoring scheme is detailed for more frequent and timely monitoring.

A rapid assessment monitoring effort for black-hawks will be employed and will focus on nests or regular territories that occur in refugia and within 300 yards of a high-use recreation site (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 within close proximity to a regular territory or a known nest. Since black-hawks have exhibited disturbance behavior when humans get within 200 meters, a 300-yard (274 meter) buffer is used as a trigger for the need to monitor. A 300-yard buffer is also consistent with guidelines in the Coconino Forest Plan.

The objective when monitoring for black-hawks during the breeding season (March 15- July 31) will be to confirm the presence of territorial pairs near high-use sites at the least, and when funding permits, the location of nests and productivity for each occupied territory. An occupied territory may be indicated by detecting the presence of a territorial pair, observing a pair displaying courtship behaviors, observing an individual displaying nesting behavior (carrying nesting material, carrying food, etc.), detecting black-hawks incubating eggs in a nest, detecting nestlings in a nest, or observing fledged young (as indicated by immature plumage). A regular territory is one that is used for nesting in most years.

The thresholds are derived from the available data; however, these data likely do not represent current conditions. Thus, once monitoring is conducted to establish current conditions, the thresholds may need to be adjusted. It will be important to conduct several years of monitoring before re-establishing current conditions because natural events such as injury or disease may result in a year that particular nest areas are not occupied.

Table 6-6. Biological ORV monitoring and adaptive management – common black-hawk occupied territories

Plan Element	Detail
Objective	Minimize nest failure and/or regular territory abandonment within refugia areas.
Indicator	The presence of black-hawk pairs, nestlings, or fledglings in regular territories known within 300 yards of high-use recreation sites or unplanned trails within refugia.
Metric	The number of regular black-hawk territories that are occupied near high-use sites.
Measurement Frequency	After current data are collected on regular black-hawk territories in the recreation segment, monitoring will occur at black-hawk territories known to occur within 300 yards of high-use recreation sites 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.
Assessment Frequency	By January 1 following the survey season.
Soft Threshold	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.
Adaptive Management Actions	Investigate factors that may be contributing to declining black-hawk numbers to determine if visitor use is the likely cause and what adaptive management actions are most likely to be effective. Accordingly, adaptive management actions such as one or more of the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation. • Increase signage, education and outreach efforts, or ranger presence, with the goal of directing visitors away from nest sites and encouraging visitor use within planned recreation sites. • Improve amenities (such as toilets, picnic areas, and creek access points) within recreation sites to encourage use within recreation sites. • Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing. • Adjust the distribution of visitor use within the Fossil Creek corridor to reduce use near black-hawk nest sites. • Restore unauthorized trails leading out of recreation sites using passive or active techniques, with priority given to locations that are within 300 yards of black-hawk nest sites.

Plan Element	Detail
Hard 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.

Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken:
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use.
	  • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.
	  • Reduce corridor-wide visitor numbers.
	• Relocate portions of roads or trails contributing to impacts.
	• Implement short- or long-term closures of specific location(s) or specific kinds of use within the WSR corridor.

Expected Outcomes	Visitor use does not lead to black-hawk abandonment of regular territories or nest sites.
Indicator of Success	Regular territories and nests in refugia and near high use recreation sites are continue to be occupied.

Fossil Springsnails

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 AGFD will be used to assess the condition of riparian areas occupied by Fossil springsnails (table 6-7), and Fossil springsnail population counts will be used to assess the abundance of springsnails at key locations in Fossil Creek (table 6-8). Collaboration with the US Fish and Wildlife Service and AGFD will facilitate monitoring Fossil springsnail populations and habitat. Springs that support suitable habitat for the Fossil springsnail need to be surveyed to protocol in order to determine occupancy. The numerous springs that occur on steep slopes and where access is difficult are lower priority for inventory.

Table 6-7. Biological ORV monitoring and adaptive management – Fossil springsnail habitat

Plan Element	Detail
Objective	Springs containing populations of Fossil springsnails persist free from impacts of visitor use; springsnail habitat is rated as high or moderate and does not show a downward trend over the monitoring period.
Indicator	Habitat condition assessment rating of occupied springs.
Metric	Numeric habitat condition ratings for various habitat parameters. The cumulative score is categorized into high, medium, and low habitat ratings.
Measurement Frequency	Continue gathering initial data for all accessible sites in Fossil Creek. Once initial conditions are established, conduct springsnail habitat monitoring at priority occupied sites periodically or when an activity at an occupied spring results in habitat impacts.
Assessment Frequency	At the end of each monitoring period.
Soft Threshold	Monitoring shows the habitat rating of occupied springs is trending downward as a result of visitor use.

Plan Element	Detail
Adaptive Management Actions	Investigate factors that may be contributing to declining habitat condition to determine if visitor use is the likely cause and what adaptive management actions are most likely to be effective. Accordingly, adaptive management actions such as one or more of the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation. • Increase signage, education and outreach efforts, or ranger presence, with the goal of reducing visitor impacts on springsnail habitat and encouraging visitor use within planned recreation sites. • Where designated trails cross springs, install footbridges over the extent of the wetted area that is present at the wettest period in time. • Improve amenities (such as toilets, picnic areas, and creek access points) within recreation sites to encourage use within these sites. • Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing. • Adjust the distribution of visitor use within the Fossil Creek corridor to reduce impacts to specific springs. • Restore unauthorized trails that are impacting springs using passive or active techniques. • Restore impacted springs.
Hard Threshold	Visitor use interferes with occupied springs' ability to attain and maintain high or moderate habitat condition in the long term.

Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken:
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use.
	  • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.
	  • Reduce corridor-wide visitor numbers.
	• Relocate portions of roads or trails contributing to impacts.
	• Implement short- or long-term closures of specific location(s) or specific kinds of use within the WSR corridor.

Expected Outcomes	Visitor use occurs out of the wetted areas of occupied springsnail sites.
Indicator of Success	Springs maintain high habitat condition ratings.

Table 6-8. Biological ORV monitoring and adaptive management – Fossil springsnail populations

Plan Element	Detail
Objective	Visitor use does not impact populations of Fossil springsnails.
Indicator	Relative abundance of Fossil springsnails.
Metric	Number of individual snails counted during timed count surveys, given as an estimate of Catch-Per-Unit-Effort (CPUE).
Measurement Frequency	At least every third year, especially at springs showing human use.
Assessment Frequency	At the end of each monitoring period.
Soft Threshold	Monitoring shows a reduction of 25-50% of the mean cumulative CPUE estimates.
Adaptive Management Actions	Investigate factors that may be contributing to declining springsnail populations to determine if management of visitor use is the likely cause and what adaptive management actions are most likely to be effective. Accordingly, adaptive management actions such as one or more of the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation.

Plan Element	Detail
	• Increase signage, education and outreach efforts, or ranger presence, with the goal of reducing visitor impacts on springsnail populations and encouraging visitor use within planned recreation sites. • Where designated trails cross springs, install footbridges over the extent of the wetted area that is present at the wettest period in time. • Improve amenities (such as toilets, picnic areas, and creek access points) within recreation sites to encourage use within these sites. • Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing. • Adjust the distribution of visitor use within the Fossil Creek corridor to reduce impacts to specific springs. • Restore unauthorized trails that are impacting springs using passive or active techniques. • Restore impacted springs.
Hard Threshold	Monitoring shows a reduction of >50% of the mean cumulative CPUE estimates.
Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken: • Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to, • Reallocate the amount of use among recreation sites. • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use. • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups. • Reduce corridor-wide visitor numbers. • Relocate portions of roads or trails contributing to impacts. • Implement short- or long-term closures of specific location(s) or specific kinds of use within the WSR corridor.
Expected Outcomes	Visitor use occurs out of the wetted areas of occupied springsnail sites.
Indicator of Success	Viable populations of Fossil springsnails are maintained in the Fossil Creek corridor.

Aquatic Species

Overview

Anthropogenic effects on aquatic resources resulting from CRMP actions may occur in two ways: effects directly to the aquatic species and habitat, and effects to terrestrial habitat that then effect aquatic resources. The most important threat to aquatic resources is non-native fish. Monitoring for non-native fish is not, however, part of the monitoring/adaptive management plan because corrective actions are prescribed rather than adaptive. Thus, non-native fish monitoring, as well as monitoring of other traits important to protecting the aquatic aspect of the biological ORV, are described here but are not framed as driving adaptive management actions. USFS and other agencies will still respond to concerns found through these other monitoring efforts.

Terrestrial impacts to aquatic resources are the primary concern that can be adaptively managed, and the primary terrestrial habitat of concern is the riparian zone. Impacts to the riparian zone may include denuding and social trails (resulting in sedimentation), as well as impacts to water quality (i.e. human and pet waste, fine sediment redistribution, etc.). Protecting aquatic resources will therefore depend on the monitoring and adaptive management of terrestrial resources; in this way the CRMP will identify and remedy terrestrial impacts before they can affect aquatic resources. The CRMP adaptive management plan will include monitoring of human impacts to riparian areas, as described above, which may impact aquatic resources.

The only monitoring of aquatic resources outside of other monitoring efforts (external to the USFS, described below) prescribed by the CRMP will be annual macroinvertebrate monitoring. Macroinvertebrate populations are

a common indicator that integrates many aquatic impacts over time, and the CRMP will utilize macroinvertebrate studies as a safety check that aquatic resources are indeed being protected. These periodic surveys are not expected to identify a particular cause or source of a decline in macroinvertebrate abundance or diversity, but instead negative results will indicate the potential that there is a problem and that more analysis is needed to identify the cause of the problem.

The Arizona Department of Environmental Quality has developed warm and cold-water criteria and protocols for using benthic macroinvertebrate abundance and diversity to calculate an Index of Biological Integrity score that is used to monitor the "health" of aquatic systems (ADEQ 2015). Properly functioning warm water streams will have an IBI score above 50. However, these IBI scores are not thought to be usable in most of Fossil Creek due to travertine effects on macroinvertebrates, which might reduce abundance and diversity and therefore yield poor IBI scores despite a functioning aquatic environment. Conversely, several authors suggest that Fossil Creek invertebrates are diverse and abundant enough that IBI scores may be an acceptable measure of stream function even in the travertine sections, so the CRMP utilizes IBI scores to monitor for impacts to Fossil Creek aquatic resources (table 6-9). Given this uncertainty, other techniques are being analyzed, so IBI score may be replaced with another metric determined to be more effective at detecting changes in Fossil Creek invertebrates. Regardless of the method, the intent of this monitoring is to detect changes in the macroinvertebrate community that may be due to anthropogenic impacts in time to identify and correct those impacts before the Biological ORV is adversely affected.

Table 6-9. Biological ORV monitoring and adaptive management – macroinvertebrates

Plan Element	Detail
Objective	The narrative biocriterion from macroinvertebrate bioassessments in Fossil creek is adequately maintained and supported so that IBI scores meet ADEQ biocriteria standards.
Indicator	A single Arizona Index of Biological Integrity (IBI) score is at or above the 25th percentile of reference condition (greater than or equal to 50 for warm water systems).
Metric	IBI score
Measurement Frequency	Monitoring will be conducted once per year during the spring index period (April – May) at five sites in Fossil Creek. Benthic samples will follow ADEQ IBI protocols (ADEQ 2015). Sites will be: 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.
Assessment Frequency	Within 6 months following the monitoring period (to allow time for macroinvertebrate identification by specialists).
Soft Threshold	An 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.
Adaptive Management Actions	A verification may be required to determine whether there is a violation of the biocriterion (degradation).
Hard 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.
Adaptive Management Actions	Assemble a panel, preferably including experts from ADEQ, AGFD, FWS, and NAU, to assess reasons for the low score, including a review of water quality data, an assessment of recreation impacts based on monitoring data and remediation efforts, and an analysis of sediment input and sources into the system. Adjust management actions as needed to alleviate anthropogenic causes of macroinvertebrate declines. For example, management changes could include: • Focus restoration efforts on sites that are thought to impact aquatic habitat. • Improve road maintenance if sedimentation from roads appears to be contributing to low scores. • Reallocate the amount of use among recreation sites. • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use. • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.

Plan Element	Detail
	• Reduce corridor-wide visitor numbers. • Relocate or close portions of roads or trails contributing to impacts. • Implement short- or long-term closures of specific location(s) or specific kinds of use within the WSR corridor.
Expected Outcomes	Macroinvertebrate abundance and diversity (as measured via IBI) do not decline as a result of CRMP management actions.
Indicator of Success	Fossil Creek IBI scores meets the biocriterion rather than falling in the ranges that are inconclusive or in violation of the biocriterion.

In addition to the terrestrial monitoring mentioned above, many monitoring programs important to maintaining the aquatic resources aspect of the biological ORV are conducted by partner agencies and have been ongoing for many years. These include monitoring of the fish barrier (Bureau of Reclamation), monitoring of native and non-native fish populations (AGFD), and monitoring of water quantity (USGS). Other monitoring efforts are listed in the "Other Biological ORV Monitoring" section below. Because these monitoring programs have prescribed responses to adverse findings, they are not part of the CRMP's monitoring and adaptive management process. Instead, this document summarizes the ongoing monitoring processes and the expected multi-agency management responses. As non-native fish are the greatest threat to the aquatic aspect of the biological ORV, USFS must ensure that non-native fish monitoring and barrier monitoring occur. In the event that AGFD or Bureau of Reclamation monitoring ends, USFS would be responsible for ensuring non-native fish and barrier effectiveness monitoring continues to protect the biological ORV.

Invasive Plant Species

Non-native invasive plants continue to be a concern in Fossil Creek because when established, invasive species often convert diverse pockets of native vegetation to monocultures of non-native species, reducing habitat suitability for a variety of wildlife species and affecting ecosystem function. Invasive species may be spread by visitor use and other management activities. The Forest Service places highest priority for prevention, eradication, and containment on Class A species and continuous control of Class E 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. Class E (for extreme) species have wide distribution within a particular area and pose an unacceptable, extreme hazard to watershed condition. While hydropower system decommissioning activities targeted and eradicated various upland species of non-native invasive plants, other species have since become a concern. Newly emerging species that are highly invasive but have not yet been added to the Class A list will be included in monitoring and eradication efforts. One example of such a plant is yellow bluestem. Other species of concern, such as Himalayan blackberry, will also be monitored and treated as resources allow.

Weed inventory and treatments in the Fossil Creek corridor have been ongoing since at least 2010; however, at time of plan approval, some portions of the corridor have yet to receive inventory and treatment, particularly the section below Mazatzal. In addition, treated areas need re-treatment. Treatments are rarely a one-time event. Many species will re-sprout after treatment and in between treatments seeds germinate into newly established plants and populations. Class A and E non-native invasive plant species such as salt cedar, giant reed, Russian olive, tree of heaven, and malta starthistle will be monitored and treated when approved treatment methods are available (table 6-10). Some methods, such as use of the Arundo wasp or treatment of non-native invasive plants in water, may need separate clearance before they can be used. Employees will be trained to identify invasive plant species and will record and report observations to a weed coordinator, botanist, or biologist.

Table 6-10. Biological ORV monitoring and adaptive management – invasive plant species

Plan Element	Detail
Objective	Class A and E non-native, invasive plant species are limited in distribution, are targeted for eradication, and at a minimum are managed to reduce or control spread.
Indicator	Presence of class A or E non-native plant species.

Plan Element	Detail
Metric	Acres occupied by class A or E non-native plant species and the spatial distribution of these areas.
Measurement Frequency	Once non-native invasive plant inventories have been completed in the corridor, monitoring of 1/3 of the corridor will occur each year or so that the entire corridor is fully monitored every three years. Stratified sampling may be used. Emphasize monitoring the highest-use areas.
Assessment Frequency	Following measurement.
Soft Threshold	Existing class A or E non-native invasive plant populations increase in size or new populations become established.
Adaptive Management Actions	Investigate factors contributing to reaching the threshold. Accordingly, adaptive management actions such as one or more of the following may be taken depending on what is anticipated to be effective. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation. • Increase signage and education and outreach efforts with the goal of preventing invasive species establishment and spread. • Treat invasive plant populations using approved mechanical, chemical, or biological methods. • Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing. • Restore unauthorized tails and other denuded areas before the following high-use season. • Pursue approval for use of new mechanical, biological, or chemical treatment methods.
Hard Threshold	Non-native invasive plant species pose a risk to ecosystem function, including displacing or diminishing native plant and animal species.

Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken:
	• Change the locations of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use.
	  • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.
	• Implement short- or long-term closures of specific location(s) within the WSR corridor.

Expected Outcomes	Populations of class A and E non-native plant species are detected and treated. Visitor use does not contribute to the establishment or spread of class A and E non-native plant species.
Indicator of Success	Invasive plant populations are reduced and spread is controlled.

Other Biological ORV Monitoring

Lowland Leopard Frog Monitoring

The lowland leopard frog population in Fossil Creek is the sole viable population of this species on the Coconino National Forest and is one of few documented populations on the Tonto National Forest, particularly on the Payson Ranger District. Prior to restoration of full flows and the native fishery, lowland leopard frog numbers in Fossil Creek were at an all-time low and were at risk of disappearing. Phased decommissioning (allowing habitat to establish downstream of the historic dam for four years after restoration of full flows before lowering the dam), along with restoration of the native fisheries, quickly allowed for leopard frogs to expand downstream into newly created habitat and rapid population growth was observed from Fossil Springs downstream to the large waterfall. Elsewhere in Fossil Creek, bedrock-dominated stream reaches limit available habitat. The population of lowland leopard frogs in Fossil Creek was secure enough in the summer of 2009 that it was able to withstand drastic alteration of habitat above the dam after the dam was lowered and severe scouring of habitat occurred during a large winter flood in 2009/2010.

The main threats to lowland leopard frog populations in Fossil Creek are from non-native predators (particularly fish species), diseases, and natural events such as flooding. To date, no correlation between recreational use and frog population numbers has been detected. Instead, flooding has been observed to result in population decreases. Because visitor use management is unlikely to impact lowland leopard frog populations, the CRMP does not require monitoring of this species; however, because of the importance of the Fossil Creek population it is anticipated lowland leopard frog populations will continue to be monitored. Lowland leopard frog monitoring occurred annually between 2005 and 2010 and in 2012 and 2017.

Bald and Golden Eagle Monitoring

Arizona Game and Fish Department conducts aerial surveys along Fossil Creek to search for new bald or golden eagle nesting sites. If a bald eagle territory is discovered, the Fossil Creek breeding area will be included in the AGFD's statewide bald eagle management and monitoring efforts. Golden eagle breeding areas are monitored at a lower intensity across Arizona, including the one currently documented golden eagle nest along Fossil Creek.

Riparian Breeding Bird Surveys

Long-term riparian breeding bird surveys are currently conducted in Fossil Creek on a rotational basis under the Arizona Bird Conservation Initiative's Coordinated Bird Monitoring Program. Additionally, potential exists to incorporate Fossil Creek into one of the established Important Bird Areas along the Verde River, which would expand the seasons in which surveys occur.

Western Yellow-billed Cuckoo Surveys

There is a need to get more information to determine whether cuckoos are breeding in the area. After many years with no detections, informal surveys have detected cuckoos in Fossil Creek during the cuckoo breeding season the last two years. Conducting formal cuckoo surveys in Fossil Creek will help inform whether cuckoos are breeding in the area.

Bat Monitoring

Ongoing monitoring for bats occurs annually in the WSR corridor on both the Coconino and Tonto National Forests. While various techniques are used, the standardized protocol used for acoustic monitoring comes from the North American Bat Monitoring Program (NABat). NABat, an international and multiagency program, is a continent-wide effort to gather monitoring data to assess changes in bat distributions and abundances.

Fish Barrier Monitoring

The fish barrier located in the Mazatzal Wilderness is a critical component of maintaining a native fish community in Fossil Creek. The barrier is monitored at least once per year by Bureau of Reclamation (BOR) engineers to ensure it is still functioning properly. It is anticipated that BOR will transfer responsibility for barrier operations and maintenance to the Central Arizona Water District (CAWD). CAWD will then be responsible for having an engineer visually inspect the fish barrier a minimum of one time per year. The Fossil Creek fish barrier was constructed to have a 100 year life-span, which means it is expected to function through 2104 but may be modified or improved to last longer (USDA 2004b). In the event that a problem with the barrier is detected, repairs will be made as quickly as possible to return the barrier to functioning condition. If the barrier does need repair, issues to be considered include wilderness access, with the possible need for a Minimum Requirements Analysis to be done due to the barrier's location in the Mazatzal Wilderness, and an assessment of compliance with Section 7 of the Wild and Scenic Rivers Act.

Native and Non-native Fish Monitoring

Monitoring fish populations is primarily conducted by the Arizona Game and Fish Department. Through 2022, AGFD plans hoop net surveys every other year and snorkel surveys twice each year. After 2022 AGFD anticipates hoop net surveys once every 3-5 years and annual snorkel surveys (Scott Rogers, Pers. Comm., Nov. 13, 2018). Together, these techniques allow managers to evaluate the native fish community, document the geographic distribution of native fish, determine the relative abundance of native fish, and document the age structure of

native fish. The USFS will communicate with AGFD and other agencies about the status and population trends of native fish. Detections of non-native fish will be addressed by AGFD and FWS in coordination with USFS.

Geology ORV

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 thus 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. Other technologies, such as LiDAR, could be investigated for their potential to improve monitoring methodologies as funding allows. Monitoring other indicators, such as bare soil (table 6-4), may provide valuable information about potential impacts to travertine deposition from sedimentation. Additionally, separate research is encouraged to continually improve understanding of the processes and management of this travertine system.

Physical Impacts to Travertine Features

Monitoring for physical impacts to travertine (table 6-11) will be performed on the reach of Fossil Creek from 1/4-mile upstream of the waterfall upstream to the historic diversion dam. Chamberlain (1904) described travertine dams existing for only two miles downstream of Fossil Springs, which is well above the waterfall reach. Travertine dams have historically formed in this reach and are currently forming in this reach, therefore it is critical to capture growth and the physical impacts due to recreation when it is occurring. Photo points will be established in this reach when the CRMP is implemented to detect notching or other human impacts to travertine dams with repeat photography performed at least annually, but more often if a significant flood event occurs. Photo points will be established in such a manner as to capture a section of stream with more than one active travertine dam if possible. These photo points will also need to be evaluated over time for their relevance as post-flooding changes may render a particular location less valuable as a monitoring site. The protocols for these photo points will follow those detailed in Hall 2002. Ocular monitoring and informal photo documentation can also supplement photo point monitoring.

Notching, in particular, concentrates water flow at a certain point, and this new low point results in a lower water level behind a travertine dam. When notched, water no long flows over the entire length of the dam, where travertine deposition typically occurs. Notching reduces the rate of dam growth at the notched dam, yet potential for deposition is not altered. Notching then becomes a factor in channel morphology. Notching is a primary factor travertine monitoring seeks to detect. The soft threshold is designated as the detection of new visitor use impacts, as the occurrence of new impacts indicates a potential need to adjust management to prevent wide-spread impacts. The hard threshold is designated as visitor use impacts to a series of spatially connected travertine features. Such a pattern of impacts risks altering travertine deposition throughout the affected reach and is undesirable due to the sensitive nature of rapidly forming dams characteristic and the complex habitat they provide.

Table 6-11: Geology ORV monitoring and adaptive management – physical impacts to travertine features

Plan Element	Detail
Objective	Minimize impacts of visitor use to travertine features in the reach of Fossil Creek from approximately 1/4-mile upstream of the waterfall upstream to the historic diversion dam.
Indicator	Presence of impacts to travertine dams in the reach of Fossil Creek from 1/4-mile upstream of the waterfall upstream to the historic diversion dam attributable to visitor use (notching; compaction of fragile newly formed deposition; loss of plant or algal presence; exposure of newly deposited travertine).

Plan Element	Detail
Metric	Number and spatial distribution of incidences of impacts to travertine features resulting from visitor use.
Measurement Frequency	At least every year, or, if possible, twice a year or seasonally, using photo monitoring at established photo points.
Assessment Frequency	Every year, following data collection for the year.
Soft Threshold	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.
Adaptive Management Actions	Investigate factors contributing to visitor use impacting travertine dams to determine what adaptive management actions are most likely to be effective. Accordingly, actions such as one or more of the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation. • Increase signage, education and outreach efforts, or ranger presence with the goal of reducing impacts to travertine resulting from boating or other visitor use. • Pursue expanded partnerships with the boating community to promote boating practices that limit impacts to travertine. • If not already done, improve road access at times of high flow to reduce boating impacts to travertine features by improving sections of road that are problematic in wet conditions, thus reducing the need for wet weather closure at desirable boating times. (Boating at high flows is less likely to affect travertine formations.)
Hard 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.

Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken:
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • If not already in place, establish permits for access to the WSR corridor, for access to specific locations within the corridor, or for specific kinds of use (such as boating).
	  • Reduce corridor-wide visitor numbers.
	  • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.
	  • Implement seasonal boating restrictions during the base flow period, when travertine features is most susceptible to impacts (generally October-January and April-June).
	  • Prohibit boating (seasonally or year-round) in certain locations within the corridor, such as the reach of Fossil Creek from the historic dam downstream to 1/4-mile upstream of the waterfall at the end of the Dixon Lewis Trail.

Expected Outcomes	Human impacts to travertine features are detected shortly after they occur, and actions are taken to promote recovery of impacted areas and prevent future impacts.
Indicator of Success	Travertine features in the travertine forming reach of Fossil Creek do not display persistent impacts from human use. New travertine formation replaces impacts from visitor use either at the site of the impact or by creating a new feature.

Recreation ORV

The monitoring actions below (tables 6-12 through 6-14) are intended to track patterns of visitor use and ensure that the recreation ORV is protected by identifying adverse effects to or opportunities for enhancement of the ORV.

Forest Service staff 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, law enforcement incidents, and other emergencies. This information will be included in a summary report each year. The 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 will 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.

Table 6-12. Recreation ORV monitoring and adaptive management – annual visitor use data

Plan Element	Detail
Objective	The quantity and patterns of visitor use and incidents in Fossil Creek are understood and user capacity is not exceeded.
Indicator	Quantity and patterns of visitor use and incidents.
Metric	Number of visitors; number of vehicles; distribution of visitor use; number and type of incidents.
Measurement Frequency	Data are collected regularly during the high-use season.
Assessment Frequency	Every year.
Threshold	User capacity is exceeded; an increasing trend in incidents is observed.

Adaptive Management Actions	Investigate factors contributing to reaching the threshold. Accordingly, actions such as one or more of the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation.
	• Collaborate with partners such as emergency service providers to determine and implement strategies to reduce incidents.
	• Increase signage, education and outreach efforts, or ranger presence with the goal of promoting visitor preparedness and compliance with regulations to reduce incidents and instances of capacity exceedances.
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • If not already in place, establish permits for access to the WSR corridor, for access to specific locations within the corridor, or for specific kinds of use.
	• Evaluate the need for increasing corridor capacity (if possible without exceeding maximum capacity established by the CRMP).

Expected Outcomes	Amount of visitor use is within established capacity; visitor safety and compliance with regulations are maintained.
Indicator of Success	Visitor use does not exceed established capacity; number of incidents declines or does not increase.

As described in Chapter 2, the recreation ORV is comprised of the outstanding opportunities for a variety of river-related recreational activities including swimming, camping, hiking, boating, wilderness recreation, fishing, hunting, and learning about local history and cultures. As outstanding opportunities, the recreation activities must also provide a quality experience for Fossil Creek visitors. To protect and enhance the recreation ORV, it is not sufficient to simply provide access to people wanting to swim or hike. Rather, the recreation experience should also be outstanding. As surveys in Fossil Creek have shown, the quality of the experience can be degraded if visitors see too much litter, find dirty toilets, or feel crowded (Lee 2012). Thus, the recreation ORV includes access to the river-based recreation activities themselves and the quality of the experience that people have while engaging in those activities.

Monitoring for the recreation ORV addresses the quality of the recreation experience and the variety of recreational activities available. The nature of the experience will vary based on whether or not the activity is occurring in the recreational or the wild segments of Fossil Creek. The two wild segments of Fossil Creek are almost entirely within the Fossil Springs Wilderness or the Mazatzal Wilderness. A small portion of the upstream wild segment is not in the Fossil Springs Wilderness, but is still only accessible by hiking into the canyon. The primary differences between these wild segments and the recreational segment are their more primitive character, accessibility, and opportunities for solitude.

The way people experience public lands can be characterized as their interaction with the environmental, social, and managerial setting (Manning 1999). 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 derived from surveys conducted most recently after designation. The setting baseline is defined by a 2011 survey conducted by NAU (Lee 2012). This study is the closest to the 2009 year of designation with data on visitor experiences. The next earlier studies were done in 2004-2006 during dam decommissioning when recreation conditions were very different from 2009. By 2009, full flows were restored and the riparian zone had undergone substantial recovery from the time when Fossil Creek was dammed and its waters diverted for power generation. The principal setting attributes reported by participants in the 2011 study were trash, crowding, current regulations, and facilities. Taken together, these four attributes can provide an indication of change in the quality of the visitor experience. In order to provide a more accurate assessment of recreation experience quality, data collection should also include information on respondent demographics, prior experience at Fossil Creek, primary recreation activities, attitudes, and preferences.

An alternative approach to evaluating the quality of the recreation experience would be to focus on interpersonal conflict between people engaging in different recreational activities in the same area, known as “goal interference” in the recreation research literature (Manning 1999). However, baseline research in Fossil Creek does not indicate a substantial degree of conflict among visitors (Lee 2012). Factors affecting the visitor experience are more closely connected to aspects of the setting, such as toilet facilities, or the overall amount of people making parking difficult, rather than conflict between different people trying to recreate differently. The low level of conflict may be related to the similarity of activities pursued by most visitors to Fossil Creek. The most thorough assessment of visitor activities found that the most popular activities were sightseeing, walking, hiking, swimming, watching wildlife, photography, wading, and picnicking (Hancock et al. 2007). These activities are not typically found to result in conflict to the degree found in research comparing activities such as hiking, mountain biking, horseback riding, and motorcycle riding on trails (Manning 1999).

To implement monitoring of the quality of the recreation experience (table 6-13), data collection can be accomplished with a representative sample of visitor interviews using Lee’s methods, a survey questionnaire based on Lee’s findings, using the questions in the USFS National Visitor Use Monitoring (NVUM) survey that are most similar (condition of the environment, crowding, developed facilities), or another method determined to be statistically valid and representative. The NVUM is conducted by the Forest Service every five years and can be applied to specific locations such as Fossil Creek by increasing the number of sampling days.

Additional information collected through the NVUM survey includes visitor demographics. Demographic data collected using representative sampling will provide a sound basis for evaluating change in composition of the visitor population based on home zip code, race or ethnicity, gender, or age. NVUM surveys will also provide information on primary activity, group size, length of stay, and number of visits.

The degradation threshold for the recreation experience indicator is set at 15% in an index of satisfaction measures. Typically, visitor survey respondents indicate a high level of overall satisfaction with their recreation experiences on public lands. A 15% decline in reported satisfaction at Fossil Creek would be an unusual level of change, indicating a potentially long-term effect to the recreation ORV.

Table 6-13. Recreation ORV monitoring and adaptive management – recreation experience

Plan Element	Detail
Objective	Fossil Creek visitors have a quality recreation experience.
Indicator	Visitor satisfaction with environmental (trash), social (crowding), and managerial (regulations and facilities) setting as measured by visitor survey. Segment by new and repeat visitor and location of visit (e.g. wild or recreational segment). Include activity type and demographics. Additional measures of desired visitor experience may be included.
Metric	Percent change in satisfaction index from 2011 baseline survey.

Plan Element	Detail
Measurement Frequency	A minimum of every five years using oversampling of the Fossil Creek WSR during scheduled National Visitor Use Monitoring or other valid methodology. Consider additional surveys within two years of major adaptive management changes if funding allows.
Assessment Frequency	After each measurement.
Soft Threshold	5% decline in satisfaction index.
Adaptive Management Actions	Investigate factors contributing to reaching the threshold. Adjust environmental, social, and/or managerial setting attributes as indicated by survey results within one year of exceeding soft threshold. Accordingly, actions such as one or more of the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation. • Increase trash cleanup and removal; increase frequency of toilet cleaning, improve signage, redistribute use between developed recreation sites using parking capacity or other means, or add amenities such as picnic tables and shade ramadas at certain sites. • Increase management or law enforcement presence, enforcement of regulations (such as related to noise), or education and outreach. • Increase road maintenance. • Prohibit alcohol.
Hard Threshold	15% decline in satisfaction index.

Adaptive Management Actions	Adaptive management actions listed above may be taken if anticipated to be effective. Additionally, actions such as one or more of the following may be taken within one year of exceeding hard threshold if determined to be compatible with protection of other river values. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation.
	• Develop additional facilities such as toilets.
	• Establish full-time host presence.
	• Resurface roads.
	• Expand parking.
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor if crowding is the primary factor affecting the ORV. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use.
	  • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups.
	  • Reduce corridor-wide visitor numbers.

Expected Outcomes	Declining visitor satisfaction is reversed by adaptive management actions and satisfaction returns to or exceeds baseline level.
Indicator of Success	No decline in visitor satisfaction or visitor satisfaction improves.

The recreation ORV also includes protecting and enhancing outstanding opportunities for river-based recreation in Fossil Creek. The ORV assessment identifies activities including swimming, camping, hiking, boating, wilderness recreation, fishing, and hunting as some of the recreation opportunities. The recreation opportunity monitoring indicator (table 6-14) uses the total number of people who can access Fossil Creek during the limited entry period as a proxy for recreation opportunities. When the CRMP is initially implemented, approximately 135,000 people may access Fossil Creek annually during the April 1 to October 1 high-use season if all parking spaces are filled every day and each vehicle contains five people. During the 2009 baseline year, approximately 80,000 people visited Fossil Creek during the same period. Access is currently unlimited during the six month period when permits are not required because visitation rates are typically much lower compared to the high-use season. Reliable counts of visitor numbers are made daily at the two entrance gates during the high use season.

The soft threshold for recreation opportunity is a 10% decline in the number of possible visitors to Fossil Creek between April 1 and October 1 due to management restrictions. The degradation threshold for the recreation

opportunity monitoring indicator is a 25% decline from the 2009 baseline number of visitors. At the soft threshold, 90% of people would still be able to access Fossil Creek during the current high-use season compared to the 2009 baseline. In this case, most people would be unaffected by the reduction in use. Degradation of the recreation ORV would occur when only 75% of the 2009 baseline use level of people could access Fossil Creek during the permit season. At this point, one in four people would not be able to obtain access and the opportunity to recreate in Fossil Creek would be substantially reduced.

Table 6-14. Recreation ORV monitoring and adaptive management – recreation opportunity

Plan Element	Detail
Objective	River-based recreation opportunities are available to the public.
Indicator	Opportunity for river-based recreation in the WSR corridor.
Metric	Number of people who may visit Fossil Creek during the high-use season (April 1-October 1), as defined by available parking and assuming five people per vehicle.
Measurement Frequency	Annually.
Assessment Frequency	Annually.
Soft Threshold	10% 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.
Adaptive Management Actions	Within one year of exceeding soft threshold, evaluate the cause and adaptive management actions that can accommodate, or promote, continued use at current levels, as compatible with protection of the other river values. Accordingly, actions such as one or more of the following may be taken. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation. • Develop or improve recreation sites to accommodate more people while supporting protection of other river values. • Adjust managed entry system (if present) to allow additional visitor use if compatible with protecting other river values. • Improve services, facilities, and management presence to mitigate effects of additional use.
Hard Threshold	25% 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.
Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, actions such as one or more of the following may be taken within one year of exceeding hard threshold, as compatible with protection of the other river values: • Further develop or improve recreation sites to accommodate more people while supporting protection of other river values. • Further adjust managed entry system (if present) to allow additional visitor use if compatible with protecting other river values. • Further improve services, facilities, and management presence to mitigate effects of additional use.
Expected Outcomes	River-based recreation opportunities remain available to the public.
Indicator of Success	Access to river-based recreation opportunities is maintained at or above 2009 baseline level, while protecting other river values.

Other Recreation ORV Monitoring

Wilderness Monitoring

The Forest Service has a monitoring program in place to preserve the primitive character, opportunities for solitude, and other aspects of wilderness. This monitoring will include the wild segments of Fossil Creek WSR (Landres et al. 2009). Wilderness character monitoring is not included in the Fossil Creek CRMP monitoring plan because it is already mandated by the Forest Service for all wildernesses.

Western Apache and Yavapai Traditional and Contemporary Cultural Values

The overarching desired condition for the cultural values ORV is that the Fossil Creek area looks, sounds, and feels as natural and untrammeled as possible, while allowing for some concentrated recreational use at compatible locations along middle Fossil and limited backcountry recreational use focused around the creek and adjacent banks. Given this, of most concern for the cultural values ORV is government-to-government consultation with relevant tribes indicating the Fossil Creek area does meet this desired condition. Based on past consultation with relevant tribes, examples of this include, but are not limited to, overcrowding, numerous recreationists off of system trails and away from established recreation sites, presence of trash and human/pet waste, vegetation impacts, or soil impacts. Also of concern related to the condition of this ORV is human use within specific culturally significant sites, particularly development (or continued use) of unauthorized trails, new human-caused bare soil areas within site boundaries, evidence of ground disturbance, evidence of the removal of artifacts, and evidence of feature disturbance.

The tribes are the only subject matter experts qualified to measure the condition of this ORV. Therefore, regular communication is the only way to measure the direction and magnitude of changes in condition and, most importantly, to ensure that this ORV does not approach a degraded condition. Monitoring 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.

> *"…as Apaches we believe every living thing is put where it is by the Creator on purpose because that is where it is supposed to be. We do not say, 'It is over there', we say 'It lives over there', because to us everything including the water, rocks and sky are imbued with life by the Creator."* –White Mountain Apache Tribe[65]

In addition to through formal monitoring, it is important for the Forest Service to maintain open communication with concerned Western Apache and Yavapai tribes to receive feedback in real time on resource conditions and other cultural concerns. In particular, it is critical that tribes be consulted prior to a decision each time implementation or adaptive management actions are considered that could increase the intensity or duration of recreational use anywhere within the WSR corridor.

Other relevant information about changes in resource conditions can be obtained by reviewing the results of monitoring conducted for other resource areas that are material to the condition of this ORV. This other monitoring is described throughout this chapter, and adaptive management actions associated with thresholds for other monitoring indicators will likely contribute to protecting the cultural values ORV. Further, other monitoring data may help inform consultation with traditional practitioners about the condition of the cultural values ORV.

If the affected tribes are unresponsive or unable to provide relevant feedback on the condition of the ORV, then the Forest Service will use its understanding of the key characteristics of the ORV and the best available information (e.g. numbers of unauthorized trails, acres of denuded areas, amounts of trash and human waste) to make management decisions that protect the ORV.

Two indicators for the condition of the ORV have been developed: monitoring of traditional and contemporary cultural values through consultation with tribes associated with the ORV (table 6-15) and monitoring of culturally sensitive sites in the Fossil Creek area (table 6-16).

Traditional and Contemporary Cultural Values

The traditional and contemporary cultural values monitoring (table 6-15) reflects the principal goal of ensuring the Fossil Creek area retains its traditional cultural value for the affected tribes. Only the tribes can directly assess

[65] Letter from White Mountain Apache Tribe to Cal Joyner, Southwestern Regional Forester, December 12, 2018

the condition of the ORV. Dialogue with them is the only way of measuring success or failure of the corridor management as related to this ORV.

Table 6-15. Cultural values ORV monitoring and adaptive management – tribal consultation

Plan Element	Detail
Objective	Recognized traditional practitioners from tribes associated with the ORV perceive that the traditional cultural value of the Fossil Creek area is protected from adverse impacts resulting from visitor use.
Indicator	Satisfaction of traditional practitioners with the condition of traditional cultural values in the Fossil Creek area.
Metric	Consultation with recognized traditional practitioners or other tribal representatives who utilize the Fossil Creek area. 1. Optimally includes a site visit and discussion of other monitoring data. 2. Should include standard questions each year that measure whether the Fossil Creek area looks better or worse than it did last year, whether the area meets the needs for traditional cultural activities, and the reasons for the findings. 3. Results should be analyzed within the context of issues deemed by the tribes to be most important to protecting the Cultural Values ORV.
Measurement Frequency	Every year.
Assessment Frequency	Every year.
Soft Threshold	Results of consultation indicate the ORV condition has trended downward for two consecutive years.

Adaptive Management Actions	One or more adaptive management actions such as the following may be taken, depending on the causes of the downward trend and what is anticipated to be effective. If possible, work collaboratively with the tribe(s) to determine the best course of action. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation.
	• Increase signage, education and outreach efforts, or ranger or traditional practitioner presence, with the goal of fostering public interest in protecting cultural resources and developing a stewardship ethic.
	• Improve amenities (such as toilets, picnic areas, and creek access points) within recreation sites in order to reduce impacts outside of recreation sites.
	• Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing.
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor (such as the waterfall or Fossil Springs area), or for specific kinds of use.
	• Restore areas impacted by visitor use in a way that is adversely impacting the cultural values ORV using passive or active techniques.

Hard 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.
Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken. If possible, work collaboratively with the tribe(s) to determine the best course of action: • Actively restore areas impacted by visitor use that risk degrading the cultural values ORV. • Implement short- or long-term closures of specific location(s) or specific kinds of use within the WSR corridor that are potentially degrading the cultural values ORV. • Limit access to specific locations within the corridor (such as the waterfall or Fossil Springs area) to guided groups. • Reduce corridor-wide visitor numbers.
Expected Outcomes	Adverse impacts to traditional cultural values resulting from visitor use are reduced to the point that traditional practitioners indicate the Cultural Values ORV is protected by the next monitoring cycle.

Plan Element	Detail
Indicator of Success	Tribes convey that traditional cultural values are being protected.

Culturally Sensitive Sites

Culturally sensitive site monitoring (table 6-16) is intended to ensure specific areas considered to be of the greatest sensitivity are not negatively affected by visitor use. Four specific sites have been selected for monitoring based on tribal consultation. Because of the sensitivity of these places, degradation is threatened by one incidence of an identifiable unauthorized trail or other surface disturbance (e.g. denuded campsites, evidence of pot hunting, moving/rearranging of large rocks, removal of artifacts).

Table 6-16. Cultural values ORV monitoring and adaptive management – culturally sensitive sites

Plan Element	Detail
Objective	Specific sites or areas identified by associated tribes through consultation are being protected from adverse impacts resulting from visitor use. The sites are: AR-03-04-01-712 (Flume Construction Camp), AR-03-04-01-1134/1899 (Bah'Loon's Place), AR-03-04-01-1138 (Purple Mt. Work Camp/Ash Trees Growing Downward), or AR-03-12-04-2070 (Dance Ground, Emory Oaks).
Indicator	Impacts resulting from visitor use to sites AR-03-04-01-712 (Flume Construction Camp), AR-03-04-01-1134/1899 (Bah'Loon's Place), AR-03-04-01-1138 (Purple Mt. Work Camp/Ash Trees Growing Downward), or AR-03-12-04-2070 (Dance Ground, Emory Oaks), as communicated by traditional practitioners and/or detected through bare soil monitoring (see table 5).
Metric	Presence of unauthorized trails or surface disturbance within the boundaries of sites AR-03-04-01-712, AR-03-04-01-1134/1899 (Bah'Loon's Place), AR-03-04-01-1138 (Purple Mt. Work Camp/Ash Trees Growing Downward), or AR-03-12-04-2070 (Dance Ground, Emory Oaks), as indicated by traditional practitioner observation and/or bare soil monitoring.
Measurement Frequency	Annually at all sites AR-03-04-01-712 (Flume Construction Camp), AR-03-04-01-1134/1899 (Bah'Loon's Place), AR-03-04-01-1138 (Purple Mt. Work Camp/Ash Trees Growing Downward), and AR-03-12-04-2070 (Dance Ground, Emory Oaks). If no impacts are observed for two consecutive monitoring cycles, the monitoring interval will be increased to once every three years. Annual monitoring will recommence if impacts are observed.
Assessment Frequency	Concurrent with measurement.
Soft Threshold	Indication of new visitor use (faint indications of unauthorized trails or new ground disturbance) within site boundaries.

Adaptive Management Actions	One or more adaptive management actions such as the following may be taken, depending on the causes of the impacts and what is anticipated to be effective. If possible, work collaboratively with the tribe(s) to determine the best course of action. These actions would supplement or enhance similar actions occurring as a part of standard CRMP implementation.
	• Increase signage, education and outreach efforts, or ranger or traditional practitioner presence, with the goal of fostering public interest in protecting cultural resources and developing a stewardship ethic.
	• Improve amenities (such as toilets, picnic areas, and creek access points) within recreation sites in order to reduce impacts outside of recreation sites.
	• Better define the boundaries of recreation sites, roads, and trails through signage, barriers, or fencing.
	• Change the locations, kinds, or amounts of visitor use in the Fossil Creek WSR corridor. Actions may include, but are not limited to,
	  • Reallocate the amount of use among recreation sites.
	  • Establish permits for access to the WSR corridor (if not already in place), for access to specific locations within the corridor, or for specific kinds of use.
	• Restore unauthorized trails and ground disturbance caused by visitor use leading to or within cultural sites.
	• Re-route trails or sections of trail if their location is contributing to impacts in culturally sensitive sites.

Plan Element	Detail
Hard 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.
Adaptive Management Actions	Adaptive management actions such as those listed above may be taken if anticipated to be effective. Additionally, one or more actions such as the following may be taken. If possible, work collaboratively with the tribe(s) to determine the best course of action: • Protect impacted cultural sites through brushing, boulders, or other physical barriers. • Implement short- or long-term closures of specific location(s) or specific kinds of use within the WSR corridor that are impacting culturally sensitive sites. • Reduce corridor-wide visitor numbers.
Expected Outcomes	Adverse impacts to specific culturally sensitives sites resulting from visitor use are reduced by the end of the next monitoring cycle.
Indicator of Success	Tribal traditional practitioners feel and/or bare soil monitoring indicates that specific sites within the Fossil Creek area are free from adverse impacts resulting from visitor use.

Other General Monitoring and Procedural Requirements

Other monitoring and procedural requirements may contribute to protection of river values or provide useful context for assessing monitoring data collected through the CRMP monitoring program. These include Forest Plan monitoring, range monitoring and adaptive management, air quality monitoring, and National Environmental Policy Act (NEPA) compliance. Authority for these requirements is separate from the CRMP.

Forest Plan Monitoring

Forest Plan monitoring is intended to regularly evaluate, document, and report how the forest plans are applied, how well they work, and if the purpose and direction provided in the plans remain appropriate. Factors such as watershed and riparian function, habitat improvement, and recreation management may be considered in Forest Plan monitoring. Descriptions of Forest Plan monitoring can be found in the Coconino and Tonto forest plans.

Range Monitoring and Adaptive Management

On range allotments in the Fossil Creek area that experience livestock grazing, utilization monitoring is conducted annually to determine the amount of forage grazed that year and ensure compliance with allotment management plans and annual operating instructions. Long-term trend monitoring is conducted every five years to assess trends in the condition of vegetation, litter cover, and soil. Adaptive management authorized through allotment management plans is used to modify the location, timing, and amount of livestock grazing when needed to respond to changing forage conditions and ensure effects are within acceptable levels.

Air Quality Monitoring

To meet the requirements of the Environmental Protection Agency's Regional Haze Rule, air quality monitoring of the Mazatzal Wilderness Area Class I Airshed is conducted through the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. A monitoring site is located on Ike's Backbone to the west of the Mazatzal Wild Segment of Fossil Creek. This site, along with other monitoring sites throughout the country, establishes current visibility and aerosol conditions in Class I airsheds; identifies chemical species and emission sources responsible for existing man-made visibility impairment; documents long-term trends in visibility; and provides regional haze monitoring, where practicable.

National Environmental Policy Act Compliance

Any future "major federal actions"[66] in Fossil Creek that are not covered by the analysis associated with this CRMP will be subject to the NEPA process. This process will ensure future actions are compatible with this

[66] Major federal actions are defined at 40 CFR 1508.18 and generally consist of projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies.

CRMP and the Coconino and Tonto forest plans, provide opportunities for public involvement, and will analyze and disclose the potential effects of implementing the actions.

Literature Cited

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Glossary

Adaptive Management: A "rigorous approach for learning through deliberately designing and applying management actions as experiments" (Murray and Marmorek 2003). The CRMP includes monitoring indicators and metrics associated with specific objectives. As the CRMP is implemented, monitoring provides the data that inform the adaptive management process and is the critical link in determining when action is needed. Adaptive management is an important component of this CRMP and is described in Chapter 6.

Adverse Impact: A substantial reduction in the condition of a river value in relation to baseline conditions as a result of public use, development, and/or administrative use. An adverse impact is a condition that requires immediate management attention. It may be detected by periodic monitoring or by other means. When more than one indicator is monitored for any river value, an adverse impact associated with any one of the indicators constitutes an adverse impact on the value as a whole. This definition is specific to the WSRA and is not the same as the definition used in NEPA. General definitions of adverse impact with respect to the river values are provided in Chapter 2 of the CRMP.

Aquatic Management Zone (AMZ): An established area that generally follows the shape of the streamcourse and consists of vegetation and vegetative litter within a specified distance from the edge of the stream. The purpose of the AMZ is to buffer against detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment that may seriously and adversely affect water conditions or fish habitat, similar to the "riparian management zone" described at 36 CFR 219.8(a)(3)(ii). As described in Chapter 3, in Fossil Creek, the AMZ is established 100 feet from either edge of the perennial portion of Fossil Creek and 50 feet or encompassing the entire riparian area on each side of intermittent streams, whichever is wider.

Baseline Condition: The condition of river values at the time of designation of a wild and scenic river. Fossil Creek's baseline year is 2009. Baseline conditions are described in Chapter 2 of the CRMP.

Best Management Practices (BMPs): A component of resource protection measures. BMPs are methods, measures, or practices selected by an agency to meet its nonpoint source pollution control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters.

Degradation: The state in which a river value has been fundamentally altered by public use or development to the point that its condition is reduced below the baseline documented at time of designation. Degradation is a long-term, segment-wide condition. A river value has been degraded when recovery would only be possible through a sustained change in management and a significant investment of financial capital. Degradation may be detected by periodic monitoring or by other means. Degradation of river values is prohibited by the Wild and Scenic Rivers Act. General definitions of degradation with respect to the river values are provided in Chapter 2 of the CRMP.

Desired Conditions: Plan components that set forth the desired social, economic, and ecological goals of Fossil Creek. They attempt to paint a picture of what we (the public and the Forest Service) desire the WSR corridor to look like or the goods and services we desire it to provide. Desired conditions are generally expressed in broad, general terms; however, more specificity may be added to clarify the intent. Desired conditions are timeless in that there is no specific date by which they are to be completed. They are aspirations and not commitments or final decisions that approve projects or activities, and they may only be achievable over a long timeframe. Projects and site-specific activities must be consistent with desired conditions. Projects that conflict with desired conditions would require a plan amendment. Desired conditions for Fossil Creek are described in Chapter 3 of the CRMP. Forest-wide desired conditions are described in the land and resource management plans for the Coconino and Tonto national forests.

Enhancement: Actions taken to improve the condition of a river value. Such actions improve the conditions of a river value to the point where the river value's condition meets or exceeds the desired condition. Where possible,

these actions correct past and present degradation. The state of enhancement is the best possible condition for a river value.

Free-flowing: The condition of a river, or section of a river, moving in a natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. A river must be in a free-flowing state to be eligible for inclusion in the National Wild and Scenic Rivers System.

Guidelines: Plan components that are sideboards that guide management activities and provide specifications that a project or activity would adopt unless there is a compelling or defensible reason to vary from the guideline. A guideline is applied only after it has been analyzed in project-level planning and included in a project decision. Unlike a standard, deviation from the explicit provisions of the guideline is permitted without a plan amendment, as long as the intent of a guideline is met. Deviation from the explicit provisions of a guideline, if it is meeting the intent of the guideline, must be documented in the project record. Projects that deviate from a guideline's intent must be accompanied by a plan amendment that would allow for the deviation. Guidelines for projects and activities in Fossil Creek are described in Chapter 3 of the CRMP. Forest-wide guidelines are described in the land and resource management plans for the Coconino and Tonto national forests.

Heritage Resource: Heritage resources consist of both the traditional and contemporary cultural uses outstanding remarkable value and resources eligible or potentially eligible to be listed on the National Register of Historic Places. Historic properties are also referred to as archaeological sites.

Indicator: A factor assessed through monitoring to determine the condition of river values. Indicators are selected based their relationship to river values, their ease of measurement, precision, sensitivity to changes over time, and, if possible, their ability to satisfy multiple objectives of the monitoring process. Indicators are provided in Chapter 6 of the CRMP.

Interim Management Measures: Management actions taken to ensure a wild and scenic river's values are protected while development of the comprehensive river management plan is ongoing.

Management Approaches: Statements that help clarify how plan direction may be applied and identify probable management actions that are designed to maintain or make progress toward desired conditions and objectives. Management approaches are strongly influenced by recent trends, past experiences, anticipated staffing levels, and short-term budgets. Management approaches for projects and activities in Fossil Creek are described in Chapter 3 of the CRMP. Forest-wide management approaches are described in the land and resource management plans for the Coconino and Tonto national forests.

Middle Fossil: The reach of Fossil Creek between the Mazatzal recreation site upstream to ¼ mile above the waterfall at the end of the Dixon Lewis (Waterfall) Trail.

Mitigation: A component of resource protection measures. Mitigation includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (e) compensating for the impact by replacing or providing substitute resources or environments.

Monitoring: Evaluation of the condition of river value-related indicators to determine if they are protected and enhanced or to detect adverse impacts and to inform the need for adaptive management actions. Monitoring is described in Chapter 6 of the CRMP.

National Register of Historic Places-Eligible Historic Property: A historic property that is National Register-Eligible (as per the National Historic Preservation act of 1966, as amended, and through promulgated regulations).

Objectives: Concise, time-specific statements of measurable, anticipated results that help achieve or move toward desired conditions over the life of the plan. Objectives are projections based on recent trends, current and anticipated staffing levels, and anticipated budgets. Activities specified in objectives are intended to help make progress toward achieving desired conditions and represent just some of the outcomes or actions expected to accomplish movement toward desired conditions. Objectives for projects and activities in Fossil Creek are described in Chapter 3 of the CRMP. Forest-wide objectives are described in the land and resource management plans for the Coconino and Tonto national forests.

Ordinary High Water Mark: The U.S. Army Corps of Engineers defines the ordinary high water mark as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

Other Use: Use within a WSR corridor other than public use (defined below), such as federally authorized mining, forestry, grazing, subsistence hunting and fishing, road use and management, administrative use for other than WSR purposes, and use on non-federal lands in a WSR corridor that have a potential to affect river values. Other use also includes any use on federal or non-federal lands that border upon or are adjacent to a WSR corridor that may substantially interfere with public use and enjoyment of river values.

Outstandingly Remarkable Value (ORV): A scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar river-related value that is unique, rare, or exemplary feature and is significant when compared with similar values from other rivers at a regional or national scale. Fossil Creek's ORVs are geology, biological, recreation, and Western Apache and Yavapai traditional and contemporary cultural values. ORVs are described in detail in Chapter 2 of the CRMP.

Plan Components: Desired conditions, objectives, standards and guidelines. Once plan components are approved, any substantive changes to them will require a plan amendment. Plan components are described in Chapter 3 of the CRMP. Forest-wide plan components are described in the land and resource management plans for the Coconino and Tonto national forests.

Protection: Documenting and eliminating adverse impacts on river values, including activities that were occurring on the date of designation. Protection of river values is mandated by the Wild and Scenic Rivers Act.

Public Use: Visitor use and WSR-specific administrative use within a WSR corridor.

Recreation Sites: Recreation sites include both developed recreation footprints and recreation dispersal footprints. Developed recreation footprints are areas within the Fossil Creek WSR corridor in which disturbance from machinery, the building of infrastructure, the presence of vehicles, and use by visitors may occur. Recreation dispersal footprints are areas within the Fossil Creek WSR corridor where effects from visitor use may occur, but no major machinery or infrastructure will be used or built in these areas. Minor allowed infrastructure or actions could include signage, hardened trails and armored creek access, and restoration activities.

Refugia: Upland and riparian areas outside of recreation sites, roads, and trails where the effects of visitor use are so minor as to be negligible and use of heavy machinery or development of infrastructure will not occur.

Resource Protection Measures: Actions taken to ensure management activities do not adversely impact river values. Resource protection measures include mitigation and best management practices (defined above).

River Corridor: Also referred to as the WSR corridor. The geographic area generally encompassed within one-quarter mile on either side of Fossil Creek that contains the river and its outstandingly remarkable values. Fossil Creek's river corridor is described in Chapter 1 of the CRMP.

River-related or river-dependent: The state of being located in the river or on its immediate shorelands (generally within 0.25 mile on either side of the river); contributing substantially to the functioning of the river ecosystem; and/or owing its location or existence to the presence of the river.

River Segment Classifications: The Wild and Scenic Rivers Act creates Wild, Scenic, and Recreational segment classifications:

- ***Wild:*** Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- ***Scenic:*** Rivers or sections that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- ***Recreational:*** Those rivers or sections that are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past.

River Values: The characteristics that contributed to designation as a wild and scenic river. Fossil Creek's river values are a combination of its outstandingly remarkable values (defined above) and its water. Fossil Creek's river values are described in detail in Chapter 2 of the CRMP.

Section 7 Analysis: An analysis required by Section 7 of the Wild and Scenic Rivers Act undertaken to determine whether a proposed water resources project (defined below) within Fossil Creek would have a "direct and adverse" effect on Fossil Creek or whether a proposed water resource project below, above, or on a stream tributary would "invade" Fossil Creek or "unreasonably diminish" its river values.

Standards: Plan components that are constraints upon project and activity design. A standard is an absolute requirement to be met in the design of projects and activities. A standard is applied only after it has been analyzed in project-level planning and included in a project decision. A project or activity is consistent with a standard when its design is in accord with the explicit provisions of the standard; variance from a standard is not allowed except by plan amendment. Standards for projects and activities in Fossil Creek are described in Chapter 3 of the CRMP. Forest-wide guidelines are described in the land and resource management plans for the Coconino and Tonto national forests.

Thresholds: Thresholds signify degrees of movement toward degradation of river values. Soft and hard thresholds are pre-defined decision points that indicate, barring mitigating circumstances, an adaptive management action is warranted to ensure protection or prevent degradation of river values. Soft thresholds indicate the point at which adverse impacts may be at risk of occurring. Hard thresholds indicate the point at which the risk of degradation is threatened.

Traditional Cultural (uses/values/importance): Associated with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Traditional Cultural Property: A cultural (heritage) resource that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community. The entity evaluated for eligibility for inclusion in the National Register of Historic Places must be a tangible property; that is, a district, site, building, structure, or object as defined in 36 CFR 64.4 (Forest Service Manual, Chapter 2360).

Travertine: Biotically and/or abiotically precipitated calcium carbonate (predominately calcite and aragonite) from spring-fed, heated and/or ambient-temperature waters. Travertine is chemically identical to the mineral calcite.

User Capacity: The maximum amounts and kinds of public use that a WSR collectively or by analysis area can accommodate without degrading river values.

Visitor Use: Human presence within a WSR corridor for recreational purposes, including education, interpretation, inspiration, and physical and mental health.

Water Resources Projects: Water resources projects are projects proposed in the bed or banks of a designated river or congressionally authorized study river and that are proposed by a federal agency or require some type of federal assistance such as a permit, license, grant, or loan. Water resources projects include any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act, or other construction of developments which would affect the free-flowing characteristics of a wild and scenic or congressionally authorized study river. In addition to projects licensed by the Federal Energy Regulatory Commission, water resources projects may also include: dams; water diversion projects; fisheries habitat and watershed restoration/enhancement projects; bridges and other roadway construction/ reconstruction projects; bank stabilization projects; channelization projects; levee construction; recreation facilities such as boat ramps and fishing piers; and activities that require a 404 permit from the Army Corps of Engineers.

“Bed or banks” is limited to the area within the ordinary high water mark of the river. The ordinary high water mark is defined in 33 CFR Part 328.3(c)(6) as “…that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.”

Wild and Scenic River: A river that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values that, by inclusion in the national wild and scenic rivers system created by the Wild and Scenic Rivers Act, is preserved in free-flowing condition, and that is protected for the benefit and enjoyment of present and future generations.

Wild and Scenic River-Dependent Activities: Those activities that happen specifically in a WSR setting, and that may not necessarily occur in other areas with similar features. WSR-dependent activities are also those activities that allow visitors to appreciate and value the river values that make the area special. For example, water play in this unique environment, where the water is a clear turquoise blue, is unique to Fossil Creek Wild and Scenic River corridor.

WSR-specific Administrative Use: Use within a WSR corridor by the river manager, including ranger patrols, maintenance activities, field research, staff visits to administer contracts or facilities, search and rescue, and interpretative programs for the purpose of protection or enhancement of river values.

List of Acronyms

ADEQ – Arizona Department of Environmental Quality
ADWR – Arizona Department of Water Resources
AGFD – Arizona Game and Fish Department
AMZ – Aquatic Management Zone
APS – Arizona Public Service Company
AZCC – Arizona Conservation Corps
BCE – Before Common Era
BMP – Best Management Practice
BOR – Bureau of Reclamation
CE – Common Era
CFR – Code of Federal Regulations
CFS – Cubic Feet per Second
COBH – Common Black-hawk
CPUE – Catch per Unit Effort
CRMP – Comprehensive River Management Plan
DEIS – Draft Environmental Impact Statement
EA – Environmental Assessment
EIS – Environmental Impact Statement
EPA – Environmental Protection Agency
ESA – Endangered Species Act
FERC – Federal Energy Regulatory Commission
FR – Forest Road
FS – Forest Service
FSH – Forest Service Handbook
FSM – Forest Service Manual
IBI – Index of Biological Integrity
IMPROVE – Interagency Monitoring of Protected Visual Environments
IWSRCC – Interagency Wild and Scenic Rivers Coordinating Council
LRMP – Land and Resource Management Plan
MA – Management Area
mL – Milliliter
NAU – Northern Arizona University
NEPA – National Environmental Policy Act
NFMA – National Forest Management Act
NFS – National Forest System
NOI – Notice of Intent
NRHP – National Register of Historic Places
NVUM – National Visitor User Monitoring
OAW – Outstanding Arizona Waters
PAC – Protected Activity Center
PAOT – Persons at One Time
OCWC – Oak Creek Watershed Council
OHV – Off-highway Vehicle
ORV – Outstandingly Remarkable Value
SHPO – State Historic Preservation Office
TCP – Traditional Cultural Property
US – United States
USC – United States Code
USDA – United States Department of Agriculture
USFS – United States Forest Service
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey
VES – Visual Encounter Survey
VWRC – Verde Watershed Restoration Coalition
WAPA – Western Area Power Administration
WSR – Wild and Scenic River
WSRA – Wild and Scenic Rivers Act

Appendix A. Resource Protection Measures

Resource protection measures are actions taken to ensure management activities do not adversely impact river values. Resource protection measures include mitigation and best management practices (BMPs). Mitigation includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (e) compensating for the impact by replacing or providing substitute resources or environments. BMPs are methods, measures, or practices selected by an agency to meet its nonpoint source pollution control needs. BMPs include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters.

The following resource protection measures will be implemented along with actions authorized by the Fossil Creek CRMP.

Soils, Watershed, Fish, and Aquatic Resources

In 2012, the U.S. Forest Service unveiled its national BMP program to improve agency performance and accountability in managing water quality consistent with the Clean Water Act and state water quality programs. This program includes a set of core BMPs that apply to agency activities with the potential to cause nonpoint source pollution of surface water, including but not limited to, wildland fire management, rangeland management, recreation management, road management, facilities management, and mechanical vegetation management. The *National Core BMP Technical Guide* is incorporated herein by reference (USDA 2012).

In addition to implementation of national core BMPs as part of management activities associated with Fossil Creek, any construction activities that disturb one or more acres of land need to be permitted under the Arizona Pollutant Discharge Elimination System (AZPDES) Construction Activity General Permit for Stormwater. AZPDES permits are issued by the Arizona Department of Environmental Quality (see http://www.azdeq.gov/node/524) and entail development and implementation of a stormwater pollution prevention plan (SWPP) consistent with ADEQ requirements.

Wildlife and Vegetation

1. To protect springs that cross roads, permeable road fill should be used to facilitate water movement across the road surface. Locations on FR 502 include the spring near Sally May Wash, and locations on FR 708 include the Tonto NF springsnail site.
2. To improve drainage on the closed section of FR 708, drainage features should be improved. Improvements may include water bars, rolling dips, culverts, properly placed outsloped or insloped roads with outlets draining water across adequate filter strips.
3. Determine potential occurrences and habitat of Southwestern Region sensitive plants and known invasive species in project activity areas when planning for implementation of any site-disturbing project. Identify potential species and survey the area to be treated before implementation.
4. Mitigate negative effects from management actions on Southwestern Region sensitive plants during design and implementation.
5. Prohibit road and trail construction/ reconstruction within populations of Southwestern Region sensitive plants and promote road and trail decommissioning in potential habitat.
6. Survey springs for Southwestern Region sensitive plants and springsnails before implementation of actions that may adversely impact sensitive plants or springsnails. Inform the forest botanist if sensitive plants are found and the Red Rock District biologist if springsnails are found. Determine actions needed to mitigate potential impacts. Mitigations may include avoiding sensitive springs, altering designs,

establishing protective spring crossings (e.g. footbridges), or enclosures around sensitive plants or springsnail locations. Incorporate buffer strips along drainages.

7. Incorporate weed prevention and control into project layout, design, alternative evaluation, and project decisions. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.
8. Follow current guidance for invasive weed management, currently contained in appendix B of the "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott NFs within Coconino, Gila, Mojave, and Yavapai Counties, Arizona," including: (1) survey the treatment area and evaluate weeds present before implementation; avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds; (2) treat weed infestations within project area before implementation; (3) manage prescribed fires as an aid to control existing weed infestations and to prevent the spread of existing weeds; and (4) monitor all disturbed sites regularly for invasive weeds and control noxious or invasive weeds.
9. Control noxious or invasive weeds and treat weed infestations as needed to minimize impacts to the river values, especially before implementing ground-disturbing actions.
10. Prevent spread of potential and existing noxious or invasive weeds by vehicles used in ground disturbing activities by washing vehicles and equipment prior to entering the project area and when moving from one infested area to another.
11. Monitor the effects of project activities on Region 3 sensitive plants after treatments are completed.
12. Incorporate surveys for rare and endemic plants into surveys for Region 3 sensitive plants and/or noxious or invasive weeds prior to implementation. Survey needs will be dependent on known or potential occurrences in the treatment areas.
13. To rehabilitate riparian locations where ground disturbance occurs, seed at 5 pounds per acre with certified weed-free native seed mix to rehabilitate the site and minimize impacts of noxious weeds. Potential vegetation for individual sites should utilize the Coconino NFs TES to identify species to be utilized. Where feasible, protect site with a variety of methods.
14. Road maintenance and non-emergency construction activities involving loud heavy machinery or other loud activities (e.g. blasting) occurring within the Fossil Creek WSR corridor will occur only between Sept 1 and March 15 to avoid the breeding season for nesting birds.
15. Activities in the high, very high, and extremely high noise level range (table A-1) will not occur during critical periods of time for wildlife.
16. To benefit pollinators, use only local native seeds in restoration, rehabilitation and revegetation efforts.
17. Assure continuity of nectar and pollen resources when pollinators are active, especially from spring to late summer.
18. Increase abundance and diversity of wildflowers to improve pollinator diversity.
19. Ensure that pollinator nesting habitat is in close proximity (500-800 m; 0.3-0.5 mi) to foraging habitat.
20. Manage wildlife openings to improve and sustain pollinator habitat.
21. Time prescribed burns when bumble bees are dormant, if possible. When not possible, stagger treatment areas to ensure that some flowers are always available.
22. Incorporate bat roosting specifications into designs for new bridge construction.

Table A-1. Typical noise levels for most equipment types at 50 feet (If not on list, must look up)

Equipment	Decibel (dB) Range	Relative Noise Level (see ranking below)
Pneumatic riveter	125 @ 4'	Extreme

Equipment	Decibel (dB) Range	Relative Noise Level (see ranking below)
Sandblasting, loud rock concert	115	Extreme
Power saw at 3'	110dB @ 3’	Extreme
Explosives	94 @ 50’ – 145 @ 330’	Extreme
Helicopter	77 @ 800 ft – 106 @ 100 ft	Extreme
Pneumatic tools, jackhammers, & pile driver	101-110	Very High
Road grader	83 @ 50’	
Rock drill	85 - 98 @ 50’	Very High
Heavy Trucks	90-95	Very High
Jake Brake on Truck	110 @ 8’	High
Jackhammer	74 (when muffled -89 @ 50’	High
Dozer	84-88 @ 50’	High
Front-end Loader	80-87 @ 50’	High
Crane	85-88@ 50’	High
Hammer Hoe	85-90 @ 50’	High
Excavator	81 @ 50’	High
Pumps, generators, compressors	81-87	Medium
Chainsaw	75-86	Medium
Road Grader	83-85 @ 50’	Medium
Concrete Truck	81-85 @ 50’	Medium
Concrete Mixer	80 @ 50’	Medium
Dump Truck	84 @ 50’	Medium
Crane	81 @ 50’	Medium
Backhoe	80-84 @ 50’	Medium
Roller	74-80 @ 50’	Medium
Auger Drill Rig	84 @ 50’	Medium

Note that for humans, pain begins at 125 dB, short term exposure can cause permanent damage at 140 dB, death of hearing tissue occurs at 180 dB and the loudest sound possible is 194dB.

Noise Level Ranking
Zero: < 45 dBA
Very low: 46-65 dBA
Low: 66-76 dBA
Medium: 77-87 dBA
High: 88-95 dBA
Very High: 96-108 dBA
Extreme: >108 dBA

Heritage Resources

Four sites—the Flume Construction Camp (AR-03-04-01-712), the Purple Mt. Work Camp (Ash Trees Growing Downward, AR-03-04-01-1138), Bah’Loon’s Place (AR-03-04-01-1134/1899), and Dance Ground, Emory Oaks (AR-03-12-04-2070)—have been identified as having Culturally Outstandingly Remarkable Value and will receive annual monitoring to evaluate their condition. If no impacts are observed, monitoring will be conducted at longer intervals. More details are provided in Chapter 6.

Additionally, the following actions and those listed for sites in table A-2 are required to result in no adverse effects.

1. Sites that have in-use infrastructure going through them, such as FR 502 and 708, and the APS NW-1 powerline, may continue with normal use and maintenance. Use of heavy equipment on powerlines will require monitoring as authorized by CNF Report 2012-34-A (Walker et al. 2014).

2. Sites with prehistoric components that are crossed by roads and powerlines will require monitoring if new disturbance beneath the current road bed is proposed to ensure no intact subsurface cultural deposits exist.

3. When in-use trails cross sites, consideration will be given to the possibility of moving the trails off the sites, as proposed for AR-03-04-01-1177. If trails cannot be moved, SHPO will be consulted on an

appropriate course of action. Such trails may continue in use but cannot receive maintenance without SHPO consultation.

4. Sites proposed to have new recreation facilities developed on them will require SHPO, and in some cases, Yavapai-Apache Nation, consultation.

5. Any other soil-disturbing activities not considered in this CRMP that may be proposed in the future will require SHPO, and in some cases, Yavapai-Apache Nation, consultation.

6. Sites needing revegetation may be lightly raked by hand and reseeded with native plant seeds. Other, more surface-disturbing techniques will require SHPO consultation.

Table A-2. Specific mitigations to avoid adverse effects to heritage resources

Site No./Name	National Register Eligibility	Management to Provide No Adverse Effects
01-11 Childs-Irving Power plant & Flume	Previously determined eligible, Criteria A,C,D. Listed On National Register Decommissioned. Related features destroyed.	Previously documented to HABS/HAER Standards. Four structures remain for future interpretation. Monitor for protection. No actions planned for remaining structures. See Historic Preservation Plan (Neal and Martin 2003).
01-12 Irving Power Plant	Previously determined eligible, Criteria A,C,D. Listed On National Register Decommissioned. Site destroyed.	Previously documented to HABS/HAER standards. No management required. No actions planned for the site.
01-258 (includes 01-259 & 01-260)	Previously determined eligible, Criterion D	FR 708 and FR 708-B run through site. FR 708-B has been closed. FR 708 operation & maintenance may continue with routine operation & maintenance. Any re-opening of FR 708-B or ground disturbing vegetation work other than light raking and reseeding will require SHPO consultation.
01-263	Previously determined not eligible	None.
01-700	Previously determined eligible, Criterion D	Trail use and normal maintenance through site may continue. Unauthorized trails may be revegetated by light raking & reseeding. More intensive soil disturbance would require additional SHPO consultation. Consultation with SHPO needed for proposed future recreation facility.
01-701 Flume Gate Tender's House	Previously determined eligible, Criterion D	A formalized trail through site that avoids features may be developed but plans for on-site recreation facility will require SHPO consultation.
01-706 – Flume Construction Camp	Previously determined eligible – Criterion D	Continued use and maintenance of the Flume road/trail may continue. Any new ground disturbing activity requires archaeological monitor.
01-712 – Flume Construction Camp	Previously determined eligible – Criterion D Site considered a Culturally Outstanding Recreational Value	Continued use and maintenance of the Flume trail/road may continue. Any new ground disturbing activity requires archaeological monitor. Initially monitored annually. If no impacts are observed for two consecutive years, monitoring interval will be increased to once every three years. Annual monitoring will recommence if impacts are observed.
01-718 Camp Hynes	Previously determined eligible – Criterion D	The APS NW 1 powerline can continue normal operation & maintenance through the site. FR 708-B is closed through the site but may need revegetation. Light hand raking and reseeding with natural plants may be done through the site. Any other activities that would result in greater surface disturbance will require archaeological monitoring.
01-720	Previously determined eligible – Criterion D	FR 708-B is closed through the site but may need revegetation. Light hand raking and reseeding with natural plants may be done through the site. Any other activities that would result in greater surface disturbance will require archaeological monitoring.
01-740 Fossil Cr. Bridge	Listed On National Register – Criterion C	None. Will be left in place when a new bridge is Installed.

Site No./Name	National Register Eligibility	Management to Provide No Adverse Effects
01-1079 Crismon Homestead	Previously determined not eligible, but newly discovered artifacts in disturbed areas require re-assessment, so is now Unevaluated.	Continued operation & maintenance of FR 708 through site, existing parking area, and vault toilets is allowed. Plans for a developed recreation area and creek access trail require SHPO consultation.
01-1134/1899-Bah'Loon's Place	Previously determined eligible - Criterion D. Site considered a Culturally Outstanding Recreational Value	The APS NW 1 power line, FR 502, and FR 708 may continue in use, but any ground disturbance other than routine operation and maintenance will require archaeological monitoring. Will be Initially monitored annually. If no impacts are observed for two consecutive years, monitoring interval will be increased to once every three years. Annual monitoring will recommence if impacts are observed.
01-1135	Previously determined eligible - Criterion D	Continued normal operation & maintenance of the APS power line may continue. The SHPO will be consulted when plans for a developed recreation area are proposed or any other ground disturbing activity.
01-1136/ 1080-Sally May Homestead	Previously determined eligible - Criterion D	Continued use and normal maintenance of FR 502 may continue. Light hand raking and reseeding of disturbed areas may be done. Any other ground disturbing activities require SHPO and Yavapai-Apache consultation.
01-1137	Previously determined not eligible	No protection needed.
01-1138 – Purple Mt. Work Camp, Ash Trees Growing Downward	Previously determined eligible, - Criterion D. Site considered a Culturally Outstanding Recreational Value	On-going use and normal maintenance of the BOR 345 kV line and the existing recreation area may continue. Archaeological monitoring required in conjunction with any other ground disturbing activities. Light hand-raking and reseeding with native plants may be done. Initially monitored annually. If no impacts are observed for two consecutive years, monitoring interval will be increased to once every three years. Annual monitoring will recommence if impacts are observed.
01-1152	Previously determined eligible - Criterion D	Continued use and normal maintenance of the APS NW 1 power line may continue. Light hand-raking and reseeding of the access roads with native plants may be done. Any other ground disturbance will require archaeological monitoring.
01-1177	Previously determined eligible - Criterion D	The proposed trail will be rerouted to the east to avoid Impacting the site.
01-1178-Mazatzal Work Camp	Previously determined eligible - Criterion D	The access road from FR 502 on the edge of the site will not be used and will be allowed to regenerate. Light hand-raking and reseeding with native plants may also be done. Other ground disturbing activities will require SHPO and Yavapai-Apache consultation.
01-1782/1896	Previously determined eligible - Criterion D	Continued normal use and maintenance of FR 502 and the APS powerline may continue. Archaeological monitoring required in conjunction with any ground disturbing activities.
01-1786/01-2053	Previously determined eligible - Criterion D	Normal use and maintenance of FR 708 and the APS powerline through the site may continue. The unauthorized trails may be naturalized using light hand raking and use of native plant seeds. Any road maintenance or trail restoration that involves ground disturbing other than as noted here will require SHPO consultation.
01-1834	Previously determined eligible - Criterion D	Consideration will be given to relocating the parking lot access road to avoid the site. If this doesn't work, SHPO will be contacted to consider another alternative. The unauthorized trails and disturbed areas may be lightly raked and reseeded with native plants. Any other ground disturbing modifications to the parking areas will also require SHPO consultation.

Site No./Name	National Register Eligibility	Management to Provide No Adverse Effects
01-2086/ AR-03-12-04-1629. FR 708 – Fossil Cr. Road	Previously determined not eligible. The Tonto National Forest portion of road is outside of project area	Normal operation and maintenance may continue. Any new ground disturbance beneath the road grade in sites with prehistoric components will require monitoring.
01-2269 – Heinrich Property	Previously determined eligible, Criterion D	Light hand raking and reseeding of the unauthorized trails and the disturbed area may be done. However, if any other more intrusive surface disturbance is proposed, the SHPO will be consulted. The SHPO will also be consulted when design concepts for the recreation area are being considered.
01-2270	Previously determined eligible, Criterion D	FR 502 may continue to operate with normal use and maintenance. Any other ground disturbing activities will require SHPO and Yavapai-Apache consultation.
01-2273	Previously determined eligible, Criterion D	Light hand raking and reseeding of the unauthorized trails and the disturbed area may be done. When plans for the recreation development are being proposed, SHPO consultation will be necessary.
01-2276	Previously determined eligible, Criterion D	Consideration will be given to move the trail out of the site boundary. If this is not possible, the SHPO will be consulted to determine an appropriate course of action. The trail may continue in use, but no maintenance will be performed until SHPO consultation has taken place. Should any other surface-disturbing work be proposed within the site area, SHPO consultation will be required.
01-2277	Previously determined eligible, Criterion D	Consideration will be given to move the trail out of the site boundary. If this is not possible, the SHPO will be consulted to determine an appropriate course of action. The trail may continue in use, but no maintenance will be performed until SHPO consultation has taken place. Should any other surface-disturbing work be proposed within the site area, SHPO consultation will be required.
03-12-04-282	Unevaluated	No ground disturbing trail maintenance activities will occur within the resource boundaries.
03-12-04-694	Unevaluated	Continued use and normal maintenance of the APS NW 1 power line may continue. Any other ground disturbance will require archaeological monitoring.
03-12-04-815	Previously determined eligible, Criterion D	Archaeological monitoring required in conjunction with any ground disturbing activities.
03-12-04-1364 – Mail Trail	Not considered by this report	Mail Trail on the Tonto NF. Obliterated in project area by 1960s widening and grading.
03-12-04-1725	Previously determined eligible, Criterion D	No actions proposed inside site, but actions outside site will allow regeneration & site protection.
03-12-04-1727	Previously determined eligible, Criterion D	No actions proposed inside site, but actions outside site will allow regeneration & site protection.
03-12-04-1728	Determined eligible, Criterion D, this report	Archaeological monitoring required in conjunction with any ground disturbing activities.
03-12-04-2070 Dance Ground – Emory Oaks	Previously determined eligible, Criteria A and D	Initially monitored annually. If no impacts are observed for two consecutive years, monitoring interval will be increased to once every three years. Annual monitoring will recommence if impacts are observed.
03-12-04-2071 – Dixon Lewis Site	Previously determined eligible, Criteria A and B, but not D due to disturbance	Use and maintenance of FR 708 through the site may continue. However, archaeological monitoring required in conjunction with any ground disturbing activities.
03-12-04-2103 – Francis Bear Site	Previously determined eligible, Criterion D	No actions proposed inside site, but actions outside site will allow regeneration & site protection.
03-12-04-2366	Previously determined eligible, Criterion D	The proposed trail will be rerouted to the south to avoid Impacting the site.
03-12-04-2370	Unevaluated	No ground disturbing trail maintenance activities will occur within the site boundaries.
03-12-04-2372	Previously determined eligible, Criterion D	No ground disturbing restoration or regeneration activities will take place within the site boundary during the implementation of the action alternatives.

Recreation

1. Use engineering, education, and enforcement methods to mitigate recreation impacts before limiting public use.
2. Use mitigation measures with a high likelihood of success, taking into account public preferences, visitor behaviors, and available resources.
3. Provide for equitable public access when implementing a managed entry system.

Scenery

To minimize the impact to scenery from bridge and bank stabilization activities:

1. Choose any riprap material used in the project to blend with the surrounding rock and exposed soil color.
2. Use construction materials that mimic color and texture from existing landscape features, including fill material, and rock riprap in drainage structures.
3. Paint, stain, or otherwise treat for rusty appearance (preferred) or use a flat forest service brown on exposed metal.
4. Avoid removing mature vegetation to the extent possible.
5. Locate staging areas or other construction-related activities within designated limits of disturbance. Replant these areas with native seed or salvaged plant material when construction is complete.
6. Design erosion control measures to be naturally appearing in long term.
7. Avoid construction vehicle movement on National Forest lands outside the designated construction access limits. Preserve and protect vegetation outside of the specified clearing limits.
8. Use tree wells and/or other techniques to extend the preservation of vegetation at the edge of the clearing limits. Provide a depth of 1–2 feet of porous fill around trees adjacent to the toes of slopes.

To minimize scenic impacts of augmentation of the gabion, methods that tie to natural elements such as the proposed integration of large boulders into the stream channel downstream of the existing gabions and protection of existing vegetation will be compatible with a High SIO. Short term impacts resulting from equipment accessing the creek bed or select vegetation removal for equipment to access the stream channel could be mitigated by reseeding and erosion control measures that would become less visible over time.

Appendix B. Recreation Site Maps

This appendix provides maps of the Fossil Creek recreation sites. The term “recreation site” refers to the combined developed and dispersed recreation areas. Developed recreation areas are those areas within recreation sites with the most concentrated development, such as parking and toilets. Developed recreation areas may be disturbed by machinery, building of infrastructure, presence of vehicles, and use by visitors. Recreation dispersal areas are typically adjacent to developed recreation areas or trails where visitors recreate along the creek. In recreation dispersal areas, effects of visitors (ground disturbance, noise disturbance, trash, etc.) are anticipated but no major machinery or infrastructure will be used or built. Minor infrastructure or actions such as signage, hardened trails and armored creek access, and restoration may occur.

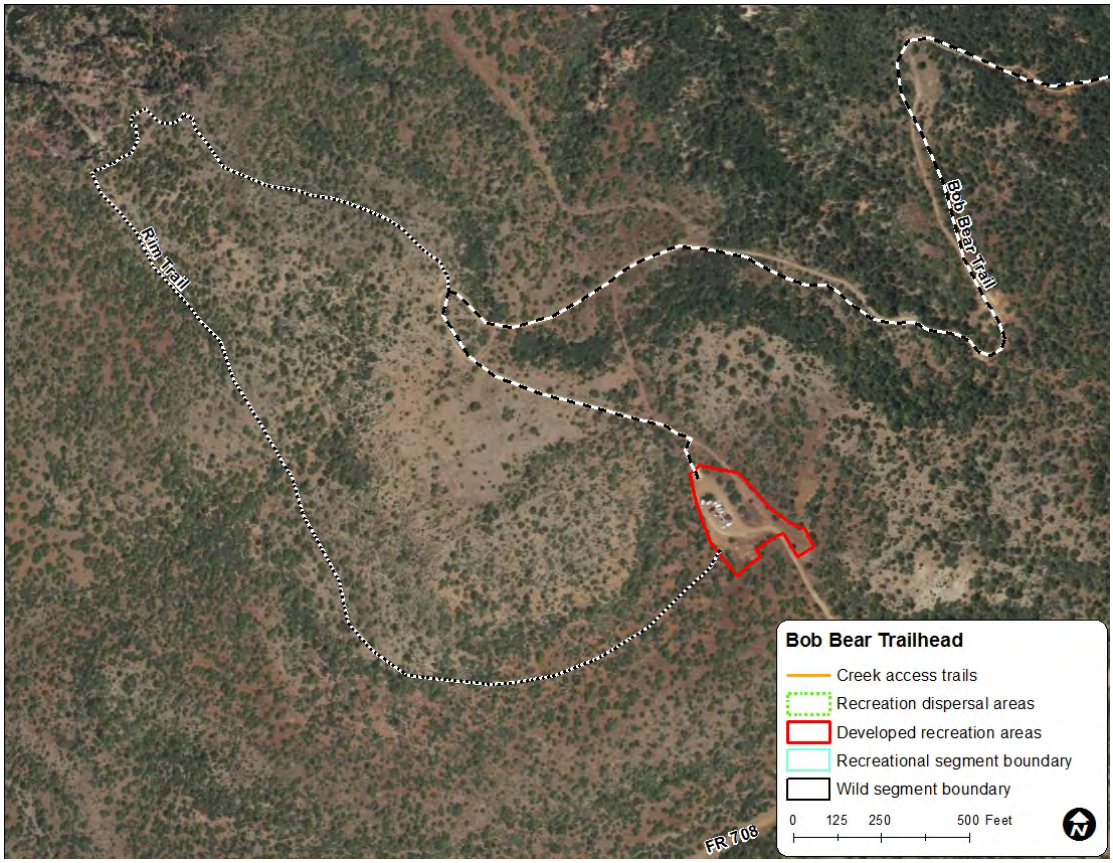

Figure B-1. Bob Bear Trailhead recreation site

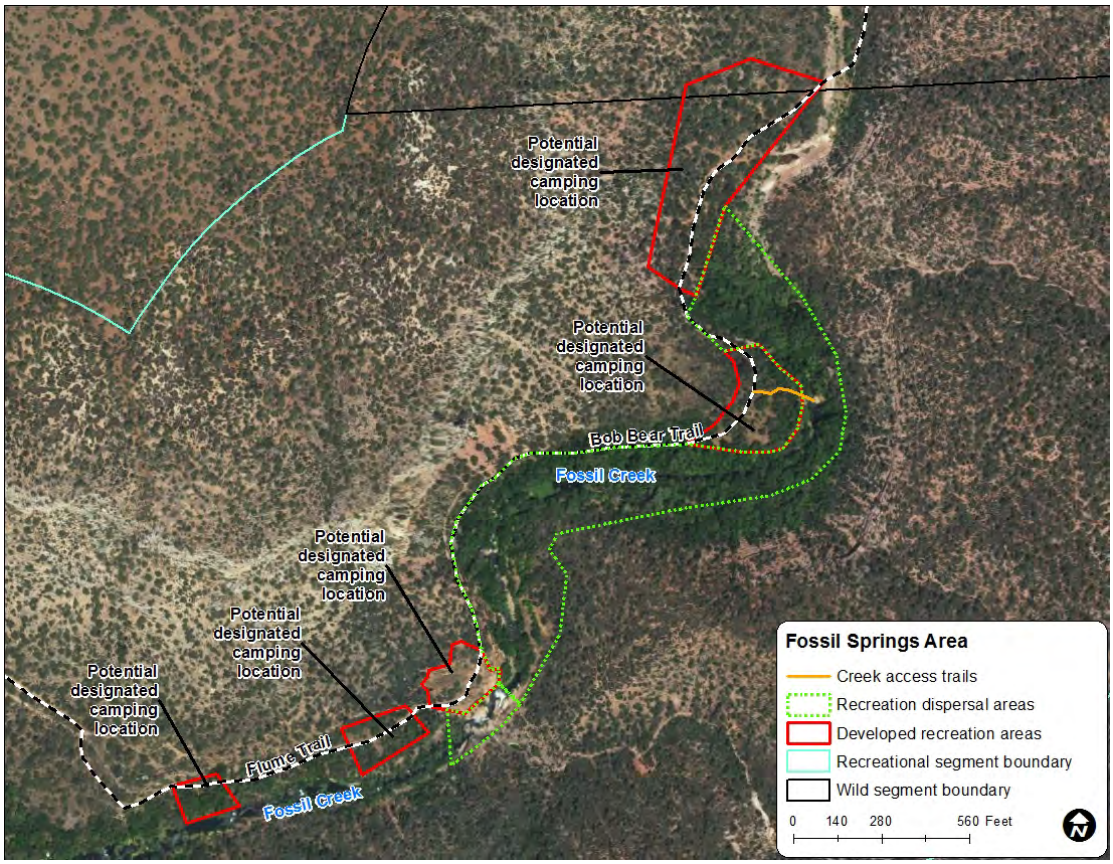

Figure B-2. Fossil Springs area. Designated camping may be established at one or more identified sites

Figure B-3. Dixon Lewis Trailhead recreation site

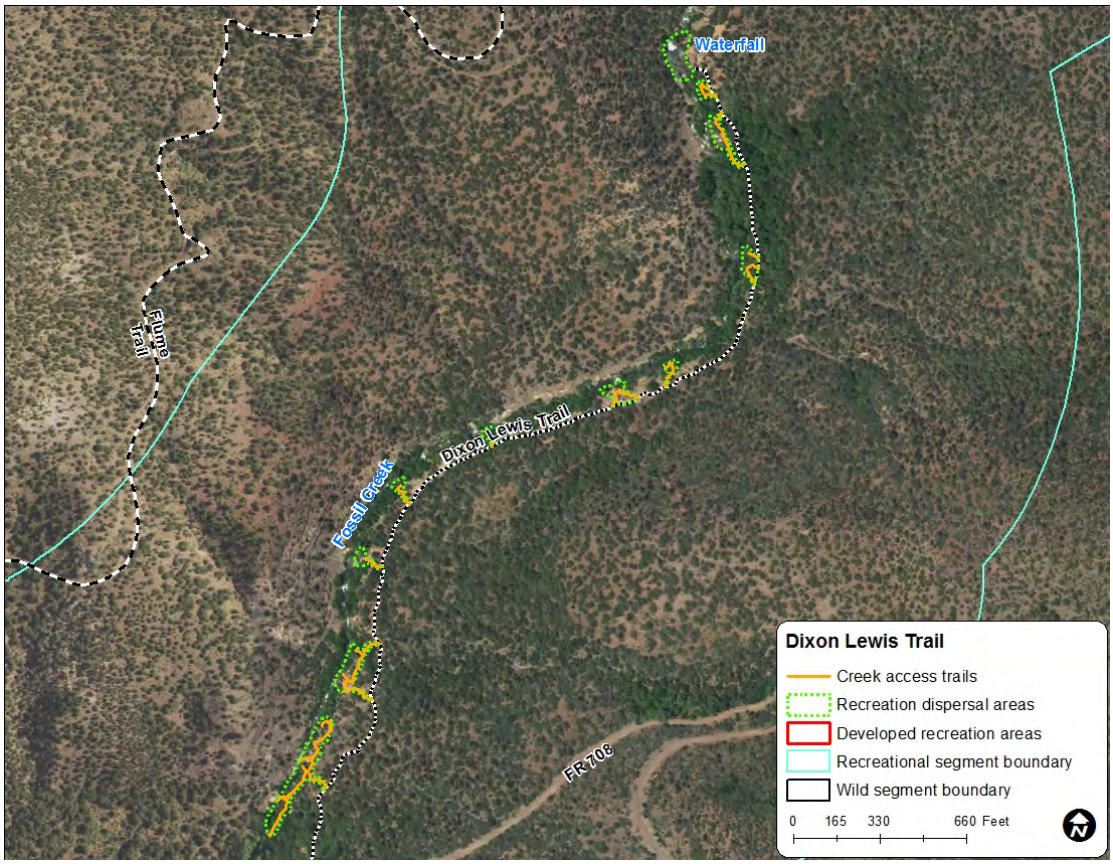

Figure B-4. Dispersed recreation areas along the Dixon Lewis Trail

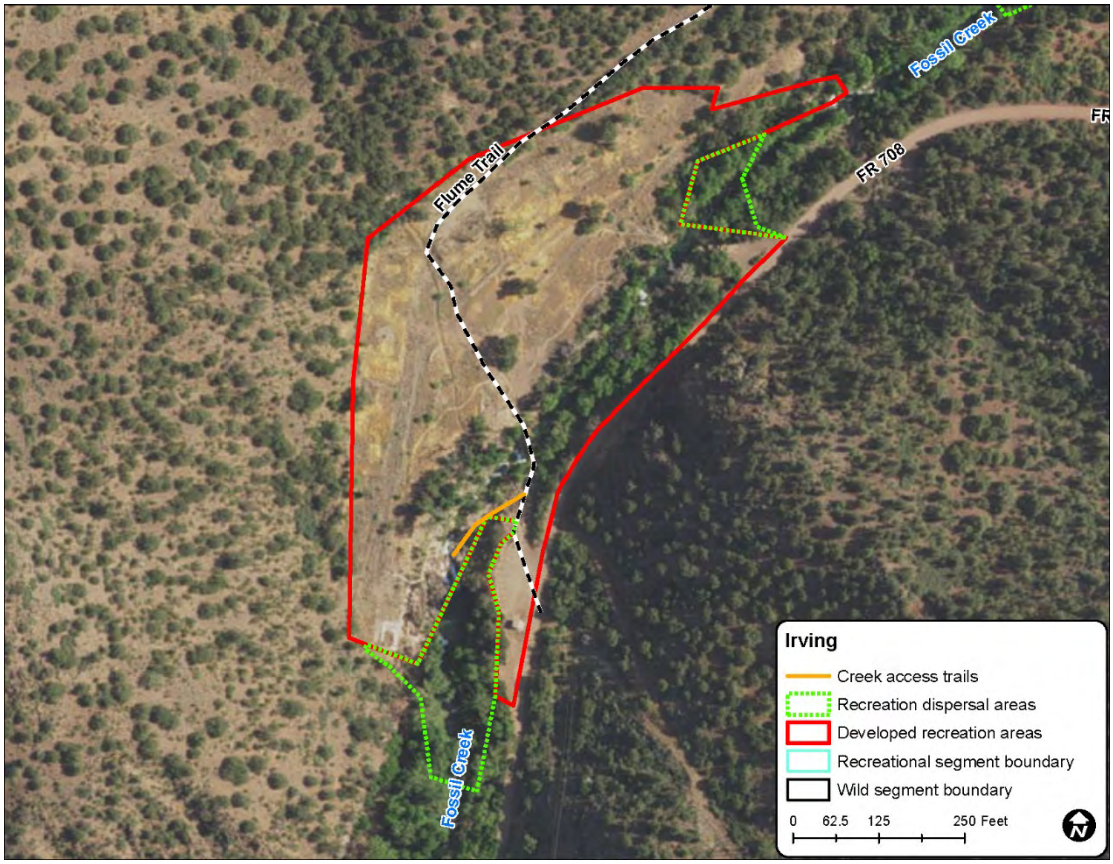

Figure B-5. Irving recreation site

Figure B-6. Tonto Bench recreation site

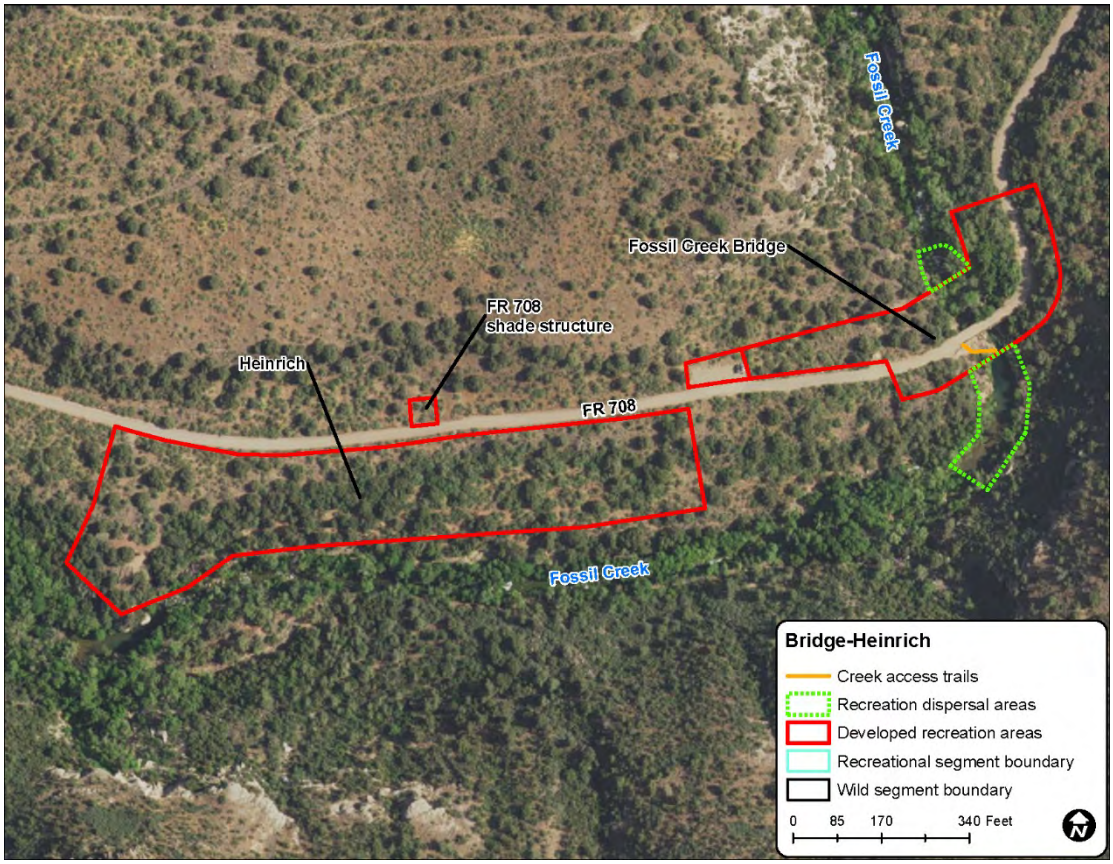

Figure B-7. Heinrich and Fossil Creek Bridge recreation sites

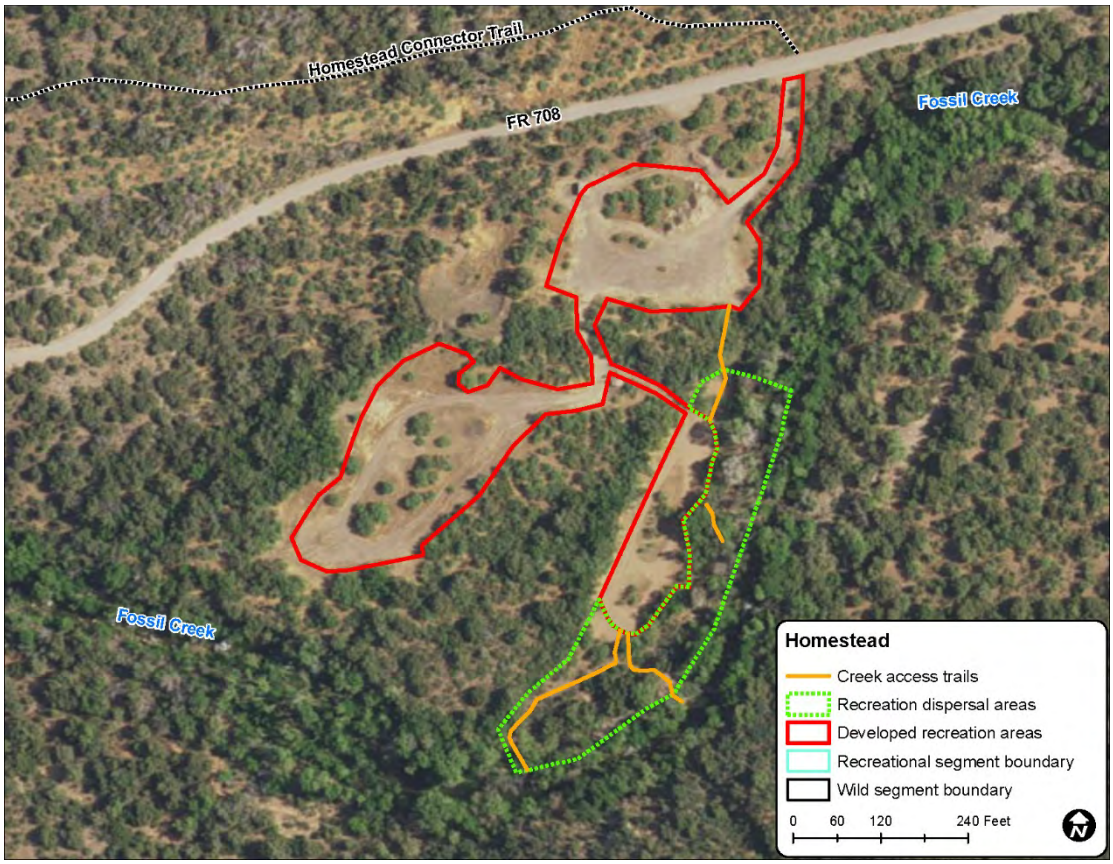

Figure B-8. Homestead recreation site

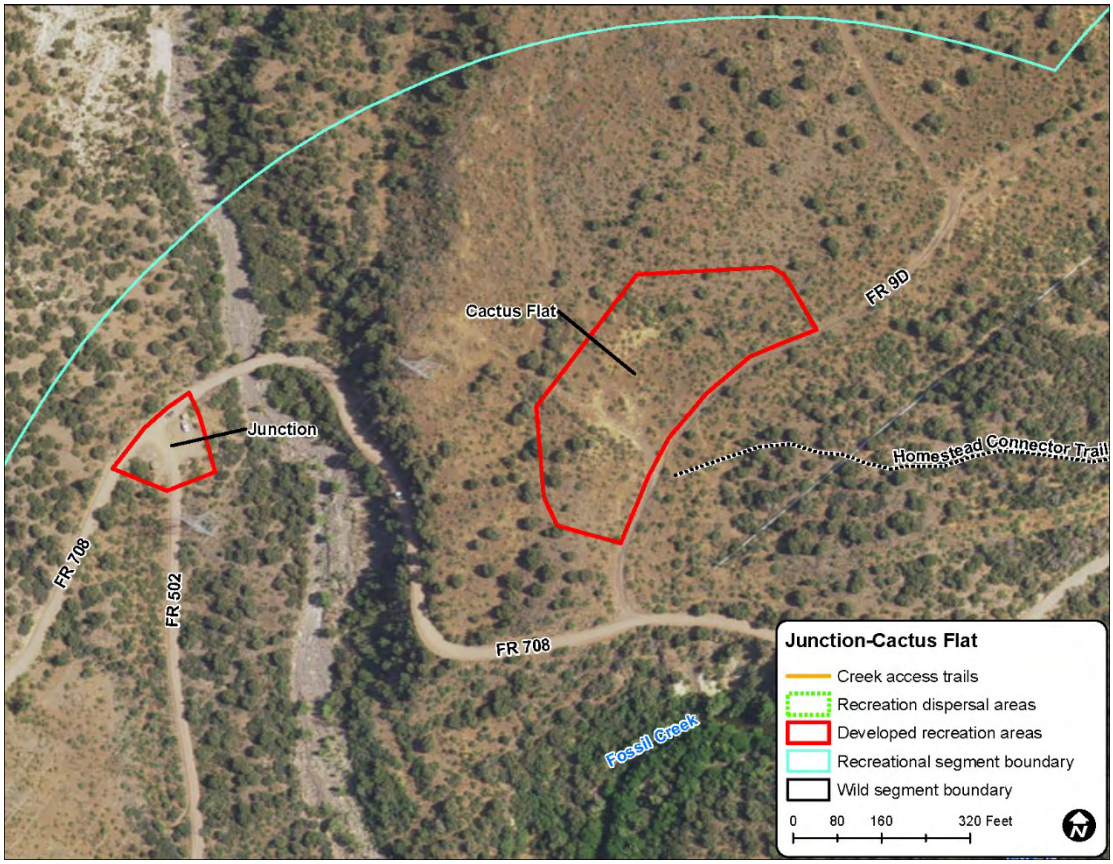

Figure B-9. Cactus Flat and Junction recreation sites

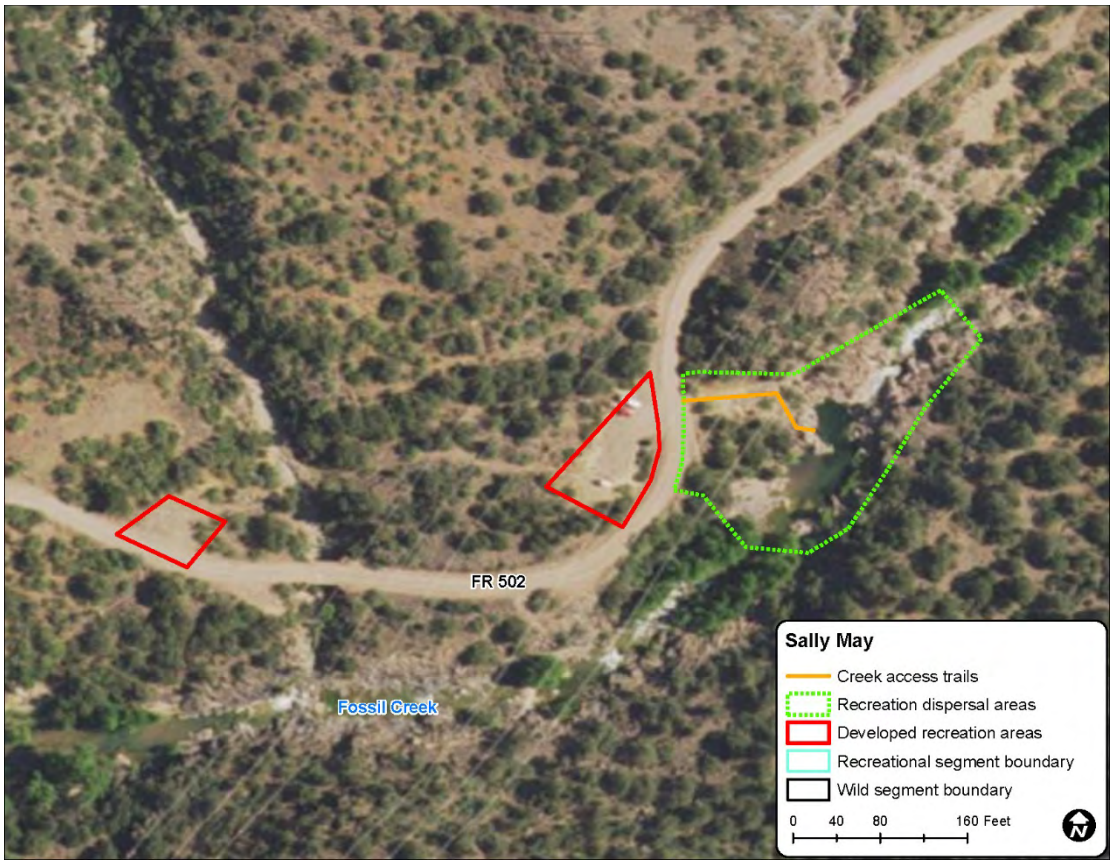

Figure B-10. Sally May recreation site

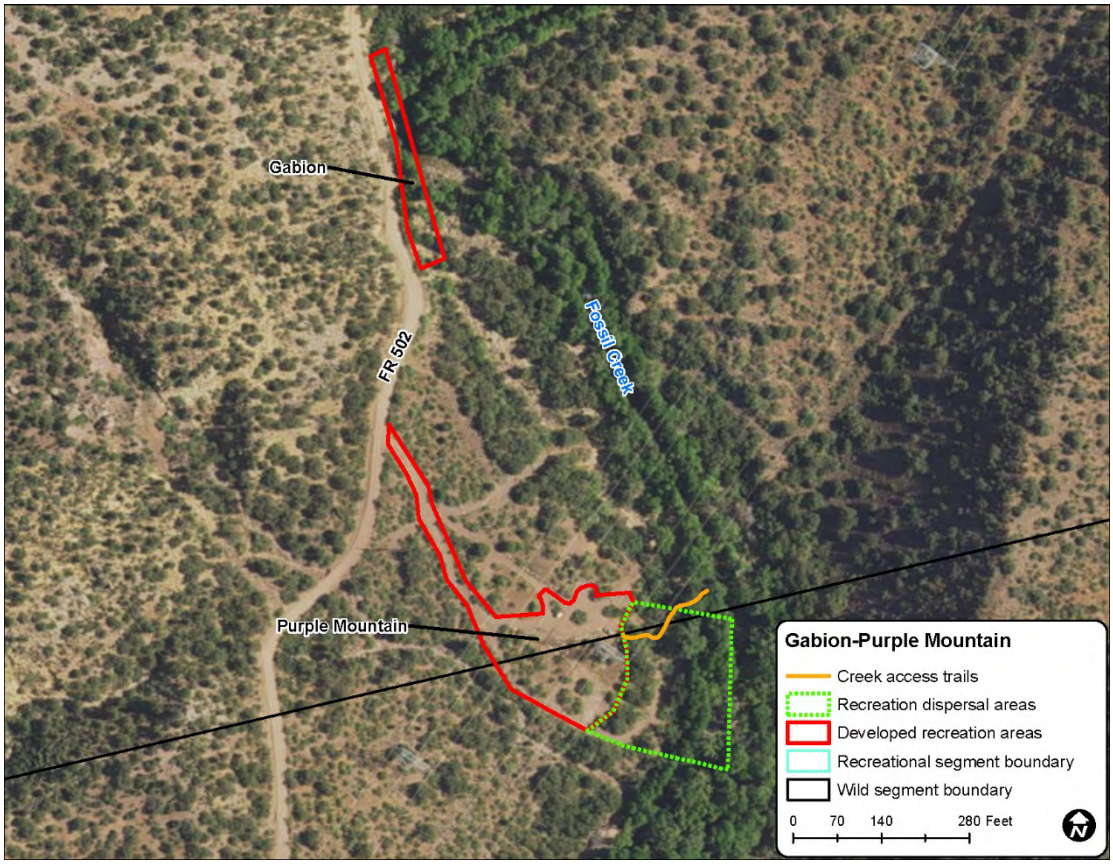

Figure B-11. Purple Mountain recreation site and gabion location

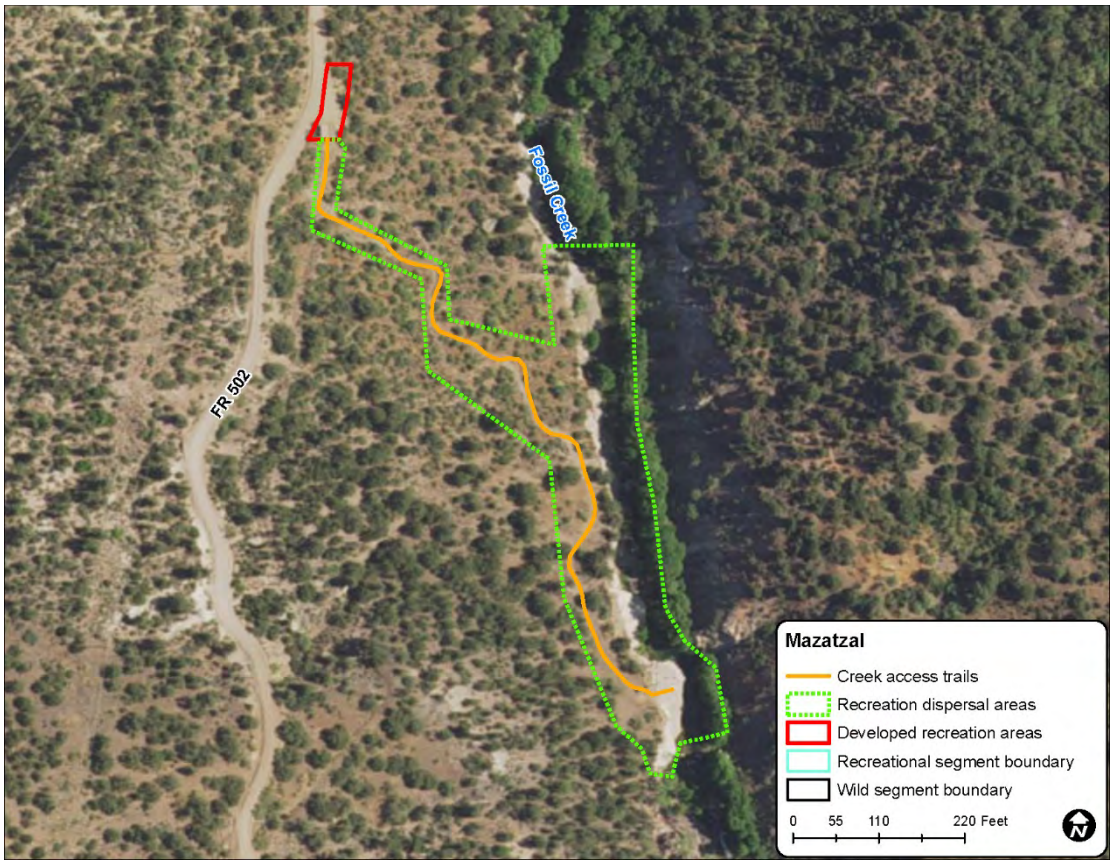

Figure B-12. Mazatzal recreation site