



Coconino National Forest
Red Rock Ranger District

**Wilderness Education Plan:
Fossil Springs Wilderness
September 2012**



***It is not enough to understand the natural world;
the point is to defend and preserve it.***

- Edward Abbey

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I. Introduction and Overview

What is the purpose of a Wilderness Education Plan?

The creation and implementation of individual Wilderness Education Plans under the 10-Year Wilderness Stewardship Challenge is part of a growing tradition of wilderness preservation that ultimately began with the 1964 Wilderness Act—an act designed “To establish a National Wilderness Preservation System for the permanent good of the whole people, and for other purposes.” The National Wilderness Preservation System itself is the heart and soul of the Wilderness Act, built upon the following groundwork:

“In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness.”

Furthermore, inherent in the Wilderness Act of 1964, its National Wilderness Preservation System, *and* the US Forest Service wilderness management, is education. Wilderness education has been identified as one of the most effective tools to protect wildernesses and to foster stronger human/wilderness relationships. Education can help limit resource damage from accidental *and* intentional human actions. The Forest Service Manual chapter 2323.12 dictates that all forests “use information, interpretation, and education as the primary tools for management of wilderness visitors.” The most recent incarnation of this directive is the Wilderness Stewardship Challenge and the Wilderness Education Plan.

The 10-Year Wilderness Stewardship Challenge, as stated in its Executive Summary, was “developed by the Chief’s Wilderness Advisory Group as a quantifiable measurement of the Forest Service’s success in Wilderness stewardship.” The Challenge itself is divided into ten elements; number four is the creation and implementation of a Wilderness Education Plan. According to the *10-Year Wilderness Stewardship Challenge Guidebook*, a Wilderness Education Plan must be conceived for each federally designated Wilderness so that “Existing and potential wilderness visitors will understand the values of wilderness beyond recreation and have a better appreciation for the importance of wilderness and how to protect it.”

This plan is an important step in identifying priority issues and solutions so that the Coconino National Forest can accurately assess Fossil Springs Wilderness’ current status, implement education goals, protect the newly designated Fossil Creek Wild and Scenic River, and apply this crucial information to the Comprehensive River Management Plan currently in development.

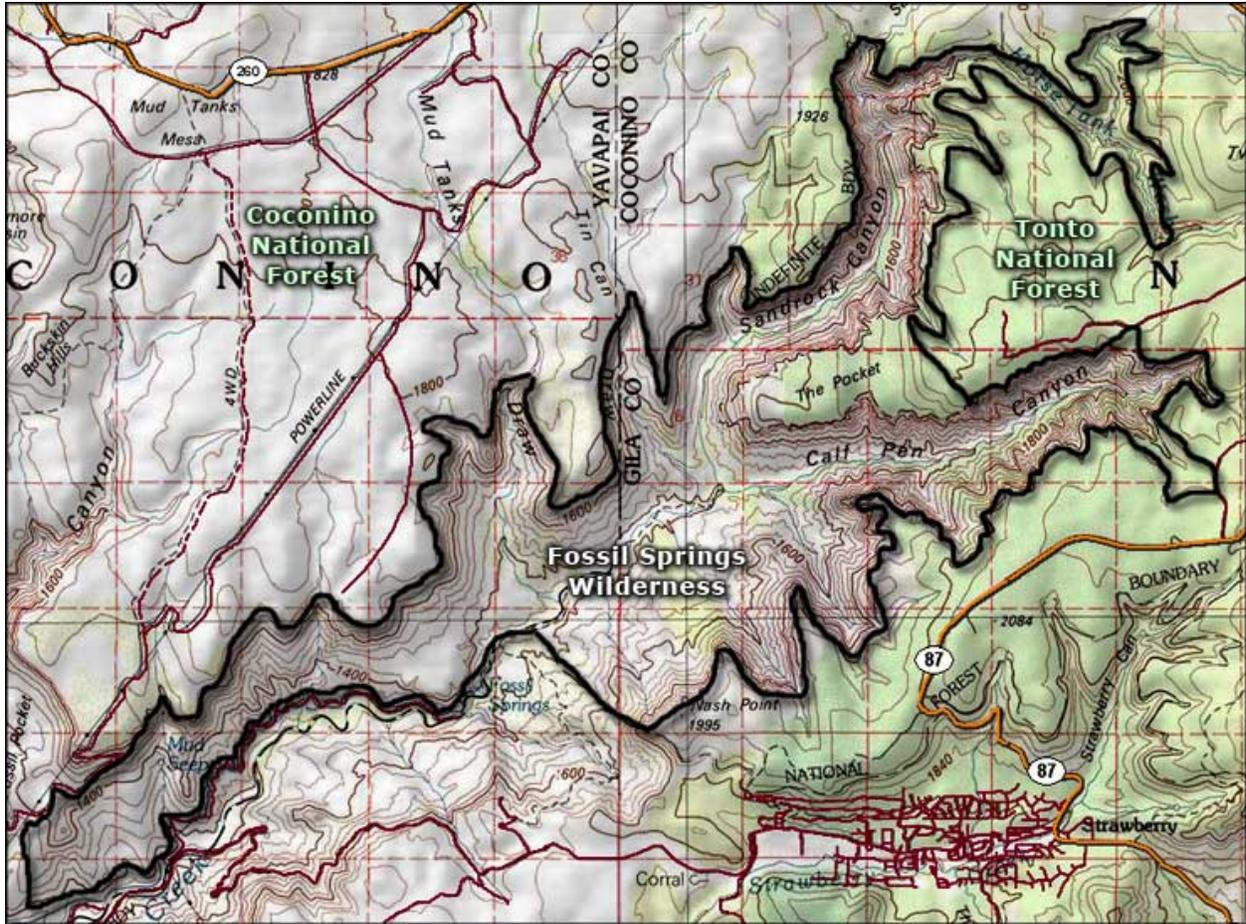
Executive Summary

This document largely examines the problems and education goals that accompany the sudden growth in popularity of the Fossil Springs Wilderness area. With the increased visitation has come an onslaught of individuals who leave human waste, toilet paper, and hundreds of pounds of trash behind. Their use has negatively affected water quality, the quality of wilderness experience, and the well being of wildlife and vegetation. Search and rescues and crowding were exacerbated by the 2011 condemning of a nearby road that once took visitors on an easy drive to the creek. Now, unprepared visitors are embarking on a strenuous 8 to 10-mile hike (often in 100 degree temperatures) to reach the creek, resulting in human injuries and the deaths of several dogs.

Regarding the identified issues mentioned above, the two primary methods of attaining the Coconino National Forest's education goals are: face-to-face patrol contacts, and an increase in successful Leave No Trace education methods. It is important to include signage and face-to-face contacts in Spanish, not just English, to reach the large percentage of Spanish-speaking forest visitors. Initiating a comprehensive PSAR (Preventative Search and Rescue) Program would help the forest to reach visitors who may endanger themselves without knowledge of wilderness travel. It is clear, however, that education alone will not address Fossil Springs Wilderness' identified issues. Capacity for the wilderness and its popular adjacent areas must be determined by the Comprehensive River Management Plan as a crucial step in managing this wilderness, as many of the identified Issue Items are results of high visitation.

An Overview: Fossil Springs Wilderness and Its Characteristics

The Fossil Springs Wilderness was designated by Congress in 1984, 20 years after the inception of the Wilderness Act. Its acreage totals 10,433 and, according to the Coconino National Forest Plan, encompasses a steep, wide canyon approximately 1,600 feet down at the edge of the Colorado Plateau. Fossil Springs and Fossil Creek are located on the southern side of the wilderness, but are not within the wilderness boundary.



Native Plants

The area immediately adjacent to the wilderness contains one of the most diverse riparian areas and aquatic habitats in the State. Over 30 species of trees and shrubs provide striking contrast to the surrounding desert scrub zone. Trees include mesquite, catclaw acacia, canotia, cacti, ash, walnut, alder, cottonwood, willow, boxelder, sycamore, fir, and oak, with ponderosa pine dominating the higher plateaus and upper reaches of Sandrock and Calf Pen Canyons. There also is a wide variety of nonwoody plant life including lichens, mosses, ferns, grasses, and forbs. The species listed below have been collected in Fossil Creek or identified as having potentially suitable habitat within the larger Fossil Creek area:

Species	Status
Aravaipa sage (<i>Salvia amissa</i>)	Forest sensitive, habitat
Arizona agave (<i>Agave arizonensis</i>)	Endangered, federally listed, habitat

Arizona giant sedge (<i>Carex ultra</i>)	Forest sensitive, habitat
Gila rock daisy (<i>Perityle gilensis</i> var. <i>salensis</i>)	Forest sensitive, habitat
Hualapai milkwort (<i>Polygala rusbyi</i>)	Forest sensitive, habitat
Tonto Basin agave (<i>Agave delmateri</i>)	Forest sensitive, habitat
Metcalfé's ticktrefoil (<i>Desmodium metcalfei</i>)	Endemic, rare, collected
Fossil Hill Creek bedstraw (<i>Galium collomiaae</i>)	Endemic, rare, collected
Ciliate rock daisy (<i>Perityle ciliate</i>)	Endemic, rare, collected

The main biotic communities present in the area include mixed conifer, ponderosa pine, pinyon/juniper, chaparral, desert grasslands, and riparian. This diversity provides an array of habitat structures that support hundreds of species of reptiles, amphibians, fish, birds, and mammals.

Native Fish and Wildlife

Wildlife species in the Fossil Creek area include elk, mule deer, white-tailed deer, bear, mountain lion, bobcat, gray fox, coyote, javelina, cottontail and jackrabbits, squirrels, and raccoons. Beaver and otter are known to occur in Fossil and are riparian obligates. Other mammals include various species of chipmunks, mice, rats, woodrats, skunks, and bats. The ring-tail cat is very common in the area as well. Until recently, limited surveys for bats had been conducted in the Fossil Creek area. In 2011, a multi-agency effort resulting in a total of 266 mist net-hours yielded 157 bats representing 15 of the 28 species found in Arizona. The dominant species captured were Mexican free-tailed bat (32% of captures), pallid bat (23%), and California myotis (15%). Some of the more unusual species captured included Allen's lappet-browed bat, Western red bat, Townsend's big-eared bat, cave myotis, and big free-tailed bat. A fascinating finding was the dominance of reproductive females; 90% of the 105 females captured were pregnant, lactating, or post-lactating. The number of bat species detected in this area is the highest of any other area netted on the Coconino National Forest.

There are many species of birds that occur in the Fossil Creek area, the majority of which are songbirds, but other groups include waterfowl, wading birds, fowl-like birds, raptors, and various non-passerine birds such as kingfishers, doves, hummingbirds, and woodpeckers.

Amphibians and reptiles in the corridor include the canyon treefrog, mountain treefrog, striped chorus frog, tiger salamander, collared lizard, fence lizard, earless lizard, side-blotched lizard,

tree lizard, and Madrean alligator lizard, and the Sonoran mud turtle. Snake species include various garter snakes such as the black-necked and wandering, Sonoran whip snakes, king snakes, gopher (bull) snakes, and rattlesnakes such as the Arizona black, black-tailed and Western diamondback. Springs, seeps, creeks, and rivers are critical for amphibians and garter snakes during at least a portion of their life cycles.

The number of terrestrial and aquatic invertebrate species in the Fossil Creek area span into the hundreds. Some terrestrial invertebrates that have been observed and documented in the Fossil corridor include the tarantula, glorious scarab, ten-lined June bug, and various beetles including alder leaf flea beetle, tiger beetle, and two dot click beetle. Also occurring are the cicada, tarantula hawk, tiger sphinx, Virginia sphinx moth, glover silkmoth, lo moth, Southern dogface, pipevine swallowtail, mourning cloak, painted lady, Arizona sister, Queen, common buckeye, yellow sulphur, antlion, and katydid. Semi terrestrial invertebrates include the six-spotted fishing spider and numerous species of damselflies, skimmers, and dragonflies.

As many as 135 species of aquatic invertebrates have been detected during surveys of Fossil Creek. This includes the following species of special concern: the Page Spring microcaddisfly *Metrichia nigrutta*, the Fossil springsnail *Pyrgulopsis simplex*, three species of stoneflies *Capnia*, *Malenka*, and *Isoperla*, and seven species of caddisflies *Polycentropus arizonensis*, *Hydropsyche venada*, *Wormaldia arizonensis*, *Mayatrichia acuna*, *Metrichia nigrutta*, *Smicridea dispar* and *Chimarra primula*.

Not only does the Fossil Creek area support a high diversity of common wildlife species, it also supports many rare species that have special management status. All but one of the native fish species in Fossil Creek have special status. Fossil Creek (immediately adjacent to the wilderness boundary) is an important refuge for headwater and roundtail chubs, Sonora and desert suckers, speckled and longfin dace, loachminnow, spikedace, and Gila topminnow.

Fossil Creek harbors the main population of the sensitive lowland leopard frog on the Coconino NF. Before renovation to a native fishery in 2004 and restoration of full flows in 2005, the lowland leopard frog population was down to under 50 adults and was confined to the springs area only. Now, this population is the largest known in the entire Verde Valley. Higher up in the watershed occurs the forest's only population of the endangered Chiricahua leopard frog. Perennial pools and springs in Sandrock and Calfpen canyons may support additional populations of this species but rugged terrain has resulted in very limited surveys.

The black hawk, a sensitive species, is found in this area and is faring better here than in other Verde Valley streams due to the restoration of native fish and frogs which are blackhawks' main

prey items. The threatened Mexican spotted owl nests in the steep sections of Sandrock and Calf Pen canyon. Critical habitat for the species occurs in most of the Fossil Springs Wilderness. The recently delisted but still sensitive peregrine falcon nests along steep cliff walls within both canyons as well. The stringers of ponderosa pine and mixed conifer provide suitable winter roosting sites for the sensitive bald eagle. Wintering bald eagles may also occur in the area while foraging.

Geology

The geologic units in the Fossil Creek area include limestone, Coconino Sandstone, and volcanic rock. Precipitation infiltrating through the volcanic rocks at the top of the Mogollon Rim flows vertically down through the Coconino Sandstone and recharges the limestone aquifers below. The limestone aquifers include the Naco Formation, Redwall Limestone, and the Martin Formation. Fossil Springs discharge from the contact between the base of the Naco Formation and the top of the Redwall Limestone.

Water emerging from Fossil Springs is supersaturated with calcium carbonate (CaCO_3), which precipitates out and forms travertine dams, terraces, and other depositional features. Formation of travertine begins when precipitation infiltrates the ground and reacts with the soil zone, organic material, carbonate aquifers, or regional geothermal activity to produce carbonic acid (H_2CO_3) (Malusa, et al, 2003). H_2CO_3 dissolves carbonate rocks as it percolates through these formations and results in elevated concentrations of dissolved carbon dioxide gas (CO_2) in the water. Once this water discharges to the surface and is exposed to atmospheric conditions, CO_2 begins to outgas. As the CO_2 outgasses, the water becomes supersaturated with CaCO_3 . Once a critical level of supersaturation is exceeded, the CaCO_3 precipitates to form travertine deposits (Malusa, et al. 2003). As a result of this unique geologic setting, travertine step-pool morphology develops naturally within Fossil Creek and is maintained through a dynamic natural system of dam formation, growth and erosion by natural flood events.

Cultural Significance:

According to archaeologists, the entirety of Fossil Springs Wilderness is a traditional cultural landscape for all of the Western Apache, particularly the Dilzhe'e, and some Yavapai. The area is also important to other tribes.

Current Resource Status and Problem Identification

Fossil Springs Wilderness, like all federally designated wildernesses, is a dynamic and singular place. Since 2005, the Fossil Springs Wilderness, the spring itself, and the creek corridor that serves as part of the wilderness boundary line, have experienced significant change. A few feet

from the southern wilderness boundary was the location of a century-old dam that diverted much of the flow from Fossil Creek into a flume system and to the Childs Power Plant until its decommissioning in June of 2005. Since the decommissioning of the dam, the restoration of the creek's full flow, the restoration of native fish species, and the subsequent designation of Fossil Creek as a Wild and Scenic River, the area has gained popularity and experienced exponential growth in visitation. The increase in users has led to the area's most serious problems, including water quality and vegetation impacts, safety issues, and large amounts of human waste and litter. Many visitors arrive unprepared for the strenuous hike, resulting in a surge in SAR operations.

The Wilderness, Fossil Springs, and its ensuing creek can be accessed through three wilderness portals: first, a four-mile hike through the wilderness on the Fossil Springs Trail, second, another four-mile-long hike on the Flume Trail, and third, on the 8.5-mile historic Mail Trail, which cuts through Fossil Springs Wilderness from the southwest. Originally, the Mail Trail was used from 1884 to 1914 for mail delivery between the towns of Camp Verde and Payson and several places in between, including the old Fossil Creek Dam. The popular route into Fossil Springs today is the Fossil Springs Trail, where visitation increased by 35% between 2010 and 2011. In fact, current numbers indicate a visitation of 20,000 to 30,000 people annually. The surge in usage presents complex challenges for wilderness managers.

The area is currently being managed under the Fossil Springs Interim Management Plan (IMP) while a Comprehensive River Management Plan (CRMP) is being developed. The IMP includes fire and camping restrictions, but does not include capacity limitations or other measures that the CRMP will include. The CRMP will also need to address wilderness education goals that are included in this report. The CRMP will address most of the area's identified problems, particularly the increase in usage. By identifying capacity limitations (followed by subsequent enforcement), the plan will reduce impacts associated with overuse.

The upper reaches of Fossil Springs Wilderness consist of two tributaries: Calf Pen Canyon and Sandrock Canyon. Both canyons remain exceptionally remote with no system trail providing access. The only means of access to the upper canyons is by highly technical rappel. From the lower canyons, at the junction of the Mail Trail and Fossil Springs Trail, a person must bushwhack through thick vegetation. Despite limited access, forest users occasionally visit these canyons for hunting, backpacking, and technical climbing, a trend that will likely continue since the recent increase in popularity of the Fossil Springs Trail.

According to archaeologists, recreational use is jeopardizing the qualities that make the Fossil Springs area significant to Native Americans, including the Apache and Yavapai, and the simple presence of recreationists can adversely affect traditional practices. As a result, the tribes have expressed concern about overnight camping within Fossil Creek and its headwaters. Moving or

removing artifacts can cause major degradation to archaeological sites. Management of the area should consider the cultural importance and sensitivity of the area, but the tribes have requested that disclosure of the area's specific significance be kept confidential.

In addition to cultural complexities come unforeseen management difficulties. In 2005, marijuana plantations were discovered in the depths of Calf Pen and Sandrock Canyons, and over 36,000 plants were eradicated. The cleanup is ongoing, and in 2010, a CREC crew in a partnership with the Forest Service and other agencies, spent several days in Sandrock Canyon cleaning up miles of pipe and hose, which are now staged in helispots. According to local law enforcement, this area and any remote sections of Fossil Springs Wilderness are considered high-risk for marijuana grows, although recent sweeps by law enforcement have indicated no current growing operations. A Minimum Tools Analysis has yet to be completed regarding how and if the pipe, garbage, and hazardous waste (fertilizer, pesticides, etc.) will be removed.

II. Goals and Objectives

Many of the Coconino National Forest's goals and objectives for this plan relate to the changing nature of the Fossil Springs Wilderness and its surrounding area. In a wilderness that saw little human impact in its first twenty years of existence, the dramatic increase of visitor use in the past seven years has forced the forest to change its strategies and tactics for management. The Comprehensive River Management Plan, once developed, will help to reduce the number of visitors and therefore visitor impacts, but it is likely that the objectives of this plan will remain the same.

Primary education goals include:

- Leave No Trace ethics
- Educating all users on the concept of Wilderness
- Increasing users' appreciation and respect for Wilderness
- Reducing litter, human waste, SAR operations, and other negative impacts
- Improving the quality of recreation experiences (helping users arrive at their desired locations and activities)
- Promoting the use of designated areas
- Promoting respect for rules and regulations

The methods of achieving these goals are by-and-large dependent on face-to-face contacts—during patrols, and through the employment of trailheads as wilderness education “gateways.” Also, signage and the possible implementation of a permit system would reach those who do not receive one-on-one education from volunteers or Forest Service employees.

III. Priority Issues and Effects

TABLE ONE

Note: Many Issue Items overlap and are cross-applicable

ISSUE ITEM	PROBLEM DEFINITION	AFFECT ON RESOURCE
Crowds	Crowding at the wilderness boundary, on Fossil Springs Trail, at the spring source, and along the first mile of Fossil Creek has a direct impact on the wilderness. This area is currently not being managed to wilderness standards or Wild and Scenic River standards, and many day hikers, animals, equestrians, and backpackers are entering the wilderness without education on wilderness and LNT ethics.	<ul style="list-style-type: none"> • Litter • Heavily-used day use sites • Noise pollution • Dog waste and wildlife harassment • Campfires • Heavily-used dispersed camping areas • Human waste • Loss of solitude • Impacts on water quality and aquatic species • Impacts on riparian areas and riparian obligate species • Impacts on a Wild and Scenic River • Elevated fecal coliform levels
Safety	Many safety concerns exist for the area, including rope swings, cliff jumping, swimming in dangerous swimming holes (The Toilet Bowl), Search and Rescue response time, water hazards, heat hazards, and marijuana growing operations.	<ul style="list-style-type: none"> • Tree damage • Need for helicopters in the wilderness • A possible relocation of current helipad • User injury or death
Misdirection/ Trail Channeling	Many users (hundreds on summer weekends) enter the wilderness via the Fossil Springs Trail only because road access to lower Fossil Creek has been closed due to an unstable roadway. Confused day users then hike four miles down to the wilderness without any understanding of the wilderness area they are entering or the difficulty of the trail.	<ul style="list-style-type: none"> • Impacts on riparian areas • Impacts on a Wild and Scenic River • Litter • Heavily-used day use sites • Noise pollution • Dogs chasing wildlife • Human waste • Health and safety

ISSUE ITEM	PROBLEM DEFINITION	AFFECT ON RESOURCE
Large Groups	Large and oversized groups without permits (indeed, no special order exists to limit group sizes) often enter the area (Boy Scouts, university groups, equestrians, day users, and backpackers).	<ul style="list-style-type: none"> • Litter • Heavily-used day use sites • Noise pollution • Campfires • Heavily-used dispersed camping areas • Human waste • Loss of solitude • Visual, aural, and direct disturbance to wildlife
Trail Impacts	Social trails have been created, and the system trails have seen exponential growth in popularity. Also, with an increase in equestrians, social trails circling around down trees have developed and horse waste is regularly found on the trail.	<ul style="list-style-type: none"> • Litter • Noise pollution • Human waste • Loss of solitude • Weeds spreading from horse waste
Campsite Impacts	The dispersed camping areas adjacent to the wilderness in the Fossil Springs area see heavy use and parallel impacts. Campfires are prohibited within ¼ mile of Fossil Creek; however, a large number of illegal campfires are still found in the area. Also, the camp sites are very close to the watercourse due to the canyon's narrow walls, yet Wild and Scenic River regulations require sites to be at least 100 feet from the creek.	<ul style="list-style-type: none"> • Litter • Noise pollution • Illegal campfires • Human waste • Loss of solitude • Tree loss/limb damage • Ground vegetation loss and erosion • Impacts on water quality • Impacts on riparian areas • Impacts on a Wild and Scenic River
Water Quality	Recent fecal coliform levels exceeded the EPA limit with average counts ranging from 34 to 46 colonies per 100 mL water. These high counts occurred during the peak of summer recreation season 2011, and many swimmers were in the creek when water samples were collected. Fecal coliform monitoring is commonly used as an indicator of water quality. Unlike general fecal coliform bacteria, <i>E. faecalis</i> is an indicator specific for human fecal contamination. The EPA limit for <i>E. faecalis</i> in recreational water (full body emersion) is 30 colonies per 100 mL water.	<ul style="list-style-type: none"> • Impacts on riparian areas • Impacts on native species • Health and safety • Aesthetic quality
Archaeological and Historic Sites	The entirety of the Fossil Springs Wilderness is of cultural import.	<ul style="list-style-type: none"> • Impacts on tribal cultures • Impacts on archaeological sites • Loss of cultural artifacts

ISSUE ITEM	PROBLEM DEFINITION	AFFECT ON RESOURCE
Invasive Weeds	The main weed of concern is the Himalayan blackberry which is prevalent at the springs. The blackberry, along with tall fescue and Bermuda grass are naturalized within the riparian corridor. Other species, such as tamarisk, giant reed and yellow star-thistle, have been targeted by the Forest Service for eradication or control.	<ul style="list-style-type: none"> • Loss of ground cover • Reduction in diversity of plant species • Loss of wildlife forage • Deterioration of wildlife habitat • Inaccessibility to invaded areas
Rare, Threatened or Endangered Species	A number of rare terrestrial and aquatic species are known to occur in Fossil Springs Wilderness and Fossil Creek. This includes a number of sensitive species and species in jeopardy. The presence of people in large numbers results in visual, aural, and direct disturbance to rare species. Blackhawks are highly susceptible to disturbance from humans and as a result have abandoned a nest site by the historic dam.	<ul style="list-style-type: none"> • Recreators can crush springsnails when they walk in occupied habitat. • Recreators can disturb adult and juvenile lowland leopard frogs causing flushing which disrupts basking, foraging, and copulation. • High numbers of swimmers/diving can disturb native fish in pools and result in their displacement to less desirable habitat.
Human Waste	With the explosion in popularity of the area and the resulting influx of day hikers and backpackers, human waste and toilet paper is common in the area immediately adjacent the wilderness, on the southern edge of the wilderness, and along Fossil Springs Trail.	<ul style="list-style-type: none"> • Impacts on water quality • Impacts on riparian areas • Impacts on a Wild and Scenic River • Elevated fecal coliform levels • Litter • Sanitation • Health and Safety
Dogs	Another result of the influx of day hikers and backpackers is a growth in the number of dogs visiting. Many dogs suffer heat exhaustion, blistered paws, and even death from the strenuous and hot hike into the wilderness area on Fossil Springs Trail and the Flume Trail.	<ul style="list-style-type: none"> • Noise pollution • Impacts on native species • Impacts on water quality • Sanitation • Harm to the pet
Litter	Though Fossil Springs Wilderness is considered backcountry, many day-users stroll into the southern edge of the wilderness unprepared, carrying coolers, alcoholic beverages, and even picnicking items. Due to lack of understanding and preparation on the day user's part, those items are often abandoned in the wilderness. Litter results in nuisance wildlife (particularly skunks, squirrels, ring-tail cats, and ants, but also bears), increases the number of predators (ravens, grackles, skunks, ringtails), and increases the number of nest parasitizers (brown-headed cowbirds).	<ul style="list-style-type: none"> • Sanitation • Aesthetics • Impacts on native species

ISSUE ITEM	PROBLEM DEFINITION	AFFECT ON RESOURCE
<p>Illicit Marijuana Farming</p>	<p>The upper reaches of Fossil Springs Wilderness (Calf Pen Canyon and Sand Rock Canyon) were the scene of a large marijuana growing operation, encompassing nearly three square-miles of wilderness. This remote area sees little visitation and almost zero monitoring by wilderness managers. Several miles of piping and other grow operation equipment remains staged in the wilderness for removal over seven years since its discovery. The area has been deemed too densely vegetated for pack animals and may require a long-line helicopter operation to properly clean the site of all growing equipment. The process of rehabbing of these sites has not yet been considered.</p>	<ul style="list-style-type: none"> • Health and safety • Impacts on water quality • Noise pollution (helicopter) • Loss of ground vegetation • Invasive species (marijuana) • Litter (left from growers) • Ground clearing • Pesticide and fertilizer use • Water quality impacts

IV. Action Items

TABLE 2:

ISSUE ITEM	TARGET AUDIENCE	KEY MESSAGE	PAST EDUCATION EFFORTS
Crowds	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Dog Owners • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness regulations • Wilderness ethics and stewardship • Wild and Scenic River regulations • Interim management regulations • Legal consequences • Reasons for regulations • Health and safety 	<ul style="list-style-type: none"> • On-foot patrol • Local radio—crowding symptoms
Safety	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Dog Owners • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness regulations • Water danger • Heat danger • Remoteness 	<ul style="list-style-type: none"> • Signage at trailheads, along the trail, and at the wilderness boundary • On-foot patrol • General television, radio, and newspaper safety broadcasts
Misdirection/ Trail Channeling	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Organized groups • Advocacy groups • Local Businesses • Volunteers & Partners • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness regulations • Wilderness ethics and stewardship • Wild and Scenic River regulations • Legal consequences • Reasons for regulations • Health and safety 	<ul style="list-style-type: none"> • Trail direction signage • On-foot patrol • Maps and kiosks • Barricades • Signage with rescue and safety information • Press releases, website releases, television

ISSUE ITEM	TARGET AUDIENCE	KEY MESSAGE	PAST EDUCATION EFFORTS
Large Groups	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Organized groups • Advocacy groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness regulations • Wilderness ethics and stewardship • Wild and Scenic River regulations • Legal consequences • Reasons for regulations • Health and safety 	<ul style="list-style-type: none"> • On-foot patrol
Trail Impacts	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Equestrian • Dog Owners • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness regulations • Wilderness ethics and stewardship • Legal consequences • Reasons for regulations • Health and safety • Resource protection • Equestrians use weed-free hay 	<ul style="list-style-type: none"> • Signage and kiosks • Rehabilitation project press releases • On-foot patrol
Campsite Impacts	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Dog Owners • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness regulations • Wilderness ethics and stewardship • Wild and Scenic River regulations • Interim management regulations • Legal consequences • Reasons for regulations • Health and safety • Resource protection 	<ul style="list-style-type: none"> • LNT signage, including "Stoves Only," "No Fires," and "Pack it in, Pack it out" • On-foot patrol • NAU vegetation regrowth studies

ISSUE ITEM	TARGET AUDIENCE	KEY MESSAGE	PAST EDUCATION EFFORTS
Water Quality	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness regulations • Wilderness ethics and stewardship • Wild and Scenic River regulations • Interim management regulations • Legal consequences • Reasons for regulations • Health and safety 	<ul style="list-style-type: none"> • Signs and kiosks • On-foot patrol • NAU water quality studies • NAU travertine studies
Archaeological and Historic Sites	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Equestrian • Organized Groups • Volunteers & Partners • Advocacy Groups • Internal 	<ul style="list-style-type: none"> • Do not move/remove artifacts • Stay on the trail • Cliff dwellings also used by roosting bats; visitation causes disturbance and roost abandonment 	<ul style="list-style-type: none"> • None
Invasive Weeds	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Dog Owners • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • How invasive weeds are spread • Ways to minimize introducing weeds into an area • Ways to avoid spreading existing weeds within an area • Staying on existing trails and campsites to avoid creating newly compacted areas • Honor areas closed for rehabilitation 	<ul style="list-style-type: none"> • Brochures • Online information regarding native weed issues • News releases regarding control efforts

ISSUE ITEM	TARGET AUDIENCE	KEY MESSAGE	PAST EDUCATION EFFORTS
Rare, Threatened or Endangered Species	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Dog Owners • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • Plight of native aquatic species and those that depend on native aquatics as prey • How nonnative organisms (fish, crayfish, bullfrogs) and disease adversely affects native aquatic wildlife • Recreating in a way that minimizes impacts to wildlife, fish and plant resources (stay on existing trails and campsites, keeping noise down, keeping a clean campsite and packing all trash out, not handling wildlife) • Harmful (and illegal) introduction or movement of aquatic organisms. • Regulations pertinent to wildlife, fish, and plants • Legal consequences • Equestrians use weed-free hay 	<ul style="list-style-type: none"> • Stop aquatic hitchhikers brochure • LNT brochures • Signs about the Fossil Springsnail, native fish, lowland leopard frog, and blackhawk • Brochures for fish information • Online information regarding native fishery and wildlife species. • News releases • On-foot patrol • Crayfish control efforts
Human Waste	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Wilderness Regulations • Wilderness ethics and stewardship • Wild and Scenic River regulations • Resource protection • Health and safety 	<ul style="list-style-type: none"> • On-foot patrol • LNT signs on trail and kiosks • NAU toilet paper studies • New toilets at trailhead
Dogs	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers 	<ul style="list-style-type: none"> • LNT • Wilderness ethics and stewardship • Wild and Scenic River regulations • Preventing dog harassment to wildlife • Resource protection • Remove dog waste 	<ul style="list-style-type: none"> • On-foot patrol • Signage on kiosks

ISSUE ITEM	TARGET AUDIENCE	KEY MESSAGE	PAST EDUCATION EFFORTS
<p align="center">Litter</p>	<ul style="list-style-type: none"> • Day Hikers • Overnight Backpackers • Hunters • Dog Owners • Organized Groups • Volunteers & Partners • Advocacy Groups • Local Businesses • Media • Internal 	<ul style="list-style-type: none"> • LNT • Limit trash, food, and other items that will attract predators (jays, ravens, grackles, skunks, ringtails), nest parasitizers (cowbirds) and nuisance wildlife (skunks, rodents, squirrels, and ants). • Wilderness ethics and stewardship • Wild and Scenic River regulations • Reasons for regulation • Resource protection • Legal consequences • Health and safety 	<ul style="list-style-type: none"> • Signage on kiosks • On-foot patrol, handing out bags • Press releases, newscasts, websites
<p align="center">Illicit Marijuana Farming</p>	<ul style="list-style-type: none"> • Internal • Volunteers & Partners • All Forest Users • Law Enforcement 	<ul style="list-style-type: none"> • In remote areas, be alert to possibilities and indicators (food stashes, tubing, fertilizers) in any area where seasonal seeps, temporary, or permanent water sources exist. • How to deal with marijuana grow site cleanups in the future. If helicopters and personnel are already on site to remove the plants, then all pipe and other trash could be removed at the same time. 	<ul style="list-style-type: none"> • Internal emails • Briefings • News coverage

V. Future Education Goals and Effectiveness Monitoring

TABLE THREE

Some Education Projects encompass all of our Issue Items. These include:

- Implementing a school outreach program in partnership with the Natural Resources Conservation District
- Working with websites to promote accurate and up-to-date information
- Working with magazines and other venues to promote Leave No Trace ethics
- Including education regarding all Issue Items on Forest Service websites and on social media
- Reaching a Spanish speaking audience

ISSUE ITEM	FUTURE EDUCATION GOALS	EFFECTIVENESS MONITORING
Crowds	<ul style="list-style-type: none"> • Patrol contacts and enforcing possible CRMP regulations • Signs with LNT message at each wilderness portal • All signage in Spanish 	<ul style="list-style-type: none"> • Patrol monitoring • Trail counters
Safety	<ul style="list-style-type: none"> • Preventative Search and Rescue information at trailheads • Patrol contacts • More rescue information signs • All signage in Spanish 	<ul style="list-style-type: none"> • Patrol monitoring
Misdirection/ Trail Channeling	<ul style="list-style-type: none"> • Providing users with accurate information prior to their arrival • Increased trail patrolling • Install sign near mile two of Fossil Springs Trail informing hikers how far they have to go to reach the water • All signage in Spanish 	<ul style="list-style-type: none"> • Patrol monitoring

ISSUE ITEM	FUTURE EDUCATION GOALS	EFFECTIVENESS MONITORING
Large Groups	<ul style="list-style-type: none"> • Patrol contacts • Signs with LNT message at each wilderness portal • Future CRMP regulation enforcement • All signage in Spanish 	<ul style="list-style-type: none"> • Trail counters • Patrol monitoring • Permit tracking
Trail Impacts	<ul style="list-style-type: none"> • Rehabbing trails • Increased trail patrolling • Include sign indicating allowed user groups • Patrol contacts • Signs with LNT message at each wilderness portal • Promote the use of weed-free hay • All signage in Spanish 	<ul style="list-style-type: none"> • Ground monitoring • Trail counters • Patrol monitoring
Campsite Impacts	<ul style="list-style-type: none"> • Patrol contacts • Possible camping ban at Fossil Springs • Possible implementation of permit system • Signs with LNT message at each wilderness portal • No campfires within 100-200 feet of the water • All signage in Spanish 	<ul style="list-style-type: none"> • Patrol monitoring • Disturbed ground surveys
Water Quality	<ul style="list-style-type: none"> • Patrol contacts • Signs with LNT message at each wilderness portal • All signage in Spanish • Management of Fossil Creek may need to be modified during the recreation season to maintain EPA standards for recreation water (perhaps via additional public education about proper disposal of human waste or additional restroom facilities). • The Fossil Creek Watershed Condition Assessment suggests designating dispersed campsites to minimize current and future loss of heritage resources, loss of soil and vegetative productivity, and adverse impacts to water quality, riparian, fisheries, and aquatic habitat conditions. 	<ul style="list-style-type: none"> • Patrol monitoring • Soil surveys • Watershed condition assessments • Water sampling

ISSUE ITEM	FUTURE EDUCATION GOALS	EFFECTIVENESS MONITORING
Archaeological and Historic Sites	<ul style="list-style-type: none"> Possible camping ban at Fossil Springs Signs with LNT message at each wilderness portal All signage in Spanish 	<ul style="list-style-type: none"> Patrol monitoring
Invasive Weeds	<ul style="list-style-type: none"> Consider native tree and herbaceous revegetation in disturbed riparian areas and provide streamside zones with adequate vegetative filter strips to trap sediments and prevent its entry into streams. Protect these revegetation areas with LNT education 	<ul style="list-style-type: none"> Watershed condition assessments
Rare, Threatened or Endangered Species	<ul style="list-style-type: none"> Use law enforcement patrols and public education to ensure compliance with camping regulations and no introduction of non-native species. Patrol contacts Brochures Signs Website 	<ul style="list-style-type: none"> Patrol monitoring Wildlife surveys to monitor populations.
Human Waste	<ul style="list-style-type: none"> Possible implementation of a permit system wherein education on LNT and human waste is addressed at time of permitting Possible implementation of composting toilets or latrine toilets near Fossil Springs Patrol contacts Signs with LNT message at each wilderness portal explaining the proper disposal of human waste All signage in Spanish 	<ul style="list-style-type: none"> Patrol monitoring Toilet paper surveys
Dogs	<ul style="list-style-type: none"> Patrol contacts Signs with LNT message at each wilderness portal Pack out dog waste All signage in Spanish 	<ul style="list-style-type: none"> Patrol monitoring
Litter	<ul style="list-style-type: none"> Patrol contacts Signs with LNT message at each wilderness portal “Pack it in, Pack it out” signs Bear boxes installed at the Fossil Springs trailhead with signage All signage in Spanish 	<ul style="list-style-type: none"> Patrol monitoring Nuisance wildlife monitoring
Illicit Marijuana Farming	<ul style="list-style-type: none"> Internal safety emails External messages via news outlets 	<ul style="list-style-type: none"> No grow operations in the future

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