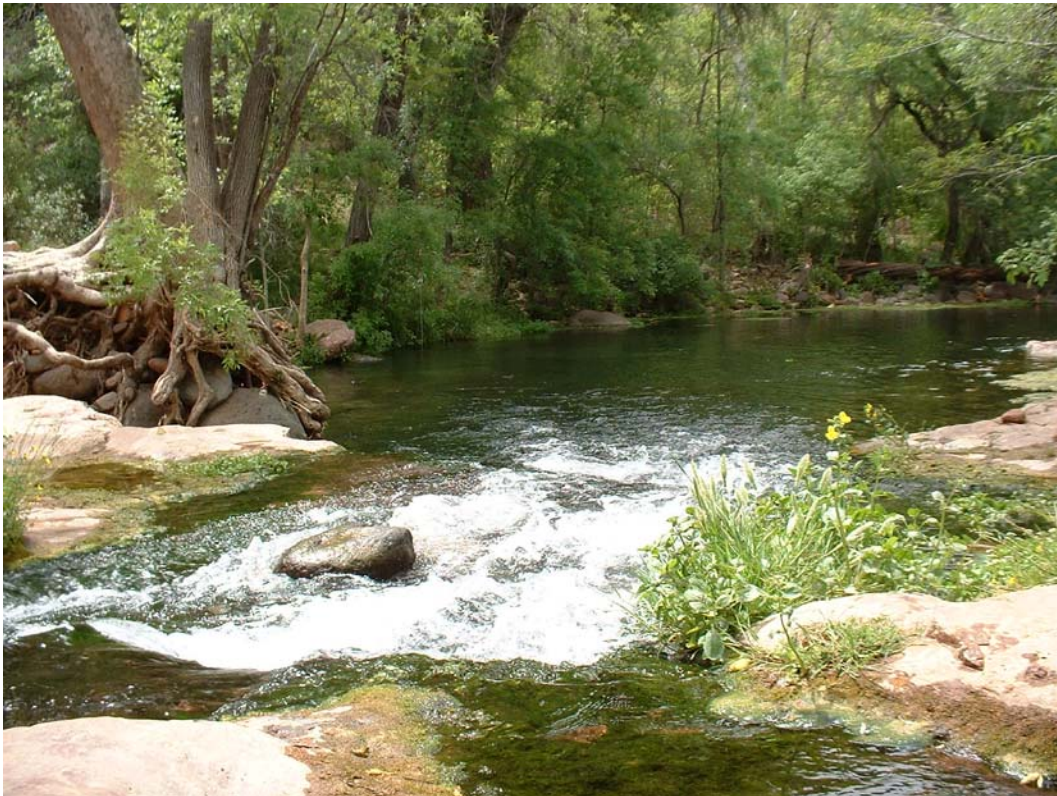


Fossil Creek

Wild and Scenic River Study



Arizona Wilderness Coalition

November, 2003

Prepared by Matt Duperrault

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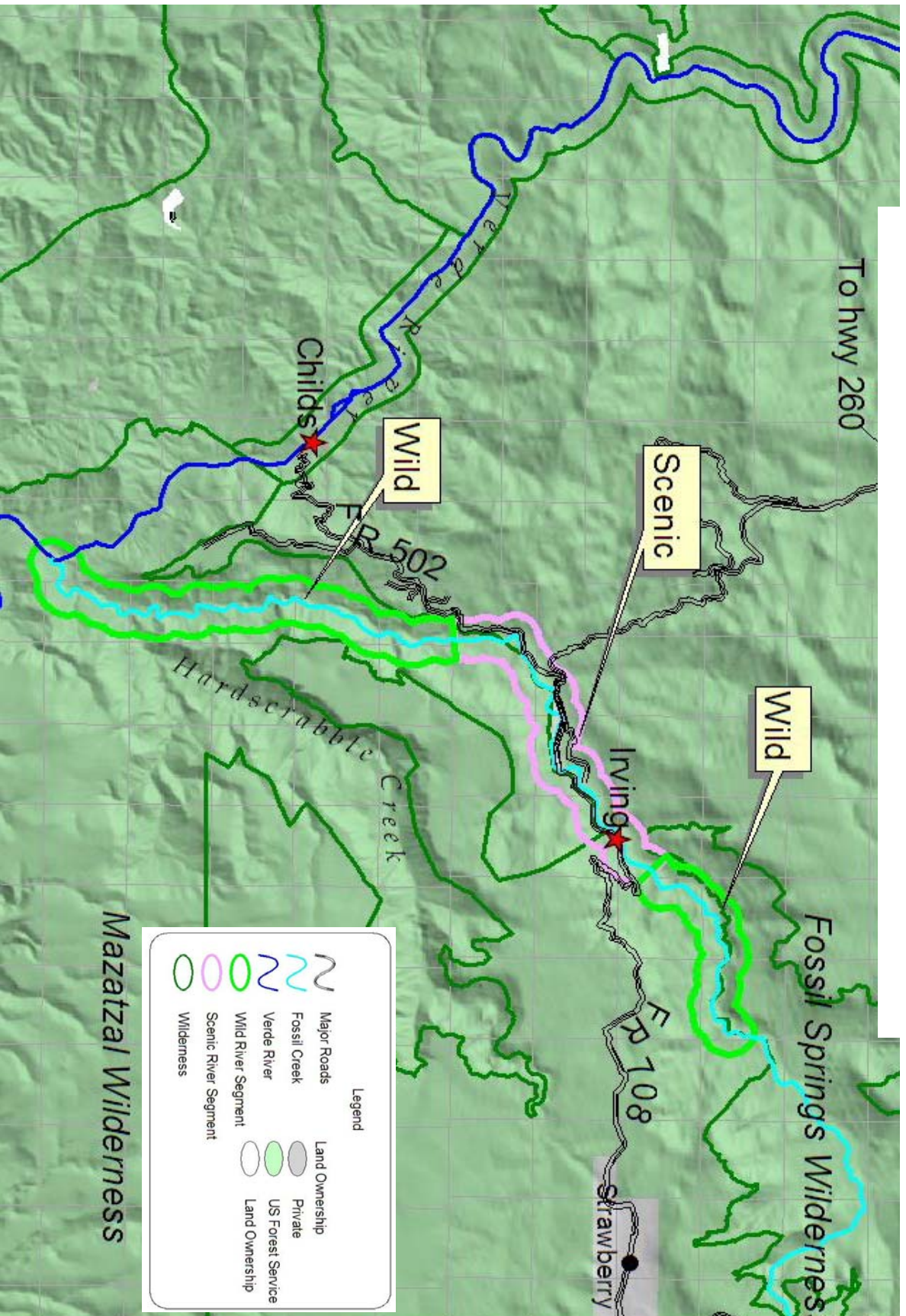
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Note about GIS Data:

The enclosed CD includes GIS shapefiles for all photo points and proposed river segments it also includes all the digital photos. The photo points are hot linked to the photos taken at those locations. For this option to work the photos must have a file path of c:\GIS\fossilcrk\photos.

Proposed Fossil Creek Wild and Scenic River Segments



Summary

This study report evaluates the **eligibility, classification and suitability** for Fossil Creek to be designated into the National Wild and Scenic Rivers System (NWSRS). The determinations are based on evaluations of the natural and cultural resource values of the area. This study has found that once full flows are restored to Fossil Creek by December 31, 2004 the entire fourteen-mile stream will meet the **eligibility** criteria for inclusion into the (NWSRS), which include the impending free-flowing character and presence of five outstanding remarkable river related resources: geology, ecology, fish, wildlife, cultural, and scenery. The Wild and Scenic Rivers Act provides a classification system for eligible river segments based on the degree of human development on the river and adjacent shorelines. The three possible classifications are *Wild*, *Scenic* or *Recreational*. This study determined that the fourteen-mile perennial length of Fossil Creek should be divided into three segments. The upper segment from Fossil Springs to Irving is classified as *Wild*. The mid-segment from Irving to ¼ mile downstream of the junction of FR502 and FR708 is *Scenic*, and the lower segment from ¼ mile downstream of the junction FR502 and FR708 to the confluence of the Verde River is *Wild*. Fossil Creek's **suitability** for inclusion in the NWSRS was determined, based on an adequate Forest Service management plan that is committed to protecting the stream's free-flowing conditions, and outstanding resource values. The Arizona Wilderness Coalition recommends Fossil Creek for Wild and Scenic River designation as outlined in this proposal.

I. Introduction and Study Background

A. The National Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act (WSRA), (Public Law 90-54289 as amended; 16 U.S.C. 1271-1287) was enacted by Congress in October 1968 to provide federal protection for selected outstanding free-flowing rivers. Congress recognized the need to preserve natural conditions along some of the nation's remaining unimpounded rivers, because of the dramatic degradation and modification caused by dams, diversions, and over-development of many rivers and segments of rivers. As of 2003, 163 rivers or river segments totaling 11,302 miles have been designated in the National Wild and Scenic River System, and one river in Arizona has been included- a 40-mile segment of the Verde. The purpose of the WSRA, 1968 is stated in section 1(b):

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. 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 Wild and Scenic Rivers Act provides permanent legislative protection for eligible free flowing rivers from any:

new hydropower projects, federal water projects, and other federally assisted water-resource projects – defined as grants, licenses, permits or funding—that would alter the rivers free-flowing characteristics, or have a direct or adverse effect on the river’s outstanding resources.

There are also strict restrictions against any development of lands the quarter mile adjacent to the stream banks that might compromise or detract from existing outstandingly remarkable values (ORVs). This protection may also be provided to rivers that have received legislative authorization from Congress for *study* as potentially eligible for the National Wild and Scenic Rivers System (NWSRS). Temporary protection for study lasts a maximum of three years after Congress has received the final study report from an agency.

There are two ways for rivers to be added to the National Wild and Scenic Rivers System, either through an act of Congress or by section 2(a)(ii) of the WSR, which allows states to petition the Secretary of the Interior to include a river to the National System. Congress can designate a river by first passing a bill authorizing a study for potential WSR designation, or the river can be designated directly without a study bill. Either way a WSR study is conducted by the federal agency (within the Department of Agriculture or Department of the Interior) responsible for management. The study report is reviewed and commented on by other state and federal agencies, conservation organizations, and the public. If the river is found to be eligible and suitable for designation a final report is then sent to the President who recommends action to Congress.

The second approach for designating a WSR is addressed in section 2(a)(ii) of the WSR. Certain states have established river preservation systems based on the NWSRS. Upon approval of a similar study process the state may designate a river through legislation and administer the river as a component of the state’s preservation system. A Governor has the ability to then request that the Secretary of the Interior add the river to the National System. The National Park Service evaluates the river and if criteria for federal inclusion have been met the Secretary of the Interior has the authority to designate the river on condition that the state assumes funding and management responsibilities.

B. Purpose of a Citizen’s Wild and Scenic River Study for Fossil Creek

The purpose a Wild and Scenic River study for Fossil Creek is to determine if the stream is eligible for inclusion in the National System based on criteria of the Act and USDA and USDI Interagency Guidelines. Any group or individual may submit a WSR study

report, which is sometimes called a citizen's proposal. This WSR citizen proposal presents a unique perspective and augments the federal agency WSR study report; it also provides information to the public, federal and state agencies, conservation organizations, Congress, and the President to support Fossil Creek's inclusion into the NWSRS. This Fossil Creek WSR study report was prepared by Matt Duperrault, a Prescott College Environmental Studies student, in conjunction with the Arizona Wilderness Coalition. The view represented by the Arizona Wilderness Coalition may add information, concur, or differ from other studies. Fossil Creek flows entirely through federal land and Arizona does not have a state river preservation system so it is not eligible for inclusion through section 2(a)(ii) of the WSRA.

C. The Study Report

The WSRA requires the report show and describe:

Each report, including maps and illustrations, shall show among other things the area included within the report; the characteristics which do or do not make the area a worthy addition to the system; the current status of land ownership and use in the area; the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed or curtailed if the area were included in the national wild and scenic rivers system; the Federal agency (which in the case of a river which is wholly or substantially within a national forest, shall be the Department of Agriculture) by which it is proposed the area, should it be added to the system, be administered; the extent to which it is proposed that such administration, including the costs thereof, be shared by State and local agencies; and the estimated cost to the United States of acquiring necessary lands and interests in land and of administering the area, should it be added to the system.

The study process and report includes three sections, **eligibility**, **classification** and **suitability**. Specific requirements must be met for a river to qualify as a Wild and Scenic River through section 2(b) of the WSRA. Primarily, the river or river segment must meet eligibility criteria. The eligibility report describes the area's natural and cultural resource values through descriptions, maps and photos of the river area. It must be free flowing (defined in section 16 the WSRA), and the river corridor and related adjacent land area must possess one or more "outstanding remarkable values"(ORVs). Potential ORVs include: geology, ecology, fish, wildlife, historic, cultural, scenic, recreation or other similar values that are deemed regionally or nationally significant. Interagency guidelines clarify that "other similar values" i.e. Native American use or educational importance can justify eligibility. Resource values must be directly river related, and their significance is evaluated nationally and within the context of a regional physiographic province. Because neither the WSRA nor the Interagency guidelines provide specific criteria to evaluate the ORVs, determination is based on regional agency standards and educated judgment of the WSR study team. Basis for judgment must be documented in the study report.

Section 2(b) of the WSRA requires that eligible river segments be classified as *Wild*, *Scenic* or *Recreational*. The classification criteria depend on the level of shoreline development

and access. Management agencies use the classifications to guide their plans and decisions with regard to development along certain segments of the river.

The suitability study addresses whether WSR designation is in the public's interest, and if designation is the most appropriate conservation measure for the river. Factors involved in the consideration include: politics and management, land ownership, costs, conflicting water projects or other development proposals. Strong public support is needed from landowners along the river corridor, local communities, conservation organizations and state and federal agencies. Management must also be directed towards protecting the free flowing conditions and outstanding resource values. Prior to suitability determination their needs to be convincing evidence that the relevant land regulations and owners are aimed at conservation. WSR designation would add legislation and requirements that would support existing management practices.

D. Methods

Criteria and methods from the WSRA, USDA/USDI Interagency WSR Guidelines and Wild and Scenic River Review in the State of Utah (USDI, 1996) were used to assess and determine Fossil Creek's eligibility, classification and suitability. Inventory and data collection from personal surveys and field observations of Fossil Creek, augmented with research reports, relevant literature, and agency surveys are documented in this report. Outstanding Remarkable Values are identified based on an analysis of Fossil Creek's resource values within the Central Arizona Highlands physiographic province (USGS, 2000) and through recognition of nationally significant qualities. Included are values dependent and supported by the natural flow regime, which is expected to be restored by December 31, 2004. Existing conditions and Forest Service future management plans are considered.

II. Description of the Study Area



A. General Setting

Fossil Creek is a perennial stream located in east central Arizona north of Payson near Strawberry. The Colorado Plateau's southwestern edge forms the Mogollon Rim at the base of which Fossil Creek has carved a deep canyon into the Central Arizona Highlands Province. A major tributary to the Verde River and Lower Colorado River watershed; Fossil Creek drains from the Mogollon Rim into the Verde River, which in turn feeds the Salt/Gila River basin, and eventually flows into the Colorado River near Yuma. The stream's perennial source originates from Fossil Springs, a collection of artesian springs that produce a constant, year-round flow at an estimated rate between 43 cubic feet per second (cfs) and 56cfs (Feth and Hem, 1963; Malusa, 1997). The Wild and Scenic River study area encompasses the springs and the entire length of the stream, which flows southwest approximately fourteen miles through the canyon to the Verde confluence. Also included in the study area are Fossil Creek's adjacent stream banks extending $\frac{1}{4}$ mile from both sides of the water channel. Fossil Creek is the border between Gila and Yavapai counties as well the Coconino and Tonto National Forests. The entire watershed including the intermittent reach upstream of the springs encompasses 135 sq. miles of National Forest land and is surrounded by Fossil Springs Wilderness and Mazatal Wilderness areas. The USDA, Forest Service manages Fossil Creek.

B. Access

Fossil Creek may be reached via Interstate 17 north from Phoenix or south from Flagstaff. Exit east onto AZ 260 to Camp Verde. Either turn right onto Fossil Springs Road or continue on 260 to Strawberry. From Strawberry follow FR708 west for 4.5 miles, then turn right on FR784 to the Fossil Springs trailhead. Fossil Springs trail (Trail 18) is 3.1 miles from the south rim to the springs. The springs can also be reached from the north rim by taking AZ 260, turning right onto FR9247B to Mail trail tank #2 and then following Mail Trail (Trail 84) to the springs. FR708 also winds from the south rim into the canyon and follows Fossil Creek for 2.5 miles in the middle segment to provide stream access. Forest Service management plans to eliminate the Flume road and (Trail 154).

C. Climate

Hot summer temperatures average 80° - 90° F and mild winter temperatures, averaging from 30° - 50° F, characterize the region's climate. Main precipitation results from July and August monsoon rains (1/3 of area's annual 19-22 inch precipitation) and winter rain and snow on the Mogollon Rim. The 1,500 foot elevation gradient throughout the length of Fossil Creek results in climatic variations.

D. Geology, Hydrology, Geomorphology

Fossil Creek's perennial source originates from springs located along a major fault zone in the Central Arizona Highlands.



Photo 82 Travertine formation over basalt

High elevation precipitation and surface runoff is quickly absorbed in large volumes by the porous bedrock of the Mogollon Rim, which supplies underground aquifers. High concentrations of calcium carbonate (CaCO_3) from the overlying limestone formations saturate the water in a gaseous form (Malusa, 1997). Tectonic faults force the deep aquifers to the surface and expose water through erosion and fractures in the Redwall limestone. Seventy-two degree water gushes out of a series

of seeps and springs at Fossil Creek's perennial source. Fossil Springs are the largest collection of springs in central Arizona (Feth and Hem, 1963). The spring outlets emerge from the right canyon wall into the main channel and are located 1-10' above the creek bed (Monroe, 2002). (see Appendix A photos 1, 123, 119) Mineral laden ground water surfaces and through exposure to the atmosphere CO_2 is released and CaCO_3 precipitates out of the water in a solid form, depositing a unique sediment which encases streambed surfaces along its course including rocks, twigs, leaves, and roots. Layers of the mineral rich sediment build up to form an iridescent, cement-like substance called Travertine. Water volume dependent travertine forms in turbulent areas and dams the water channel into clear-deep pools, which pour into waterfalls (Malusa, 1997). On F.M Chamberlain's

1904 survey of Fossil Creek prior to diversion he observed water levels ranging from a few inches to 20-30 feet deep “crystal clear water.” Chamberlain reported the largest pools were 50-60 yards long by 20-30 feet wide. The travertine pools create ideal habitat for native Arizona fish (Minkly, 1999). Other historic accounts report 15-30 foot high waterfalls pouring over travertine dams built up to 25 feet high. The extensive travertine pool/falls system and habitat is predicted to reoccur with restored natural flows. Remnants of large travertine formations occur for four miles downstream from the springs, and evidence of the extent and size of the deposits are still present on ledges around pools and as flakes in the streambed. (see *Appendix A Photos 6, 86, 76, 147*) A travertine ledge formed by millions of years of deposition protrudes into the canyon at the springs. (see *Appendix A photo 180*) Some deposits protected from the weather have retained their smooth luster, and preserved unique formations including “stalactites, flowstone, cave popcorn and cave pearls” (Overby and Malusa, 2001). (see *Appendix A photos 86, 79, 81*)

Fossil Creek’s perennial springs produce a constant, year-round base-flow of 43cfs, and contribute approximately 30-50% of the Verde River’s flow during irrigation season (American Rivers, 2003). Currently, 1/4 mile downstream from the springs a concrete dam is blocking and diverting 95% of Fossil’s flow through a flume and tunnel system to turbine generators at the Irving and Childs power plants. A small amount of water does leak through the dam into the natural creek-bed estimated at 2cfs (Monroe, 2002). The minimal seepage has maintained intermittent flows and stagnant pools from the dam to Irving. At Irving an increased amount of water (approximately 5cfs) is discharged back into the natural watercourse. This level is sufficient enough to pass continuous flows to the Verde and cause a reach of active travertine formations to occur for approximately one mile downstream of Irving. (see *Appendix A photos 169, 159*) There is also a series of small springs along the watercourse located in the southern reach of the canyon. (see *Appendix A photo 47*)

Fossil Creek’s 43cfs base-flow does experience dramatic fluctuations from runoff and flooding during seasonal precipitation. The dam’s structure is a type that does not impound floodwaters, which has helped sustain the riparian environment (Monroe, 2002). Fossil Creek’s watershed extends upstream from the springs as an intermittent reach to the Mogollon Rim. Sandrocks Canyon and Calf Pen Canyon are large drainages within the boundaries of Fossil Springs Wilderness Area. The two canyons merge to form Fossil Canyon and contribute significant seasonal runoff from snowmelt and summer monsoon rains (Monroe, 2002). Drainages also flank Fossil Creek and funnel down the steep canyon walls adding to the excited seasonal water levels. The other major intermittent tributary is Hardscrabble Creek, which is located in the Mazatal Wilderness area and drains into the southern reach of Fossil Creek near the Verde River. The large amounts of water channeled into the canyon during floods are evident from high piles of woody debris lodged against obstacles throughout the channel, and from the silt-covered rocks in the alluvial floodplain. Depending on the frequency and duration of rainfall, runoff drainages are capable of producing major floods through Fossil Canyon. The runoff carries quantities of mud which causes further channel variation. Fossil Creek’s baseflow is heightened by surface runoff less than 20% of the time (Loomis, 1994).

Elevation at the springs is 4,100' and the topography and gradient cause the creek to continually drop at an average rate of 160 feet/mile over fourteen miles downstream to the 2,600' Verde confluence. The upper five miles of the stream are more gradual than the steep downstream segment. Near the Verde confluence the gradient flattens out again. Dynamic water tumbles over boulders and ledges causing riffles, pools, and falls throughout the watercourse. Historic accounts describe the nature of the creek. "Fossil Creek makes a steep descent in falls and rapids which keep the water almost continuously white or foaming... many falls from 10-30' occur" (Santos, 1901).

The stream bank topography varies depending on the degree canyon walls restrict the water channel. In narrow segments the walls constrict into sheer cliffs through bedrock

gorges with little to no stream bank (see Appendix A photos 35, 36, 47), and in other areas the floodplain

broadens into a larger valley with alluvial benches and sandy beaches. The creek is mainly concentrated into one water channel, but in broad reaches the water occasionally spreads into braided side channels. Physical streambed surface varies between cobbles, boulders, bedrock ledges, and sand substrates. To add to the variety of features present along the stream's course, the current has carved cutbanks into ridges protruding into the valley bottom, and waterfalls have carved large potholes into the sedimentary bedrock. Several large caves have also formed in the porous limestone and travertine substrate.

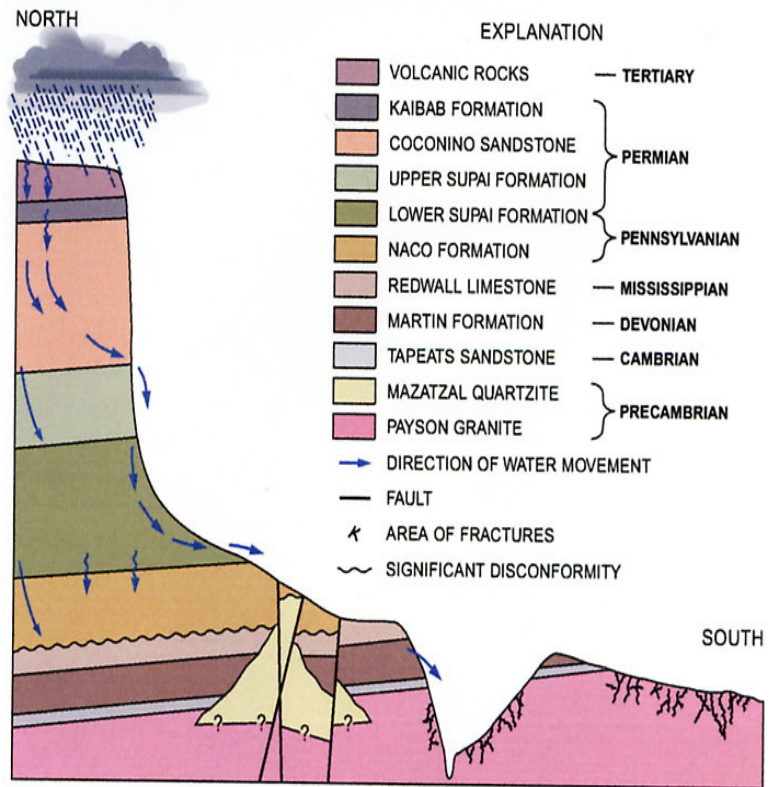


Figure 2. Schematic diagram of geology of the study area showing a generalized north to south cross section from the crest of the Mogollon Rim to the granitic terrain around the town of Payson. Springs may be fed directly from recharge areas on top of the Mogollon Rim or may be fed from deeper ground-water systems.

Taken from USGS 2001

Fossil Creek's path cuts through major geologic formations within the Central Arizona Highlands physiographic province. The Central Arizona Highlands is considered a



Photo 42 Cliff band in a narrow segment of the canyon

geological and ecological Transition Zone between the uplifted Colorado Plateau to the north and the Basin and Range to the south (USGS, 2000). The region is located in topographically rugged terrain, recognized as one of the most inaccessible areas of Arizona. Major landforms of the region consist of mountain ranges, valleys and steep walled canyons (USGS, 2000). At Fossil Springs the distance from rim to rim is two miles across and towards the

canyons dramatic 1600' depth and gradient reveal an array of formations and exposes outstanding sequences of geologic processes. The geologic history of the region is one of mountain building, rifting, uplift, faulting, volcanic activity, and contemporary landscape forming processes. Fossil Creek canyon is composed of Tertiary-basalt and tuff volcanic rocks, and Paleozoic and Cenozoic stratigraphy underlain by Precambrian rocks. The variety of sedimentary rocks displayed within the canyon walls include: Mississippi Redwall Limestone, Pennsylvanian Naco Formation, Pennsylvanian/ Permian Supai Formation, Permian Schnebly Hill Formation, Coconino Sandstone, and Permian Kaibab Formation (Blakely, 1990). Layers of geology tower overhead in steep cliffs throughout the canyon. These cliffs provide prime nesting habitat for raptors including threatened Bald eagles and Peregrine falcons. Other unique formations and physical features within the canyon include: outcrops, sharp ridges, sheer cliffs, horns, skree slopes, veins, and dykes. (see Appendix A photos 7, 45, 4)

steeper narrower sections, the valley spans less than a mile. The

E. Ecology/Vegetation

Fossil Creek's perennial flow supports a lush riparian ecosystem. The American Southwest's rare aquatic and riparian environments provide critical habitat for many species of flora and fauna. Arizona's landscape contains less than 1% streams and riparian environments, and a dramatic 90% have been degraded from grazing, logging, mining and other impacts from urban development (Living Rivers, 2003). Riparian areas provide the harsh desert climate and arid environment with water, cover, shade, and travel corridors for hundreds of species. Even with the historical withdrawal of 95% of Fossil Creek's flow, the minimal surface water has maintained an ecologically important corridor functioning in relatively pristine, intact conditions. These waters create an oasis in the arid lands of central Arizona and support a high percentage of species richness and biodiversity. The Fossil Springs area is recognized as one of the most diverse riparian environments in Arizona (Smith and Bender, 1973), (Goodwin, 1980), (Burbridge, 1974). In 1996 it was designated a Botanical Area due to its unique and outstanding

characteristics. One of its rare biological elements include the endangered Arizona Agave (*Agave arizonica*). Although the water has been diverted from Fossil Creek for almost 100 years, studies indicate that changes in community structure are minimal aside from obvious effects on vegetation abundance. Percent cover and overall vigor of the ecosystem's vegetation has been affected by the limited surface water availability. Although presently functional from an ecological standpoint, the system will not be considered truly healthy from a scientific perspective until free flowing waters are returned and the natural conditions are restored (Sayers, 1998).

Fossil Creek's mixed-broadleaf riparian forest is composed of a diverse, well-developed mosaic of lush vegetation. (see Appendix B) Mixtures of large deciduous trees including: Fremont cottonwood (*Populus fremontii*), Arizona sycamore (*Plantus wrightii*), velvet ash (*Fraxinus velutina*), Arizona alder (*Alnus oblongifolia*), boxelder (*Acer negundo*), Arizona walnut (*Juglans major*) and willow (*Salix sp.*) create a dense canopy. It is common for the creek to flow beneath overhanging trees arching into a shaded tunnel. The abundant riparian vegetation provides wildlife with an important food source, and the canopy provides dense cover for protection and breeding. The dominant riparian trees



Photo 144 Riparian vegetation

are Arizona ash, Arizona alder and Arizona walnut (Burbridge, 1974). Mature stands of cottonwood and sycamore trees are found in drier reaches of the stream. Other common over-story species occurring in the drainage include: Alligator juniper (*Juniperus deppeana*), Utah juniper (*Juniperus osteosperma*), netleaf hackberry (*Celtis reticulata*), singleleaf pinyon (*Pinus monophylla*), ponderosa pine

(*Pinus ponderosa*), and exemplifying the extraordinary diversity, white fir (*Abies*

concolor), occurs at the springs which is 4,000' below its normal range (McDougall, 1973). The vegetation is represented by a diverse age class, tree size, and foliage height. The diversity of age class is indicative of the lack of disturbance the corridor has received (Burbridge, 1974).

Common understory plant communities in the wetland ecosystem are composed of New Mexico locust (*Robinia neomexicana*) California buckthorn (*Rhamnus californica*), smooth sumac (*Rhus glabra*), chokecherry (*Prunus virginiana*), mesquite, algerita (*Mahonia trifoliolata*), catclaw acacia, (*Acacia greggii*), golden columbine (*Aquilegia chrysantha*), New Mexico tickclover (*Desmodium neomexicanum*), yellow beeplant (*Cleome lutea*), monkey flower (*Mimulus guttatus*), and cardinal flower (*Lobelia cardinalis*).

Groundcover species lining the stream bank include: barnyard grass (*Echinochloa crusgalli*), bristlegrass (*Setaria leucophila*), deergrass (*Muhlenbergia*), sideoats grama grass (*Bouteloua curtipendula*), meadowrue (*Thalictrum sp.*) and geranium (*Geranium spp.*). Dense thickets of Arizona dewberry (*Rubus arizonensis*), blackberry and moss are also abundant within the corridor. Hanging gardens of Maidenhair fern (*Adiantum capillus-veneris*) grow along banks surrounding the springs and on shady cliff faces in the canyon narrows.

Aquatic vegetation includes: watercress (*Rorippa Nasturum-aquaticum*), sedge (*Carex sp.*) cattail (*Typha latifolia*), spikerush (*Equistum sp.*), bulrush (*Scirpus sp.*), liverwort, Chora, floating algae and pondweed (*Potamageton sp.*) (Burbridge, 1974).

Riparian productivity, community structure, and percent cover (including basal area and crown density) change throughout reaches of the stream, depending on the extent of the floodplain. The alluvium is affected by variable factors including: geology and soil, channel width, stream gradient, and bank topography. Water availability and sites capable of absorbing increased amounts of water result in higher vegetation productivity. As previously mentioned the grade and proximity of the slopes adjacent to the stream vary. In areas where the canyon bottom is wide water can spread into alluvial benches and floodplains, which extends the ability for the riparian band to grow and develop. In places, steep rocky banks and high angle stream gradients have constricted the channel width and provide a marginal niche for vegetation. Exposed bedrock surface is also a limiting factor. The diverse vegetation community structure throughout the length of the stream provides an abundance and wide variety of niches. Overall the vegetation communities associated with Fossil Creek are composed of high densities of plants due to the perennial flow. Roots from the dense vegetation bordering the river stabilize the banks from erosion. The majority of the year Fossil Creek remains clear and pure of sediment except during floods when excessive amounts of mud and sediments are released into the canyon from other drainages.

The rugged topography, remoteness and inaccessibility have helped preserve Fossil Creek as one of the most undisturbed riparian areas in Arizona. Of the fourteen miles within a 1,600 foot deep canyon only 2.5 miles are accessible by an improved Forest Service dirt road. The upper and lower segments of the canyon can be reached by foot only. Other than the hydropower development, the main impacts in the canyon occur from historic grazing allotments and recreation. Presently the Forest Service management plan prohibits any grazing within the corridor in order to preserve Fossil Creek's natural conditions. The majority of the stream has been closed to grazing for over fifty years (USFS, 1995).

The landscapes adjacent to the riparian corridor are composed of two zones of distinct vegetation communities. The higher elevation upper reach of the stream is dominated by pinyon/juniper woodland. Adjacent vegetation in the lower segment from Irving to the Verde valley is a Sonoran desert scrub type, which consists of arrangements of mesquite, hackberry, catclaw acacia, shrub liveoak (*Quercus turbinella*), prickly pear (*Opuntia sp.*), yucca (*Yucca sp.*) and creosote (*Larrea tridentate*).

Fossil Creek's riparian corridor also functions as a connection from the Ponderosa and chaparral communities of the Mogollon highlands to the Sonoran Desert and Verde lowlands. It is an important migration and distribution corridor for numerous species of plants, animals, birds, and reptiles traveling from summer to winter habitats.

F. Wildlife

Fossil Creek's diverse riparian and aquatic environments provide niches for over 90% of Coconino National Forest's vertebrate species. It is prime habitat and source of life for a wide variety of aquatic, terrestrial, arboreal, and aerial animals dependent on the rare ecosystem created by Fossil Creek. Some species spend their entire life cycle, others are seasonal residents, and others use the environment for reproduction and forage. The diverse community of wildlife inhabiting the area includes over 100 species of birds (Smith and Bender, 1973), (Burbridge, 1974). The fourteen-mile perennial reach also serves as an important elevational/ecological migratory corridor between the Basin and Range lowlands and the Mogollon/Colorado Plateau highlands. Fossil Creek is considered critical habitat for several state and federally listed species. USFWS Threatened and USFS Sensitive species occurring along Fossil Creek include the bald eagle (*Haliaeetus leucocephalus*), common black hawk (*Buteogallus anthracinus*), and the Chiricahua leopard frog (*Rana chiricahuensis*). The Lowland leopard frog (*Rana Yavapaiensis*) and Fossil springsnail (*Pyrgulopsis simplex*) also inhabit Fossil Creek and are considered USFWS Category 2 candidate species and Sensitive by the USFS. When natural flows and conditions are restored the increased vigor will improve ecosystem processes and habitat for wildlife. In a letter to the Federal Energy Regulatory Commission the USFWS identified Fossil Creek to have recovery potential for the Threatened Mexican spotted Owl (*Occidentalis lucida*) (American Rivers, 2003). The primary mammals, birds amphibians and reptiles found throughout Fossil Creek and associated environment were recorded by (Smith and Bender, 1973):

Mammals of Fossil Creek

<u>Common Name</u>	<u>Scientific Name</u>
Yuma Myotis	<i>Myotis yumanensis</i>
California Myotis	<i>Myotis californicus</i>
Western Pipistrelle	<i>Pipistrellus hesperus</i>
Big Brown Bat	<i>Eptesicus fuscus</i>
Red Bat	<i>Lasiurus borealis</i>
Hoary Bat	<i>Lasiurus cinereus</i>
Pallid Bat	<i>Antrozous pallidus</i>
Black-tailed Jack Rabbit	<i>Lepus californicus</i>
Desert Cottontail	<i>Sylvilagus audubonii</i>
Rock Squirrel	<i>Citellus variegates</i>
Cliff Chipmunk	<i>Eutamias dorsalis</i>
Pocket Gopher	<i>Thomomys umbrinus</i>
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>
Deer Mouse	<i>Peromyscus maniculatus</i>
Brush Mouse	<i>Peromyscus boylii</i>
White-throated Wood Rat	<i>Neotoma albigula</i>
Porcupine	<i>Erethizon dorsatum</i>
Coyote	<i>Canis latrans</i>
Gray Fox	<i>Urocyon cinereoargenteus</i>
Ringtail	<i>Bassariscus astutus</i>
Raccoon	<i>Procyon lotor</i>
Badger	<i>Taxidea taxus</i>
Spotted Skunk	<i>Spilogale putorius</i>
Striped Skunk	<i>Mephitis Mephitis</i>
Mountain Lion	<i>Felis concolor</i>
Bobcat	<i>Lynx rufus</i>
Javelina	<i>Pecari tajacu</i>
Mule Deer	<i>Odocoileus hemionus</i>
Black Bear	

Amphibians and Reptiles of Fossil Creek

<u>Common Name</u>	<u>Scientific Name</u>
Red-spotted Toad	<i>Bufo punctatus</i>
Canyon Treefrog	<i>Hyla arenicolor</i>
Leopard Frog	<i>Rana pipiens</i>
Collared Lizard	<i>Crotaphytus collaris</i>
Greater Earless Lizard	<i>Holbrookia texana</i>
Eastern Fence Lizard	<i>Sceloporus undulates</i>
Tree Lizard	<i>Urosaurus ornatus</i>
Side-blotched Lizard	<i>Uta stansburiana</i>
Great Plains Skink	<i>Eumeces obsoletus</i>
Western Whiptail	<i>Cnemidophorus tigris</i>
Plateau Whiptail	<i>Cnemidophorus velox</i>
Narrow-headed Water Snake	<i>Natrix rufipunctatus</i>
Black-necked Garter Snake	<i>Thamnophis cyrtopsis</i>
Striped Whipsnake	<i>Masticophis taeniatus</i>
Ringneck Snake	<i>Diadophis punctatus</i>
Bullsnake	<i>Pituophis melanoleucus</i>
Sonora Mountain Kingsnake	<i>Lampropeltis pyromelana</i>
Night Snake	<i>Hypsiglena torquata</i>
Arizona Coral Snake	<i>Micruroides euryxanthus</i>
Black-tailed Rattlesnake	<i>Crotalus molossus</i>
Western Rattlesnake	<i>Crotalus viridis</i>

Birds of Fossil Creek

<u>Common Name</u>	<u>Scientific Name</u>
Olive-sided Flycatcher	<i>Nuttallornis borealis</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Scrub Jay	<i>Aphelocoma coerulescens</i>
Common Raven	<i>Corvus corax</i>
Plain Titmouse	<i>Parus inornatus</i>
Bridled Titmouse	<i>Parus wollwebri</i>
Bushtit	<i>Psaltiriparus minimus</i>
White-breasted Nuthatch	<i>Sitta carolinensis</i>
Brown Creeper	<i>Certhia familiaris</i>
Water Ouzel	<i>Cinclus mexicanus</i>
House Wren	<i>Troglodytes aedon</i>
Bewicks Wren	<i>Thryomanes bewickii</i>
Canyon Wren	<i>Catherpes mexicanus</i>
Rock Wren	<i>Salpinctes obsoletus</i>
Mockingbird	<i>Mimus polyglottos</i>
Crissal Thrasher	<i>Toxostoma dorsale</i>
Robin	<i>Turdus migratorius</i>
Hermit Thrush	<i>Catharus guttatus</i>
Western Bluebird	<i>Sialia mexicana</i>
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>
Bell's Vireo	<i>Vireo billii</i>
Gray Vireo	<i>Vireo vicinior</i>
Solitary Vireo	<i>Vireo solitarius</i>
Warbling Vireo	<i>Vireo gilvus</i>
Orange-crowned Warbler	<i>Vermivora celata</i>
Virginia's Warbler	<i>Vermivora virginiae</i>
Yellow Warbler	<i>Dendroica petechia</i>
Audubon's Warbler	<i>Dendroica coronata</i>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Townsend's Warbler	<i>Dendroica townsendi</i>
Hermit Warbler	<i>Dendroica occidentalis</i>
MacGillivray's Warbler	<i>Oporornis tolmiei</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Yellow-breasted Chat	<i>Icteria virens</i>
Wilson's Warbler	<i>Wilsonia pusilla</i>
Painted Redstart	<i>Setophaga picta</i>
Hooded Oriole	<i>Icterus cucullatus</i>
Scotts Oriole	<i>Icterus parisorum</i>

Birds of Fossil Creek Continued

Bullock's Oriole	<i>Icterus galbula</i>
Brown-headed Cowbird	<i>Molothrus ater</i>
Western Tanager	<i>Piranga ludoviciana</i>
Hepatic Tanager	<i>Piranga flava</i>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Indigo Bunting	<i>Passerina cyanea</i>
Lazuli Bunting	<i>Passerina amoena</i>
Cassin's Finch	<i>Carpodacus cassinii</i>
House Finch	<i>Carpodacus mexicanus</i>
Pine Siskin	<i>Spinus pinus</i>
American Goldfinch	<i>Spinus tristis</i>
Lesser Goldfinch	<i>Spinus psaltria</i>
Green-tailed Towhee	<i>Chlorua chlorua</i>
Rufous-sided Towhee	<i>Pipilo erythrophthalmus</i>
Brown Towhee	<i>Pipilo fuscus</i>
Oregon Junco	<i>Junco hyemalis</i>
Gray-headed Junco	<i>Junco caniceps</i>
Chipping Sparrow	<i>Spizella passerine</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Lincoln's Sparrow	<i>Melospiza lincolnii</i>
Song Sparrow	<i>Melospiza melodia</i>
Great Blue Heron	<i>Ardea herodias</i>
Turkey Vulture	<i>Cathartes aura</i>
Coopers Hawk	<i>Accipiter cooperii</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Rough-legged Hawk	<i>Buteo lagopus</i>
Golden Eagle	<i>Aquila chrysaetos</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Osprey	<i>Pandion haliaetus</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Sparrow Hawk	<i>Falco sparverius</i>
Spotted Sandpiper	<i>Actitis macularia</i>
Band-tailed Pigeon	<i>Columba fasciata</i>
White-winged Dove	<i>Zenaida asiatica</i>
Mourning Dove	<i>Zenaida macroura</i>
Roadrunner	<i>Geococcyx californianus</i>
Common Screech Owl	<i>Otus asio</i>
Great Horned Owl	<i>Bubo virginianus</i>
Pygmy Owl	<i>Glaucidium gnoma</i>
Common Nighthawk	<i>Chordeiles minor</i>
White-throated Swift	<i>Aeronautes saxatilis</i>
Black-chinned Hummingbird	<i>Archilochus alexandri</i>
Rufous Hummingbird	<i>Selasphorus rufus</i>
Belted Kingfisher	<i>Megasceryle alcyon</i>
Red-shafted Flicker	<i>Colaptes auratus</i>
Gila Woodneck	<i>Centurus uropygialis</i>

Birds of Fossil Creek Continued

Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Ladder-backed Woodpecker	<i>Dendrocopus scalaris</i>
Cassin's Kingbird	<i>Tyrannus vociferans</i>
Western Kingbird	<i>Tyrannus verticalis</i>
Wied's Crested Flycatcher	<i>Myiarchus tyrannulus</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Black Phoebe	<i>Sayornis nigricans</i>
Say's Phoebe	<i>Sayornis saya</i>
Empidonax Flycatchers	<i>Empidonax sp.</i>
Coue's Flycatcher	<i>Contopus pertinax</i>
Western Wood Pewee	<i>Contopus sordidulus</i>

Above lists taken from Fossil Creek Springs Report No. 11 by Smith and Bender, 1973.

G. Fish

Fossil Creek's water quality and impending restored conditions are ideal for a native warm water fishery. Above the dam, the springs area currently support an intact population of six native species (Minkly, 1993), (Sponholtz, 2001). The following are native fish that occur in Fossil Creek: Desert Sucker (*Pantosteus clarki*), Headwater Chub (*Gila nigra*), Longfin dace (*Agosia chrysogaster*), Roundtail chub (*Gila robusta*), Sonoran sucker (*Catostomus insignis*), Razorback Sucker (*Xyraunchen texanus*) and Speckled dace (*Rhinichthys osculus*). All but the Headwater chub are categorized by the USFWS as Category 2 candidate species. In addition the Razorback sucker and Roundtail chub are listed Sensitive by the USFS. Fish are capable of swimming upstream from the Verde to the dam and non-native species are threatening the health of the native fish populations in that reach (Sponholtz, 2001). Non-natives include green sunfish (*Leopomis cyanellus*), smallmouth bass (*Micropterus dolomieu*), rainbow trout (*Oncorhynchus mykiss*) and crawdads. Diverting Fossil's flow has dramatically decreased aquatic habitat. Restored free-flowing natural conditions will result in deeper pools and consistent interconnected flows. Deep pools created by increased water volume and travertine dams will provide critical habitat to maintain native and large-fish populations. The depth of the pools enables fish to avoid easy predation from animals (Minkly, 1999). Travertine dams will also serve the management of the native fishery, because they will act as a barrier to invasive species swimming upstream (Monroe, 2002). The improved habitat will help rebuild gene pools and healthy populations. The Bureau of Reclamation and the Forest Service are reviewing proposed treatments for native fish restoration. There are plans to remove invasive species and restock populations of native fishes. Construction of a fish barrier and alternative management options are also being considered (Bureau of Reclamation, 2003). Researchers predict probable success of returning Fossil Creek into a vestige native fishery of the Southwest (Bureau of Reclamation, 2003). Fossil Creek's fishery would also serve as a source population for the Verde River.

Of Arizona's thirty native fishes, one is extinct, seventeen are federally listed as Threatened or Endangered, and two other species are being considered. Habitat loss and non-native competition are causing their decline. Endangered native Arizona fish which historically inhabited Fossil's waters include: the Colorado squawfish (*Ptychocheilus lucius*), Loach Minnow (*Tiaroga cobitis*), Desert Pupfish (*Cyprinodon macularius*), Gila Topminnow (*Poeciliopsis occidentalis*), Spikedace (*Meda fulgida*) and Razorback Sucker. All but small numbers of the Razorback Sucker, which were reintroduced to Fossil Creek, (stocked above the dam) are not currently found (Minkly, 1993). The USFWS has designated Fossil Creek critical habitat for the Razorback Sucker, Spikedace and Loach Minnow. There is potential to reintroduce these six Threatened and Endangered native species as well as rebuild the native populations presently living in the creek.

Water samples indicate extremely high water quality ratings - another critical aspect of suitable aquatic habitat (Burbridge, 1974). Seventy-two degree water temperatures are ideal to sustain a warm water fishery. Dissolved oxygen levels are high- concentrations of 5.5-7.25 mg/litre provide excellent conditions for aquatic organisms. Dissolved solids are also at adequate levels to support populations. A highlight of Fossil Creek's water

quality is the clarity, which is above distilled water standards. In addition, the bottom fauna, aquatic invertebrates, collected are diverse and well populated (Burbridge, 1974).

Livestock grazing and recreational impacts directly and indirectly affect aquatic habitat. Foraging and hoof prints compromise streambank stability, reduce riparian vegetation, and trample grasses and forbes. The bare-ground and reduced mulch and root systems influence water quality and quantity by causing increased sediment levels (USFS, 1995). High sediment levels fill up the watercourse with excessive levels and cause respiratory complications for fish. Grazing on Fossil Creek's uplands has caused unusually high silt levels during runoff disturbing the aquatic and stream-bank vegetation. The majority of Fossil Creek has been excluded from the grazing allotment for over fifty years, (USFS, 1995) and management is working to maintain quality habitat for the future. In the management plan, the Forest Service also addressed the impact and erosion along FR502 from permanent campsites and heavy recreation use along the streambanks.

"Fossil Creek is one of the few perennial streams in Arizona with multiple species of native fish, and actions now would prevent continued declines or losses that are possible in the foreseeable future" (Bureau of Reclamation, 2002). Fossil Creek's native fishes have a rare opportunity to persist in relatively pristine conditions. It may represent the best opportunity for native fish restoration in the state.

H. Cultural

Fossil Creek has been geographically significant throughout history. Cultures have been linked to its water in this arid landscape for at least 1000 years prior to European settlement (Mindeleff, 1896; Macnider et al., 1991). The canyon's rugged topography, abundance of flora and fauna and proximity to water, provided ideal conditions for the subsistence-based lifestyle of native people. Fossil Creek sustained the Yavapai-Apache who inhabited the area up until the 1870's when the U.S. cavalry forced the natives into containment camps (American Rivers, 2003). The Yavapai-Apache Nation still considers Fossil Creek sacred ancestral homeland. Prehistoric artifacts, ruins, petroglyphs and



An archeological ruin along one of Fossil Creek's terraces

pictographs have been found on numerous locations along Fossil Creek's terraces. Information

provided by surveys and predictive models reports extremely high densities of archeological ruins (Macnider et al., 1991). Preserving the remains will provide valuable information to understand the region's history and gain further insight into Native American's intricate relationships with the land and social organization in that era of the southwest.

I. Historic

The historic period began in the 1800's with the arrival of the area's earliest explorers and trappers. Fossil Creek's location was first recorded on a map in 1864 after a Woosly expedition followed the creek (Barnes, 1960). Fossil Creek derived its name from the early explorers referring to the travertine and descriptions of the apparent fossilization throughout the water channel. Even Arizona's first governor made comments on Fossil Creek's unique "petrifications" (Monroe, 2002).

In 1901 a rancher named Lee Turner recognized the potential for hydroelectric power production, claimed Fossil Creek's water rights, and formed Arizona Public Service (APS). The spring-fed constant perennial flow and the gravity-aided steep descent are factors that contribute to the power production. Construction of the hydro-project began in 1907. A dam was built at the current Irving location in 1909, and diverted waters to Childs facility on the Verde River four miles upstream from the Fossil Creek confluence. The hydroelectric power originally served the mining boom in Jerome and other sites in central Arizona. Electricity demands increased and led to the construction of the Irving Plant and concrete diversion dam 1/4 mile beyond the springs in 1916. The diversion



Photo 129 The diversion dam

dam is built on a limestone ledge and is 25 feet high by 120 feet wide (Monroe, 2002). Ninety-five percent of the flow is diverted from the natural channel into a flume system to the power plants generating turbines. Eventually, in the 1920's the power served Phoenix development. Arizona Public Service (APS) has been operating on a Forest Service special use permit, the lease costing \$3,000 a year, and an agreement to maintain Forest Service roads.

Every fifty years the Federal Energy Regulatory Commission (FERC) reviews dams and hydropower projects. In 1992 APS's license to continue operating the Fossil Creek hydroproject came up for renewal. FERC began reviewing the Fossil Creek project in 1994 and received extensive public input and negotiated with state and federal agencies, APS, and conservation groups. The outdated hydropower development is capable of producing a maximum 5.6 megawatts of power, which presently feeds general APS in state/out of state sales pool and does not supply local power. According to American Rivers at its maximum capabilities Childs and Irving only contribute .25 of 1% of APS total power generated, and the project only supports eight APS jobs. The system is nearly 100 years old and the metal flumes, concrete dam, and other components are rapidly deteriorating. The reservoir behind the dam is almost entirely filled with sediment- levels are only a few feet beneath the crest of the dam (Monroe, 2002).

Because the environmental benefits far outweigh the small portion of power produced and eight APS jobs the Childs and Irving project supports, FERC denied the license. Organizations and agencies including the Forest Service, Arizona Game and Fish, Yavapai-Apache Nation, American Rivers, Center for Biological Diversity, and Living Rivers were all supporting and advocating the decommission for reasons including: Endangered Species Act requirements, an excellent opportunity for riparian restoration, National Forest Management Act requirements, and the fact that APS receives minimal economic benefits from a private hydropower project that is located entirely on public lands. On November 12, 1999 APS signed an Agreement-in-Principals to decommission the dam and restore full flows to the Fossil Creek. In the final Settlement Agreement, in addition to returning full flows by December 31, 2004, APS has agreed to complete and fund restoration work including complete or partial removal of structures and rehabilitation of disturbed areas. The ability to revive a river system as unique and beautiful as Fossil Creek is Outstanding and Remarkable in itself.

J. Recreation

Water-based recreation is extremely popular in the arid southwest. Fossil Creek's natural and cultural attractions provide outstanding opportunities for a variety of recreational activities. The stream is centrally located and is a popular destination for people from Phoenix, Flagstaff, Prescott, Payson, Camp Verde, Sedona as well as small communities in between. Visitors can freely experience the area because the waterway is located entirely on National Forest lands. This freshwater source provides essential relief from



Photo 28 Swimming hole and sandy beach campsite

the desert heat. Shade and cooler temperatures from the dense riparian canopy are enjoyed, and there is an abundance of clear pools to wade, swim and snorkel in. Camping is also very popular along the water. The Forest Service has inventoried over 200 campsites throughout the 14-mile stream. The permanent sites are mainly concentrated around the springs and along the 2.5-mile roadside accessible localities.

There are also braided trails weaving along the banks around the springs and near the permanent

campsites. Visitor-use surveys were conducted for Fossil Springs. The Forest Service estimates that 2,200 day hikers and 1000 backpackers visit the springs annually (USFS, 2002). Impact from large groups has caused stream bank erosion, root exposure, fire rings and firewood harvesting (including live-tree cutting), trash, soil-compaction and vegetation loss in places. Management plans make changes to prevent further impacts on the environment (USFS, 2002). Recreation takes place in areas surrounding important habitat so management is challenged to support the user numbers and popularity of the area with the carrying capacity to preserve the riparian qualities.

Fossil Creek borders and is surrounded by contiguous roadless areas of the Mazatal and Fossil Springs Wilderness. Due to the remote nature of Fossil Creek, the rugged, steep-walled lower canyon and the springs down to immediate road access offer exceptional opportunity for experienced hikers and backpackers to venture into the remote areas, explore primitive nature, and have a true wilderness experience. Other attractions include the 72° F warm springs, wildlife/nature observation, photography, bird watching, and potential cultural and historical site interpretation. The lack of development and natural character greatly enhance the quality of the recreational experience at Fossil Creek.

K. Scenic

Fossil Creek contains a very high level of scenic integrity due to the lack of urban development on the adjacent lands. The natural landscape is filled with attractive colors and dramatic views. There is a striking contrast between the lush green canopy billowing from the riparian forest surrounded by the arid desert scrub environment. The corridor does presently contain some features that visually detract from the overall natural character of the area including: the flume, Irving buildings and structures, the dam, the flume road, and power line crossings. (see *Appendix F photo 149, 183*) APS's restoration plan as well as Forest Service management plan for Fossil Creek will greatly improve the intact natural appearance throughout the entire fourteen miles of the study corridor.



Photo 218

III. Eligibility Evaluation

To be eligible for WSR designation Fossil Creek must be free flowing and the river corridor must possess one or more regionally or nationally significant outstanding remarkable value.

A. Free-Flowing Condition

Free-flowing is defined in section 16(b) of the WSRA and applies to:

“Any river or section of a river,” ... “existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence however of low dams, diversion works, and other minor structures... shall not automatically bar its consideration for inclusion: Provided, that this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the National Wild and Scenic Rivers System.

Fossil Creek presently contains a concrete diversion dam within the natural watercourse, which does significantly modify the waterway. The dam is expected to be partially or completely removed beginning December 31, 2004. At this time the waterway will be restored to its natural free-flowing condition.

B. Outstandingly Remarkable Values of Fossil Creek, Arizona

The framework and criteria used to evaluate Fossil Creek’s resource values were taken from Wild and Scenic River Review in the State of Utah- Process and Criteria for Interagency Use (July, 1996). Under the Utah criteria, a river segment can be evaluated based on eight resources: scenic, recreation, geologic, fish, wildlife, historic, cultural and ecological. The Utah WSR document states the resource values are ORVs if they are **rare, unique or exemplary** on a regional, national or global scale. Outstanding Remarkable Values are identified based on an analysis of Fossil Creek’s resource values within the Central Arizona Highlands physiographic province (USGS, 2000) and through recognition of nationally significant qualities. The Central Arizona Highlands is considered a geological and ecological Transition Zone between the uplifted Colorado Plateau to the north and the Basin and Range to the south (USGS, 2000). The region is located in topographically rugged terrain, recognized as one of the most inaccessible areas of Arizona. Major landforms of the region consist of mountain ranges, valleys and steep walled canyons (USGS, 2000). Eligibility criteria from the Outstanding Remarkable Value Standards were applied to Fossil Creek’s resources and if elements from the criteria definitions were met it provided a basis for regional and national assessment.

Geologic

The river corridor contains an example of a geologic feature, process, or phenomena that is rare or unique to the geographic region, or an outstanding example of a commonly occurring feature. The feature may be in an unusually active stage of development, represent a “textbook” example and/or represent a rare or unique combination of geologic features (erosional, volcanic, glacial, ect.) (USDI, 1996).

Fossil Creek possesses outstanding geologic features for a Southwestern stream. With restored flows it has the potential to form a travertine system similar to the nationally

renowned Havasu Canyon. Travertine deposits are a unique natural wonder that result from a specific combination of bio/chemical processes. Fossil Creek will provide a rare and important system for study and observation of this natural biogeochemical process. This system will also create critical habitat for the native fishery. Clear unpolluted water and unregulated flows for the entire length of a perennial free flowing stream is also rare in a land where grazing, mining, logging, and urban development impacts are so prevalent. Through these features Fossil Creek meets criteria for geologic Outstanding Remarkable Values.

Ecology

The river corridor constitutes an important element of a regional plan to conserve biological diversity or other specific ecological resources. Examples of important elements include rare communities or ecosystems, watersheds with special values or that are the focus of special management, essential corridors for species migration and genetic interactions, and other values of importance (USDI, 1996).

Fossil Creek's perennial flow supports a lush riparian ecosystem. The rugged topography, remoteness and inaccessibility have helped preserve Fossil Creek as one of the most diverse, undisturbed riparian areas in Arizona. The perennial waters create an oasis in the arid lands of central Arizona. The entire fourteen-mile perennial reach provides extensive and critical riparian and aquatic habitat that supports an abundance and extremely high diversity of plants, wildlife and fish. Fossil Creek's riparian corridor also functions to connect the Ponderosa and chaparral communities of the Mogollon highlands to the Sonoran Desert and Verde lowlands. It is an important migratory and distribution corridor for numerous species of plants, animals, birds, and reptiles traveling to and from summer and winter habitats. Endangered, threatened, candidate and state sensitive plant, fish and wildlife species depend on Fossil Creek's riparian environment and high quality conditions. The outstanding ecological values of the area were recognized and designated as a Botanical Area in 1986. The Forest Service 2002 management objectives plan to extend the Botanical area boundaries from the springs to Irving (USFS, 2002). The riparian habitat is essential to Fossil Creek's ecosystem as well as the overall biodiversity in Arizona, qualifying ecology as an Outstandingly Remarkable Value.

Wildlife

Wildlife values shall be judged on the relative merits of either populations, habitat, Native American cultural use, or a combination of these factors.

Populations: The river corridor contains nationally or regionally important populations of indigenous wildlife species. Of particular interest are species considered to be unique or rare species (federally listed, state listed or candidate threatened or endangered species). Diversity of species is an important consideration and could in itself, lead to a determination of outstandingly remarkable.

Habitat: The river corridor provides exceptionally high quality habitat for wildlife of national or regional significance, or may provide unique habitat or a critical link in habitat conditions for rare species (federally listed, state listed or candidate threatened or endangered species). Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of species is an important consideration and could, in itself, lead to a determination of outstandingly remarkable value (USDI, 1996).

Fossil Creek creates a rare, high-quality habitat that supports an extremely high diversity of species including concentrations of over 100 birds (Smith and Bender, 1973). The riparian environment provides wildlife with an important food source and the canopy provides dense cover for protection and breeding. Fossil Creek is considered critical habitat for several state and federally listed species. Threatened species occurring along Fossil Creek include the bald eagle (*Haliaeetus leucocephalus*), common black hawk (*Buteogallus anthracinus*), and the Chiricahua leopard frog (*Rana chiricahuensis*). When natural flows and conditions are restored, the increased vigor will greatly improve conditions for wildlife and the greater ecosystem. USFWS considers Fossil Creek to have recovery potential for the Mexican spotted Owl (*Occidentalis lucida*). These factors are regionally and nationally significant and qualify wildlife as an Outstanding Remarkable Value.

Fish

Fish values may be judged on the relative merits of fish populations, habitat, Native American cultural use, or a combination of these factors. Consideration shall be given to potential as well as existing values.

Populations: The river is internationally, nationally or regionally an important producer of resident and or anadromous fish species. Of particular significance is the presence of wild stocks or rare species (federally listed, state listed or candidate threatened or endangered species). Diversity of species is an important consideration and could, in itself, lead to a determination of outstandingly remarkable

Habitat: The river provides exceptionally high quality habitat for fish species indigenous to the region. Of particular significance is habitat for wild stocks or rare species (federally listed, state listed or candidate threatened or endangered species). Diversity of habitats is an important consideration and could, in itself, lead to a determination of outstandingly remarkable (USDI, 1996).

The waters of Fossil Creek support an exceptionally rare and critical habitat for a diverse native fishery. Five of the six native species currently found in Fossil Creek are federally listed as C2 candidate, threatened or endangered and the Roundtail chub and Razorback sucker are sensitive for the Arizona and Coconino National Forest. With restored flows the USFWS has also determined Fossil Creek critical habitat for two additional federally listed Endangered fish. The unique habitat association between native fish and the deep pools formed by the travertine system is also distinctive. The present native biodiversity combined with the excellent potential to restore Fossil Creek to an intact, completely native fishery with highly productive habitat is extremely important for the American Southwest. The significance of these qualities meets Outstanding Remarkable Value criteria.

Cultural

The river corridor contains a site where there is evidence of occupation or use by Native Americans or some other prehistoric culture. Sites must have unusual characteristics or exceptional human interest values. Sites may have national or regional importance for interpreting prehistory; may be rare or represent an area where a culture or cultural period was first identified and described; may have been used by cultural groups for rare or sacred purposes. Of particular significance are sites or features listed in or eligible for inclusion in, the National Register of Historic Places (USDI, 1996).

Fossil Creek corridor and its surrounding area possess an extremely high density of Native American archeological sites. Additionally, predictions suggest many more prehistoric sites exist along the terraces. Because the canyon has remained relatively undisturbed many of the sites and ruins have not been modified and thus likely retain their integrity. The condition and abundance of sites provide an excellent example of regional prehistory and may offer opportunities for study and cultural interpretation deeming Fossil Creek's cultural resources an Outstanding Remarkable Value.

History

The river corridor contains a site or feature associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual or unique in the region. An historic site and/or feature in most cases is 50 years old or older. Of particular significance are National Historic Landmarks, or sites or features listed in, or eligible for inclusion in, the National Register of Historic Places (USDI, 1996).

The Childs and Irving hydroproject is a unique and innovative system that effectively served development in the early part of the century. It has been designated by the National Register of Historic Places, but because the Irving structures are planned for removal, interpretation of the operation will be better served at the Childs facilities on the Verde River.

Recreation

Recreational opportunities are, or have the potential to be, unique enough to attract visitors from outside of the geographic region. Visitors would be 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, photography, hiking, fishing, hunting and boating. Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the geographic region. The river may provide or have the potential to provide settings for national or regional usage or competitive events. Consider evaluating specific, high use recreation activities (e.g. whitewater boating) separately (USDI, 1996).

Although Fossil Creek is accessible to a variety of users and offers many types of experiences along the waterway, however, there are not any regionally unique, rare, or exemplary characteristics. Similar recreation opportunities exist elsewhere within the Arizona Central Highlands region at the Verde River, Tonto Creek, Beaver Creek, West Clear Creek and Oak Creek. Recreation will continue to be an attraction and managed for at Fossil Creek, but emphasis should be placed on the protection of the other ORVs that could be adversely impacted by increased recreation.

Scenic

The landscape elements of landform, vegetation, water, color and related factors result in 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. Scenery and visual attractions may be highly diverse over the majority of the river or river segment. Existing agency procedures for evaluating scenery may be used to identify rivers with outstanding scenic resources (USDI, 1996).

Qualities and attractions within the canyon possess a high level of scenic integrity. The relative absence of development along the entire length of Fossil Creek and the surrounding area has maintained its natural character and sense of remoteness. Expansive views of a variety of landforms and colors enhance the visitors experience

along the stream. Within the canyon are steep cliffs and bedrock gorges. Clear water reveals the vigorous aquatic life and reflects the bounty of surrounding vegetation. The mosaic of vegetation forms a sharp contrast between the combination of arid pinyon/juniper and desert scrub with the lush green riparian meandering through the canyon bottom. With the perennial nature of the restored flows, the character of the creek will display a variety water features to admire including still-clear pools, waterfalls, and whitewater as the channel varies. Above all, the travertine system that is predicted to return with restored flows will be an amazing sight to behold (Malusa, 1997). The natural beauty combined with a wide-ranging distinctive landscape are scenic characteristics that will be appreciated by all visitors. Outstanding Remarkable Value for scenery is strongly evident.

C. Eligibility Findings

Full free flowing conditions are to be restored beginning in 2005. At this time the entire fourteen mile stream will be eligible for inclusion in the National Wild and Scenic River System. The restored flows will be sufficient to sustain several of the identified Outstanding Remarkable Values. In conclusion, Fossil Creek meets the Outstanding Remarkable Value criteria for the following resources: geology, ecology, fish, wildlife, cultural, and scenery.

IV. Classification

Each classification implies different management responsibilities related to protecting the resource values deemed Outstanding and Remarkable. Classification ratings intend to preserve the river in its present state. Development restrictions are based on no further degradation of the present character. The WSRA of 1968 states the following classification guidelines:

Wild river areas -- Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shoreline essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic river areas -- Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas -- Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Based on the criteria of shoreline development and access condition it was determined that the fourteen mile segment of Fossil Creek study area should be divided into three segments.

Segment 1. From Fossil Springs to .75-miles upstream of Irving
Proposed classification: **Wild**

Currently there are impoundments on Fossil Creek. The concrete diversion dam ¼ mile downstream of Fossil Springs modifies the waterway. The dam and flume are to be completely or partially removed by December 31, 2004. Currently there is access by the APS maintenance flume road. The Forest Service plans to obliterate it once the power plants are decommissioned and restoration begins. Otherwise the upper segment is undeveloped except for some barbed-wire fences. This area is planned to be converted to day-use only and will be accessible only by trail.

Segment 2. From .75- miles upstream of Irving to 4.1 miles downstream from Irving
Proposed classification: **Scenic**

With the exception of two bridge crossings, the flume paralleling the river, the Irving facilities, one power line crossing, and dispersed camping, Fossil Creek and the banks have remained undeveloped and natural in appearance. Although the development from the hydropower project has led to modifications, the Settlement Agreement signed by APS, the flume, Irving facilities, and the bridge leading to Irving are to be removed. This area is planned to be converted to dispersed camping. FR502 is not highly visible from the stream and does not detract from the natural character.

Segment 3. From 4.1- miles downstream from Irving to the Verde confluence
Proposed classification: **Wild**

This segment is undeveloped and is in essentially primitive condition except for occasional barbed-wire fences crossing into the corridor. It is accessible only by foot.

V. Suitability

Fossil creek's suitability is based whether WSR designation will protect the river's ORVs and free-flowing character. Fossil Creek flows entirely through public National Forest lands so private landowners are not a factor. The Forest Service has complete authority and ability to effectively manage and protect Fossil Creek's resource values.

In the Proposed Action for Fossil Creek Planning Area, October, 2002, the Forest Service recognized that Fossil Creek's use demands management changes. Archeological sites have been damaged from recreation and historic grazing along the creek's terraces. Dispersed camping has compacted soils, degraded vegetation, and resulted in unstable stream banks, erosion and sedimentation. Poor sanitation is also a problem. Grazing is no longer permitted anywhere along Fossil Creek, but the watershed is still affected by upland allotments; two of the tributaries release excessive sedimentation into Fossil Creek during high runoff. Off-road vehicle travel and Forest Service roads bordering drainages flowing into Fossil Creek are also adding sedimentation and runoff in places where culverts are not functioning. Invasive plant and fish species are also addressed.

The USFS management plans to restore the impacts occurring at Fossil Creek through the following changes: camping and campfires will be prohibited from the springs to Irving and converted to day use only. Additional campsites will be closed along FR502.

Vehicle access will be redesigned and limited to designated areas to reduce impacts to riparian and cultural resources. Trails will be constructed along the mid-section road accessible area to minimize impacts and provide streamside access with areas of interpretation about Fossil Creek's natural and cultural resources. Sanitation facilities will be installed in appropriated high-use camp areas. FR9206W, FR502E, and FR9248C are to be closed and revegetated to reduce runoff and sedimentation. The Irving hydropower facilities, flume road, flume, and APS's access bridge are to be removed by APS (USFS, 2002).

Possible impacts which might result from Wild and Scenic designation could occur from increased visitor use. Once this stream's natural flows are restored it will be a highlight of the state. Its travertine system, deep, clear pools, waterfalls, lush riparian environment, native fishery, abundance of wildlife, and exemplary scenery would be recognized by a greater number of people through Wild and Scenic designation. The Forest Service has addressed impacts from recreation use, and plans to control and eliminate impacts to riparian and cultural resources. "Management is directed towards maintaining as nearly as possible existing conditions and natural processes for public enjoyment, demonstration and study" (USFS, 2002). The directives for the upper **wild** segment are to restore and maintain the area as a vestige primitive area of the Southwest. The Forest Service's restoration and conservation efforts aim to expand the Fossil Springs Botanical Area to include the stream bank riparian down to Irving. To fulfill the management objectives Forest Service would benefit from the federal support of Wild and Scenic River designation.

Fossil Creek flows entirely through National Forest Land. This fact provides an unimpaired opportunity for the Forest Service to develop and uphold a conservation-based management plan. Directives are set to preserve resource values, and the Forest Service intends to implement interpretation and education about those resource values. Wild and Scenic designation would ensure that management plans are permanently upheld and this rare, exemplary river along with its outstanding remarkable resource values will be preserved in free-flowing, natural conditions, and management would be specific to the ORVs and not recreation.

The other suitability factor is whether WSR designation is an appropriate conservation tool for Fossil Creek. What is the effect designation might have on other uses for Fossil Creek's waters? Hydroelectric power projects and livestock grazing allotments along the creek would be permanently foreclosed if Fossil Creek was designated a WSR. The proposed recommendation would not allow dams, diversions or other developments that could effect the free flowing condition, and resource values of Fossil Creek. These developments would compromise recreation, reduce critical habitat and ecosystem integrity through impact to the overall health and vigor of the plants, fish, and wildlife. Grazing could continue on the uplands to the extent that it does not detract ORVs for which the river was designated i.e. water quality and riparian and aquatic habitat. Due to the rugged topography of the canyon other development has not occurred in the past and there are no adequate foreseeable uses for the adjacent land or water in the future.

In summary, Fossil Creek's riparian integrity, water quality, and resource values will be protected by WSR designation and associated Forest Service management objectives. Current grazing allotments along the stream are already prohibited to preserve the quality of Fossil Creek's resources. The Federal Energy Regulatory Commission gave equal consideration to power production, fisheries, wildlife habitat, and recreational opportunities and in so determined the importance of hydropower projects on Fossil Creek are far outweighed by environmental and human benefits. Therefore it is determined that suitability standards have been met.

VI. Existing Assessment

In 1993 at the request of Congress, the Forest Service conducted a statewide inventory and prepared a preliminary analysis of potential Wild and Scenic River eligibility for rivers within Arizona's six National Forests. The survey found the segment of Fossil Creek downstream of the APS diversion dam to the confluence of the Verde River to be potentially eligible for inclusion in the NWSRS due to the following ORVs: geologic, fish, wildlife, historic, ecological/riparian and scenic values (USFS, 1993). Since the Federal Energy Regulatory Commission's decision to decommission the APS dam and hydro-project at Fossil Creek, the Forest Service has produced an Existing Conditions report and Proposed Action for Fossil Creek Planning Area-October, 2002. The agency plans to recommend Fossil Creek eligible to the National Wild and Scenic River System. With the expected modification or removal of the dam the Forest Service reports the entire length of Fossil Creek is eligible. They have classified the upper portion of Fossil Creek *Wild*, the middle segment *Scenic* and the lower section *Wild*. Management objectives include plans to improve the existing conditions of Fossil Creek area prior to completing a final Wild and Scenic River study. Changes are expected to be implemented by 2006, and should benefit the existing conditions and impacts on resource values. In the Proposed Action report they announced directives to manage for carrying capacity recreational use without impact on the Outstanding Remarkable Values as well as the natural free flowing conditions. A final report and suitability study are not planned to be completed until 2006 at the time of implemented Forest Service revisions (USFS, 2002).

VII. Conclusion

Healthy riparian areas and streams are extremely rare in Arizona representing only one percent of the landscape. Riparian environments of the American Southwest have been lost, modified, or face severe degradation from recreation, grazing, logging, mining, and other impacts from development. In addition, 90% of Arizona's rivers no longer run year round due to diversions, withdrawals, and dams. Water is a critical resource in the arid southwest; it is needed for livestock and agriculture, some hydroelectric projects, drinking water, and recreation. Water is also an essential aspect to maintaining ecosystem health in arid landscapes. Often when riparian areas face development or multiple use impacts, the health of the overall landscape suffers serious consequences. Both state and federal agencies have a responsibility to preserve the ecosystem integrity and natural conditions of Fossil Creek, as it will be restored as a vestige stream of the American Southwest. Fossil Creek has a great opportunity to be restored and thrive as an undisturbed, intact, natural riparian ecosystem. The Wild and Scenic Rivers Act was

designed to protect places exactly like this. My hopes for this project are to heighten local awareness of Fossil Creek and its related resources, and lead Congress to authorize a study bill directing the Forest Service to assess Fossil Creek for potential inclusion to the NWSRS, while providing temporary protection from any development or hydropower projects that might impact the identified resource values. The proposed WSR designation for the entire fourteen-mile length of Fossil Creek is based on the Outstanding Remarkable geology, ecology, fish, wildlife, cultural, and scenic Values.

Fossil Creek represents an important opportunity to protect and restore critical riparian and aquatic habitat as well as the natural and cultural resource values it possesses. It is a milestone for the reversal of riparian degradation in Arizona and the American Southwest. This is the first time in Arizona history that a stream will be fully restored. Wild and Scenic River designation is the most effective way to preserve the unique, rare and exemplary conditions that will thrive again at Fossil Creek.

VIII.

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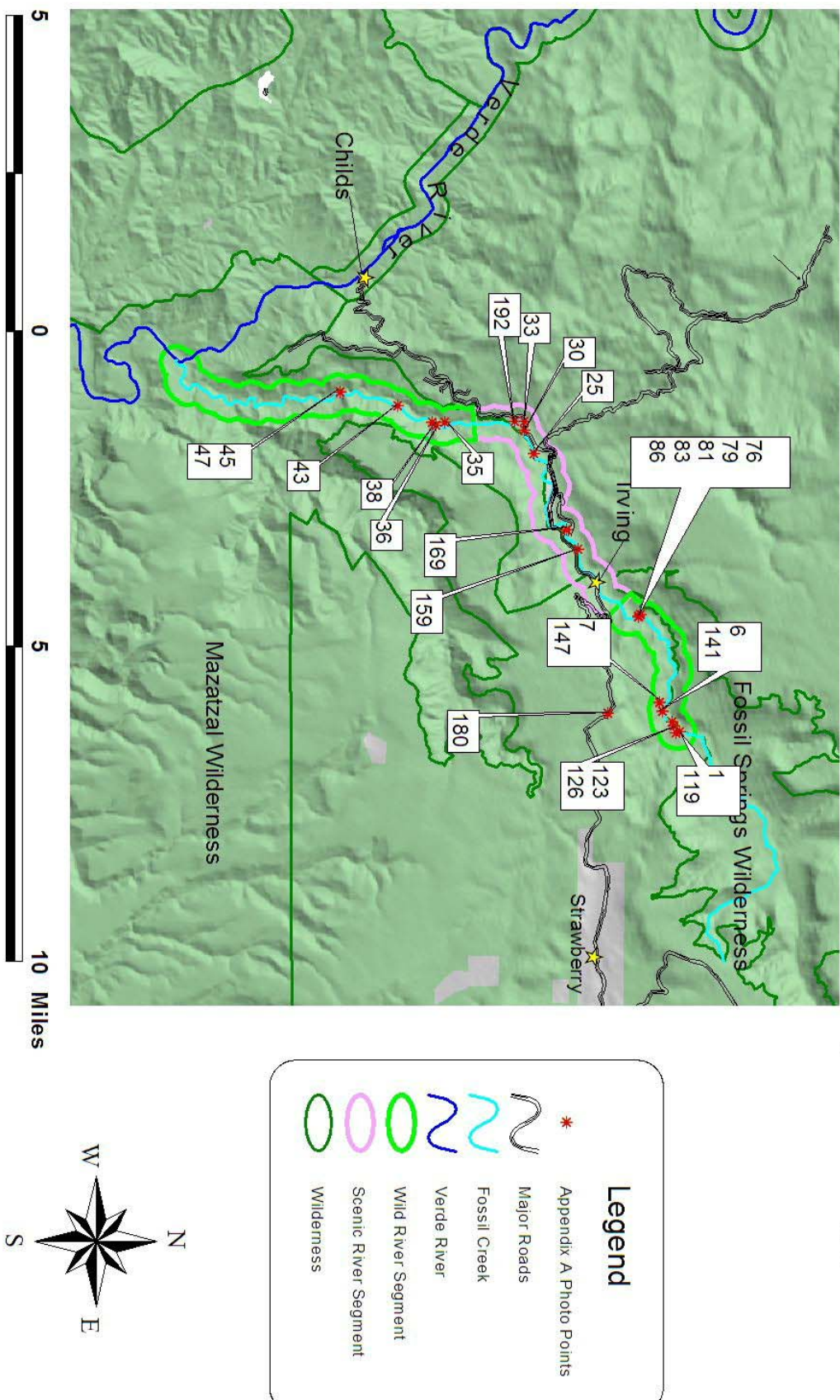
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Photo Locations for Appendix A Geology, Hydrology, Geomorphology



Appendix A Geology, Hydrology, Geomorphology



Photo 1 Spring



Photo 123 Spring gushing into the main channel



Photo 119 Spring gushing from a streambank covered with maidenhair fern



Photo 38 Spring in the lower canyon



Photo 86 Travertine

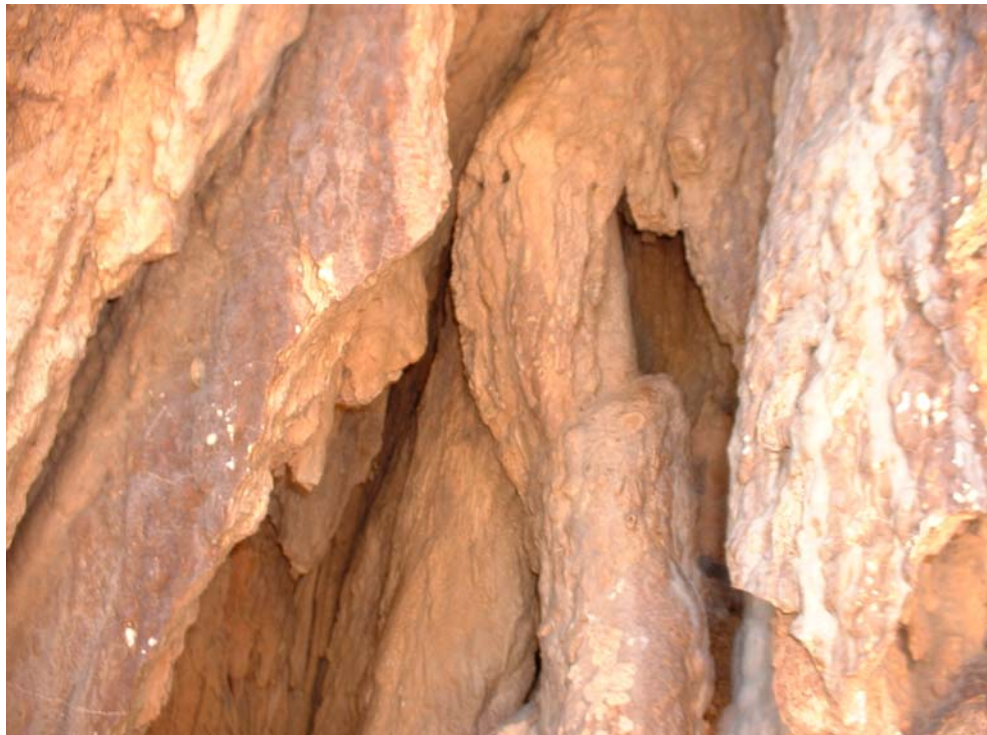


Photo 79 Travertine



Photo 81 Travertine



Photo 6 Remnant travertine pool



Photo 83 Travertine



Photo 76 Travertine



Photo 147 Travertine



Photo 169 Current travertine dam downstream from Irving



Photo 159 Current travertine dams, falls and pool system occurring downstream from Irving



Photo 180 Travertine ledge at Fossil Springs area



Photo 7 Volcanic vein through sedimentary



Photo 35 Basalt cliff along creek



Photo 36 Basalt cliffs and deep pool



Photo 47 High cliffs in the canyon narrows



Photo 45 Pointed knoll



Photo 141 Travertine overlying sedimentary



Photo 126 Cliffs



Photo 30 Basalt banks

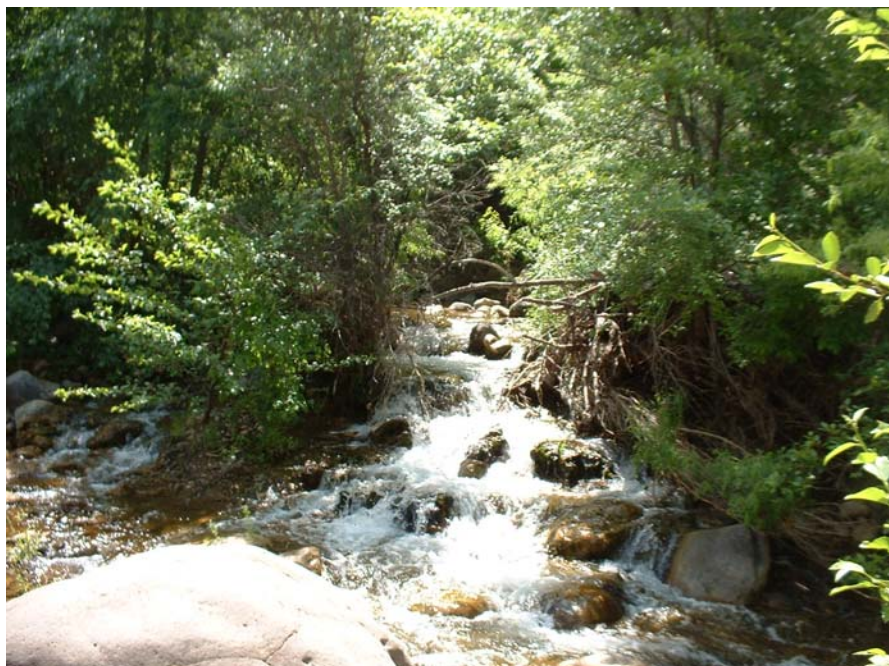


Photo 25 Side-channel falls and debris pile

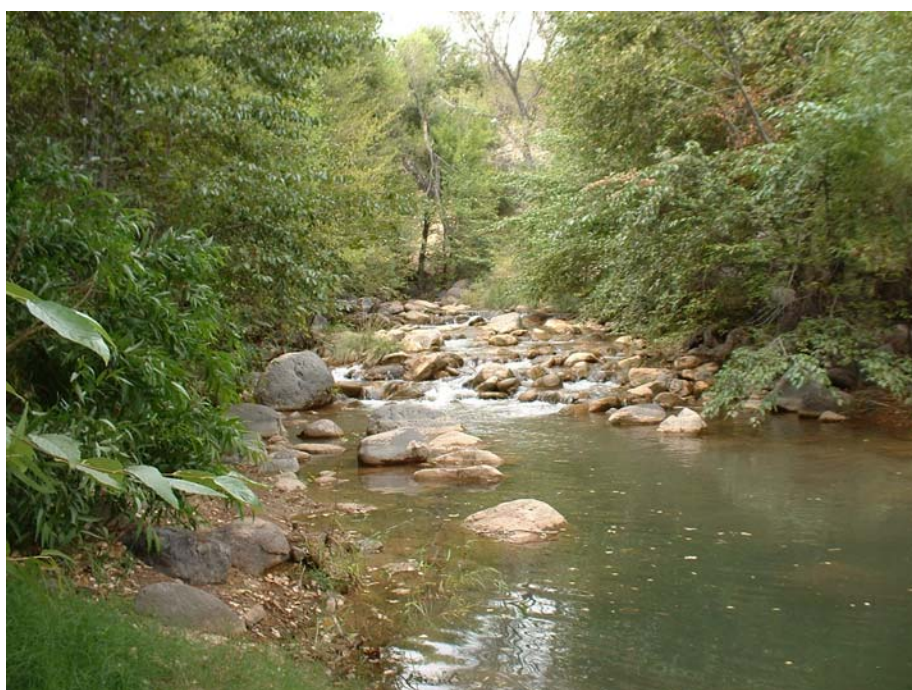


Photo 192 Creek pouring over boulders

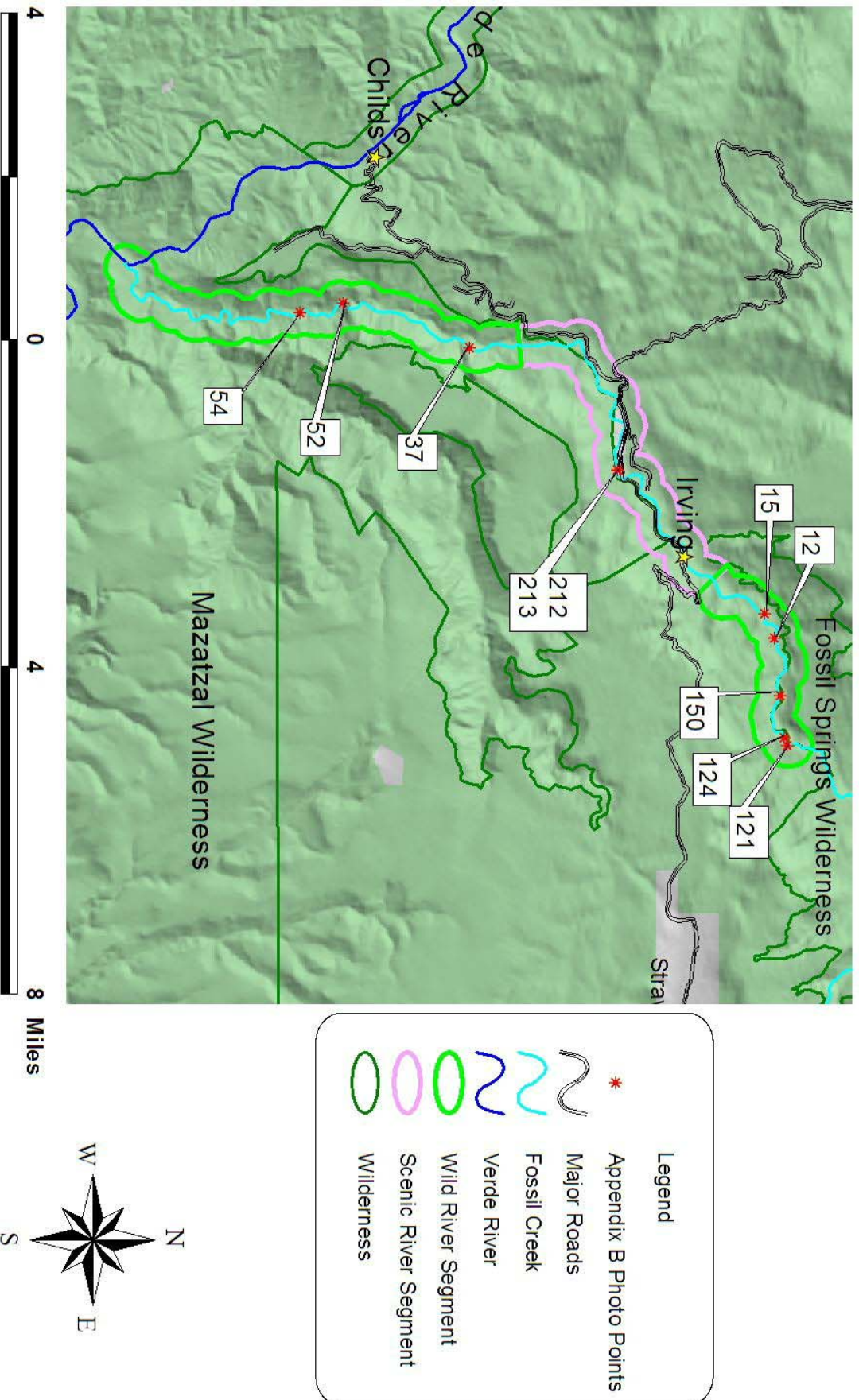


Photo 43 Narrow gorge in the middle canyon



Photo 33 Cutbank

Photo Locations for Appendix B Ecology/Vegetation



Appendix B Ecology/Vegetation



Photo 121 Riparian overhanging creek



Photo 124 Dense riparian trees along creek



Photo 15



Photo 212 Riparian canopy



Photo 12



Photo 52 Lush vegetation overhanging creek



Photo 37 Old sycamores growing on the floodplain



Photo 150 Lush riparian corridor surrounded by pinyon/juniper complex



Photo 213 Vegetation



Photo 54 Riparian canopy

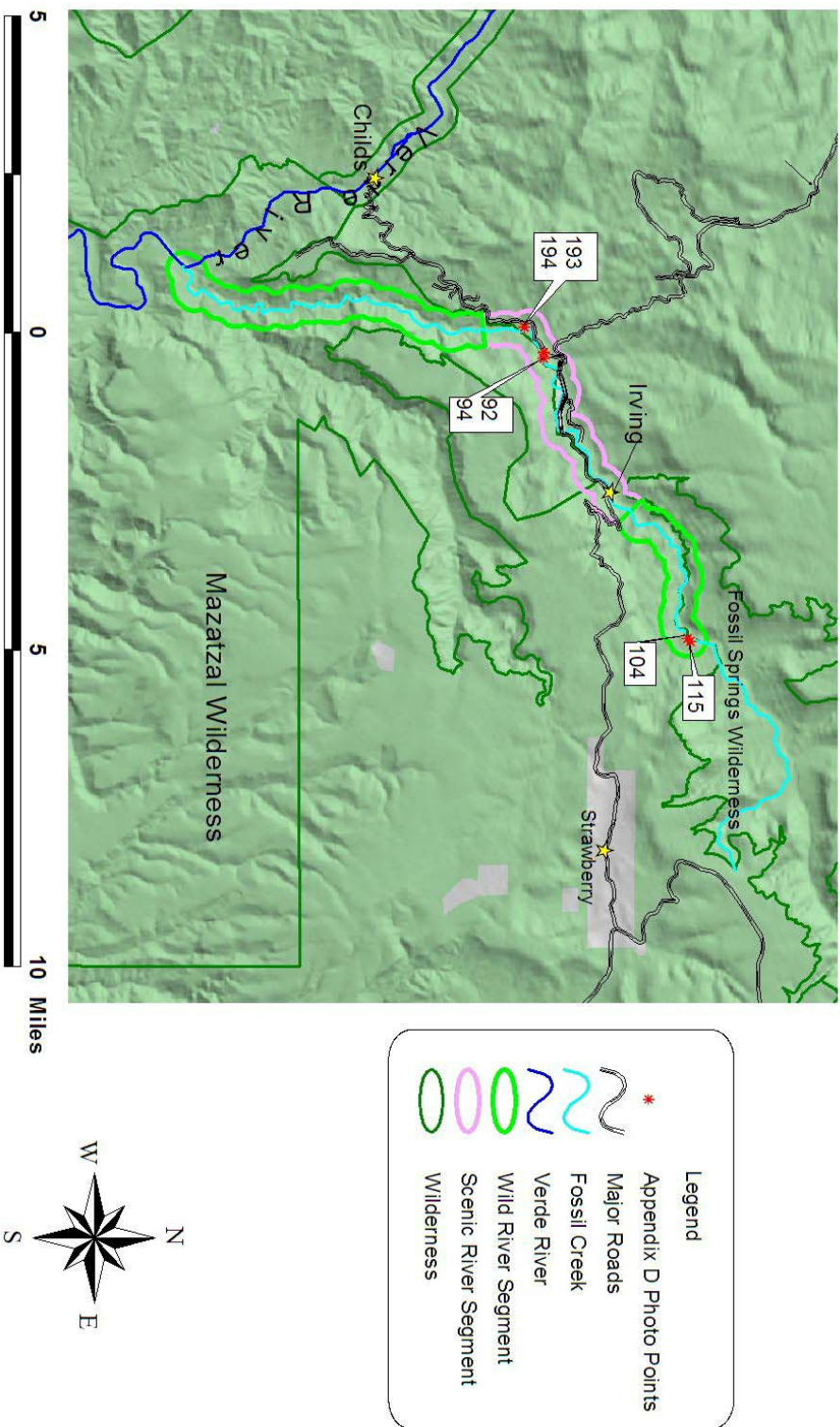
Appendix C Cultural: archeological sites





(Map not included to protect the location of these sites)

Photo Locations for Appendix D Recreation/Campsites



Appendix D Recreation- camp sites



Photo 115



Photo 104



Photo 92



Photo 94

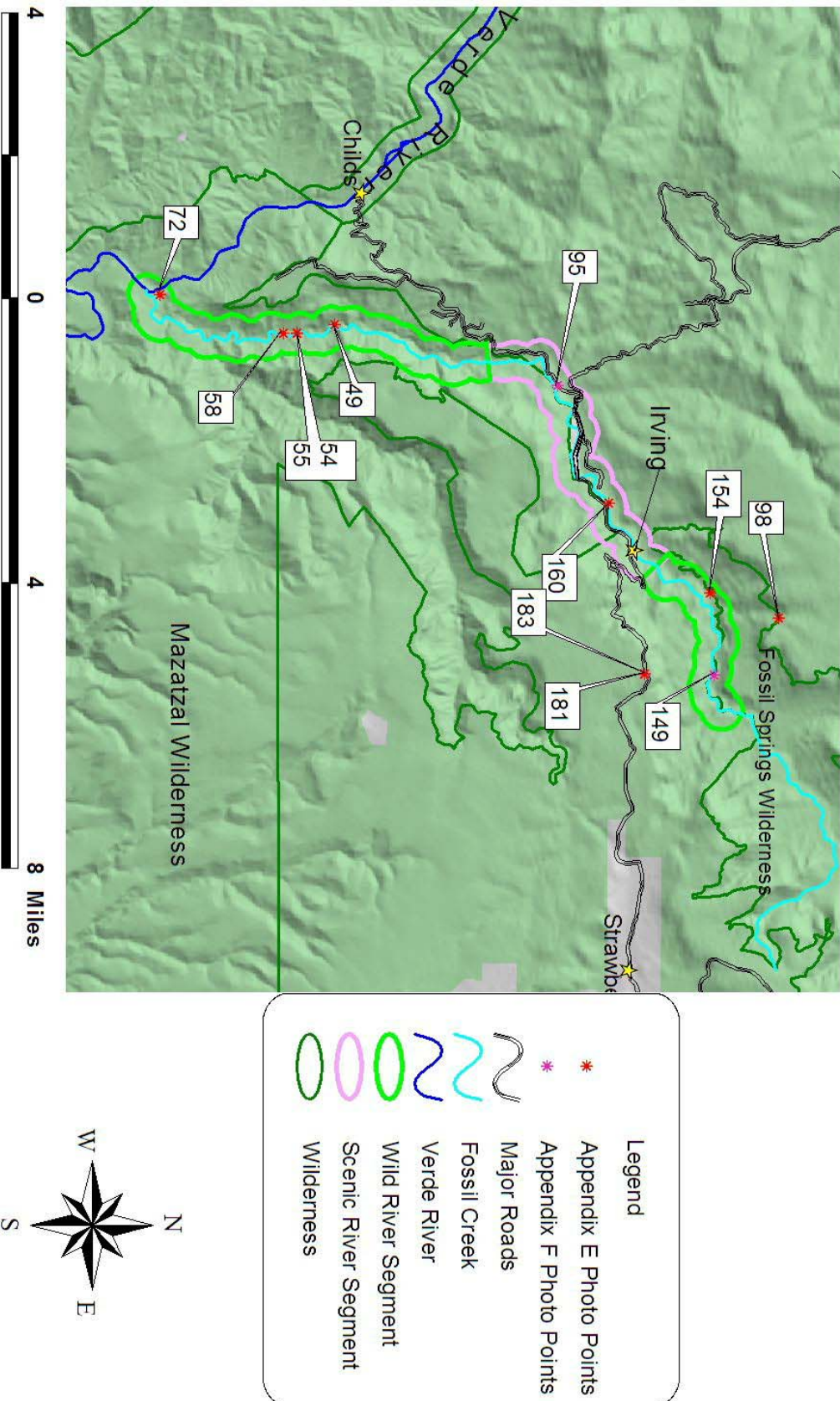


Photo 193



Photo 194

Photo Locations for Appendix E and F Scenic and Developments



Appendix E Scenic



Photo 98



Photo 154



Photo 181



Photo 160



Photo 49



Photo 58

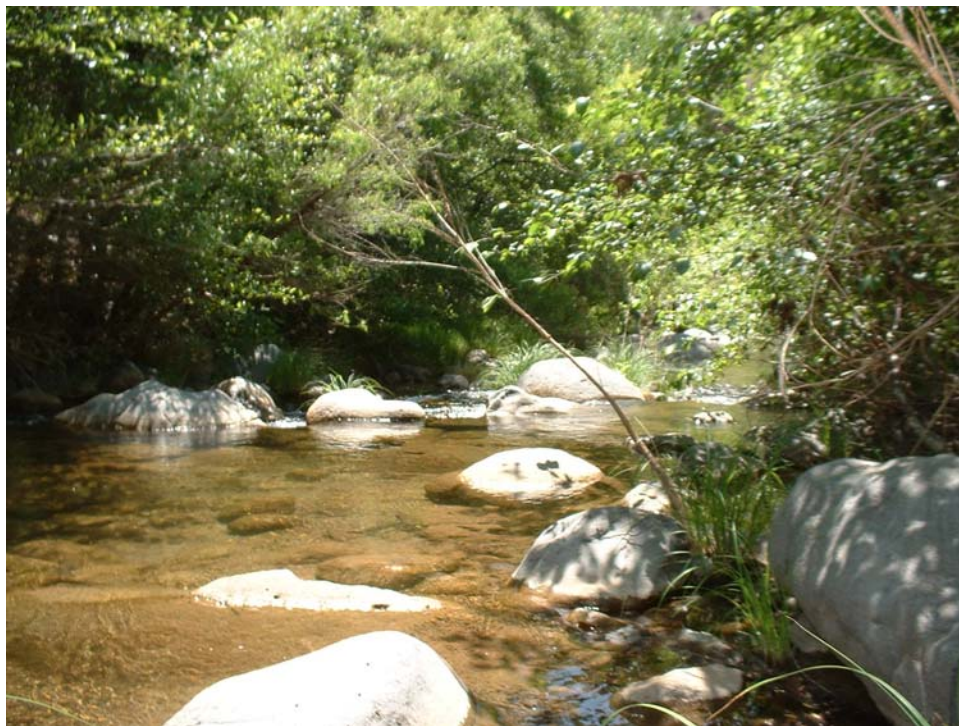


Photo 55



Photo 54



Photo 72

Appendix F Development along Fossil Creek



Photo 149 The flume- transporting water to Irving



Photo 95 Forest Road- 502 and dispersed camping road to the right



Photo 183 Overlooking the Irving facilities

Appendix G

STATUS DEFINITIONS ARIZONA GAME AND FISH DEPARTMENT (AGFD) HERITAGE DATA MANAGEMENT SYSTEM (HDMS)

FEDERAL US STATUS

ESA Endangered Species Act (1973 as amended)
US Department of Interior, Fish and Wildlife Service (<http://arizonaes.fws.gov>)

Listed

- LE** Listed Endangered: imminent jeopardy of extinction.
- LT** Listed Threatened: imminent jeopardy of becoming Endangered.
- XN** Experimental Nonessential population.

Proposed for Listing

- PE** Proposed Endangered.
- PT** Proposed Threatened.

Candidate (Notice of Review: 1999)

- C** Candidate. Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list as Endangered or Threatened under ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.
- SC** Species of Concern. The terms "Species of Concern" or "Species at Risk" should be considered as terms-of-art that describe the entire realm of taxa whose conservation status may be of concern to the US Fish and Wildlife Service, but neither term has official status (currently all former C2 species).

Critical Habitat (check with state or regional USFWS office for location details)

- Y** Yes: Critical Habitat has been designated.
- P** Proposed: Critical Habitat has been proposed.

[\NNo Status: certain populations of this taxon do not have designated status (check with state or regional USFWS office for details about which populations have designated status)].

USFS US Forest Service (1999 Animals, 1999 Plants: corrected 2000)
US Department of Agriculture, Forest Service, Region 3 (<http://www.fs.fed.us/r3/>)

- S** Sensitive: those taxa occurring on National Forests in Arizona which are considered sensitive by the Regional Forester.

BLM US Bureau of Land Management (2000 Animals, 2000 Plants)

US Department of Interior, Bureau of Land Management, Arizona State Office
(<http://azwww.blm.gov>)

- S** Sensitive: those taxa occurring on BLM Field Office Lands in Arizona which are considered sensitive by the Arizona State Office.
- P** Population: only those populations of Banded Gila monster (*Heloderma suspectum cinctum*) that occur north and west of the Colorado River, are considered sensitive by the Arizona State Office.

TRIBAL STATUS

NESL Navajo Endangered Species List (2000)

Navajo Nation, Navajo Fish and Wildlife Department

(<http://www.heritage.tnc.org/nhp/us/navajo/esl.html>)

The Navajo Endangered Species List contains taxa with status from the entire Navajo Nation which includes parts of Arizona, Utah, and New Mexico. In this notebook we provide NESL status for only those taxa whose distribution includes part or all of the Arizona portion of the Navajo Nation.

Groups

- 1** Those species or subspecies that no longer occur on the Navajo Nation.
- 2** Any species or subspecies which is in danger of being eliminated from all or a significant portion of its range on the Navajo Nation.
- 3** Any species or subspecies which is likely to become an endangered species, within the foreseeable future, throughout all or a significant portion of its range on the Navajo Nation.
- 4** Any species or subspecies for which the Navajo Fish and Wildlife Department (NF&WD) does not currently have sufficient information to support their being listed in Group 2 or Group 3 but has reason to consider them. The NF&WD will actively seek information on these species to determine if they warrant inclusion in a different group or removal from the list.

MEXICAN STATUS

MEX Mexican Federal Endangered Species List (October 16, 2000)

Proyecto de Norma Oficial Mexicana PROY-NOM-059-ECOL-2000

The Mexican Federal Endangered Species List contains taxa with status from the entire Mexican Republic and waters under its jurisdiction. In this notebook we provide MEX designations for only those taxa occurring in Arizona and also in Mexico.

- P** En Peligro de Extinción (Determined Endangered in Mexico): in danger of extinction.
- A** Amenazada (Determined Threatened in Mexico): could become endangered if factors causing habitat deterioration or population decline continue.
- Pr** Sujeta a Protección Especial (Determined Subject to Special Protection in Mexico): utilization limited due to reduced populations, restricted distribution, or to favor recovery and conservation of the taxon or associated taxa.

E Probablemente extinta en el medio silvestre (Probably extinct in the wild of Mexico): A native species whose individuals in the wild have disappeared, based on pertinent documentation and studies that prove it. The only existing individuals of the species are in captivity or outside the Mexican territory.

[|= One or more subspecies of this species has status in Mexico, but the HDMS does not track it at the subspecies level (most of these subspecies are endemic to Mexico). Please consult the NORMA Oficial Mexicana PROY-NOM-059-ECOL-2000 for details.]

STATE STATUS

NPL Arizona Native Plant Law (1999)
Arizona Department of Agriculture
(<http://agriculture.state.az.us/PSD/nativeplants.htm>)

HS Highly Safeguarded: no collection allowed.
SR Salvage Restricted: collection only with permit.
ER Export Restricted: transport out of State prohibited.
SA Salvage Assessed: permits required to remove live trees.
HR Harvest Restricted: permits required to remove plant by-products.

WSCA Wildlife of Special Concern in Arizona (in prep)
Arizona Game and Fish Department (<http://www.azgfd.com>)

WSC Wildlife of Special Concern in Arizona. Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the Arizona Game and Fish Department's listing of Wildlife of Special Concern in Arizona (WSCA, in prep). Species indicated on printouts as WSC are currently the same as those in **Threatened Native Wildlife in Arizona** (1988).

Revised 8/14/02, AGFD HDMS
J:\HDMS\DOCUMENT\NBOOKS\TEMPLATE\EORDEF\STATDEF

Species in the HDMS Documented within the Fossil Creek WSR

NAME	COMMON NAME	ESA	BLM	USFS	WSCA	NPL
<i>Agosia chrysogaster</i>	Longfin Dace	SC	S			
<i>Catostomus clarki</i>	Desert Sucker	SC	S			
<i>Catostomus insignis</i>	Sonora Sucker	SC	S			
<i>Gila nigra</i>	Headwater Chub					
<i>Gila robusta</i>	Roundtail Chub	SC		S	WSC	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	LT		S	WSC	
<i>Hyla eximia</i>	Mountain Treefrog					
<i>Nyctinomops femorosaccus</i>	Pocketed Free-tailed Bat		S			
<i>Pyrgulopsis simplex</i>	Fossil Springsnail	SC	S	S		
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog	LT		S	WSC	
<i>Rana yavapaiensis</i>	Lowland Leopard Frog	SC		S	WSC	
<i>Rhinichthys osculus</i>	Speckled Dace	SC	S			
<i>Triteleia lemmoniae</i>	Mazatzal Triteleia					SR
<i>Xyrauchen texanus</i>	Razorback Sucker	LE		S	WSC	

Critical Habitats for the spikedace, loach minnow, and razorback sucker in Fossil Creek.

Arizona Game and Fish Department, Heritage Data Management System, November 17, 2003.

Appendix H

Field data- Photoform

All Photos can be accessed from included CD by referencing the last 8 characters in the photo_path column and looking in the Photo folder on the included CD. This table has been imported into Arcview GIS to create points/ shapefile that show the photo locations, the photos have been hot linked and can be viewed by using this tool in Arcview. It is the hope of the author that this data can now serve as a reference point for future studies and comparisons when full flows are restored to Fossil Creek.

<u>photo_id</u>	<u>photo_dir</u>	<u>easting</u>	<u>northing</u>	<u>photo_path</u>	<u>description</u>
1	N	447399	3809148	C:\GIS\fossilcrk\photos\03051704.TIF	one of fossil springs along trail
2	S	447436	3809111	C:\GIS\fossilcrk\photos\03051705.TIF	waterfall and pool at springs
3	E	447436	3808998	C:\GIS\fossilcrk\photos\03051706.TIF	springs area canopy
4	E	447121	3808835	C:\GIS\fossilcrk\photos\03051707.TIF	dam
5	E	447089	3808763	C:\GIS\fossilcrk\photos\03051710.TIF	cave, pool, algea,cliff
6	W	446886	3808695	C:\GIS\fossilcrk\photos\03051711.TIF	travertine ledge, pool
7	SE	446646	3808634	C:\GIS\fossilcrk\photos\03051712.TIF	basalt intrusion through limestone
8	N	446646	3808634	C:\GIS\fossilcrk\photos\03051713.TIF	travertine boulder, sycamore
9	NE	445562	3808613	C:\GIS\fossilcrk\photos\03051714.TIF	alluvium floodline
10	NE	445562	3808613	C:\GIS\fossilcrk\photos\03051715.TIF	canyon wall,rim, dry creekbed
11	NE	445562	3808613	C:\GIS\fossilcrk\photos\03051716.TIF	flume debris in creekbed
12	W	445313	3808801	C:\GIS\fossilcrk\photos\03051717.TIF	lush vegetation tunnel canopy
13	S	445313	3808801	C:\GIS\fossilcrk\photos\03051718.TIF	small clear pool, minnows
14	NE	444825	3808617	C:\GIS\fossilcrk\photos\03051719.TIF	large sycamore
15	SW	444825	3808617	C:\GIS\fossilcrk\photos\03051720.TIF	floodplain dense vegetation
16	N	444447	3808102	C:\GIS\fossilcrk\photos\03051722.TIF	floodplain, canyon wall
17	N	444458	3807751	C:\GIS\fossilcrk\photos\03051723.TIF	large pool circled by cliffs
18	NE	444457	3807354	C:\GIS\fossilcrk\photos\03051724.TIF	bedrock creekbed
19	E	444004	3807354	C:\GIS\fossilcrk\photos\03051727.TIF	cottonwood, canyonwall,skyline
20	SE	444004	3807354	C:\GIS\fossilcrk\photos\03051728.TIF	canyonwall roadcut halfway
21	S	442120	3805812	C:\GIS\fossilcrk\photos\03051729.TIF	bridge, people on floats
22	E	440657	3805700	C:\GIS\fossilcrk\photos\03051831.TIF	creek dropping over falls, bouldergarden
23	W	440657	3805700	C:\GIS\fossilcrk\photos\03051832.TIF	vegetation overhanging creek
24	S	440657	3805700	C:\GIS\fossilcrk\photos\03051733.TIF	debris pile left bank
25	SE	440310	3805360	C:\GIS\fossilcrk\photos\03051834.TIF	waterfall, channel, dense vegetation
26	NE	440310	3805360	C:\GIS\fossilcrk\photos\03051835.TIF	floodplain
27	SW	440310	3805360	C:\GIS\fossilcrk\photos\03051836.TIF	riparian, scrub interface
28	NE	440265	3805357	C:\GIS\fossilcrk\photos\03051837.TIF	clear pool camp on beach
29	NE	439040	3805272	C:\GIS\fossilcrk\photos\03051838.TIF	scenic ridgeline, camping access road
30	W	439714	3805104	C:\GIS\fossilcrk\photos\03051839.TIF	deep pool, bedrock, tall cottonwood, ridge
31	E	439714	3805104	C:\GIS\fossilcrk\photos\03051840.TIF	basalt bedrock narrow, ridgeline
32	E	439493	3805104	C:\GIS\fossilcrk\photos\03051841.TIF	campsite, neil
33	W	439493	3805104	C:\GIS\fossilcrk\photos\03051842.TIF	limestone cutbank
34	NE	439515	3803037	C:\GIS\fossilcrk\photos\03051843.TIF	vegetaion and right bank
35	SW	439515	3803037	C:\GIS\fossilcrk\photos\03051844.TIF	basalt, conglomerate cliff, vegetation
36	E	439580	3802830	C:\GIS\fossilcrk\photos\03051845.TIF	cliff, pool
37	E	439583	3802830	C:\GIS\fossilcrk\photos\03051846.TIF	lush riparian, sycamore floodplain
38	W	439497	3802730	C:\GIS\fossilcrk\photos\03051847.TIF	spring and grasses

<u>photo id</u>	<u>photo dir</u>	<u>easting</u>	<u>northing</u>	<u>photo path</u>	<u>description</u>
39 SW		439497	3802730	C:\GIS\fossilcrk\photos\03051848.TIF	boulder creek, veg on banks, cliff in distance
40 NW		439418	3802270	C:\GIS\fossilcrk\photos\03051849.TIF	channel, sycamore grove, floodplain
41 S		439163	3801920	C:\GIS\fossilcrk\photos\03051850.TIF	rattlesnake
42 SE		439090	3801817	C:\GIS\fossilcrk\photos\03051851.TIF	steep canyon wall, cliffband
43 SW		439094	3801813	C:\GIS\fossilcrk\photos\03051852.TIF	cliff, bouldergarden in creek narrows
44 NE		439094	3801813	C:\GIS\fossilcrk\photos\03051853.TIF	boulders shaded narrows
45 NW		438730	3800320	C:\GIS\fossilcrk\photos\03051855.TIF	pointed knoll, looking towards the pocket
46 SE		438730	3800320	C:\GIS\fossilcrk\photos\03051856.TIF	scrub ridge, riparian canopy
47 S		438730	3800320	C:\GIS\fossilcrk\photos\03051857.TIF	tall basalt cliffs and scrub
48 SW		438730	3800320	C:\GIS\fossilcrk\photos\03051858.TIF	cactus and shrubs foreground, canyon wall
49 NE		438703	3800346	C:\GIS\fossilcrk\photos\03051860.TIF	ridge canyon wall
50 S		438703	3800346	C:\GIS\fossilcrk\photos\03051861.TIF	canopy, cliff
51 W		438703	3800346	C:\GIS\fossilcrk\photos\03051962.TIF	floodplain surrounded by veg
52 S		438703	3800346	C:\GIS\fossilcrk\photos\03051963.TIF	lush vegetation tunnel over creek
53 N		438703	3800346	C:\GIS\fossilcrk\photos\03051964.TIF	dense vegetation
54 NW		438894	3799489	C:\GIS\fossilcrk\photos\03051965.TIF	canyon slope, boulder falls, vegetation
55 S		438894	3799489	C:\GIS\fossilcrk\photos\03051967.TIF	right bank veg. Creek
56 E		438889	3799178	C:\GIS\fossilcrk\photos\03051969.TIF	left bank grasses, creek boulders
57 NE		438889	3799178	C:\GIS\fossilcrk\photos\03051970.TIF	upstream ridge in distance boulder in creek
58 S		438889	3799178	C:\GIS\fossilcrk\photos\03051971.TIF	ridge riparian and creek
59 SW		439064	3798812	C:\GIS\fossilcrk\photos\03051973.TIF	veg. Over hanging right bank clear water
60 W		439062	3798226	C:\GIS\fossilcrk\photos\03051974.TIF	large pool cattails, scrub ridge
61 E		439062	3798226	C:\GIS\fossilcrk\photos\03051975.TIF	creek widens overgrown by veg.
62 E		438892	3797970	C:\GIS\fossilcrk\photos\03051976.TIF	deep pool sandstone on right
63 SW		439019	3797402	C:\GIS\fossilcrk\photos\03051977.TIF	grassy areas channels merging
64 NE		439019	3797402	C:\GIS\fossilcrk\photos\03051978.TIF	cliff band, reeds
65 NE		438665	3796800	C:\GIS\fossilcrk\photos\03051979.TIF	boulder floodplain, veg, ridge in distance
66 SE		438665	3796800	C:\GIS\fossilcrk\photos\03051980.TIF	willow, grasses, creek dropping
67 S		438665	3796800	C:\GIS\fossilcrk\photos\03051981.TIF	boulders, creek, willows
68 NE		437938	3796076	C:\GIS\fossilcrk\photos\03051982.TIF	conglomerate, upstream from confluence
69 NW		437938	3796076	C:\GIS\fossilcrk\photos\03051983.TIF	Verde confluence
70 NE		437952	3796075	C:\GIS\fossilcrk\photos\03051984.TIF	upstream at confluence
71 SE		437952	3796075	C:\GIS\fossilcrk\photos\03051985.TIF	conglomerate at confluence
72 NE		438026	3796380	C:\GIS\fossilcrk\photos\03051986.TIF	view of lower Fossil canyon
73 N		438026	3796380	C:\GIS\fossilcrk\photos\03051987.TIF	lower Fossil Canyon
74 N		438026	3796380	C:\GIS\fossilcrk\photos\03051988.TIF	prickly pear blooming
75 NE		442120	3805850	C:\GIS\fossilcrk\photos\03052089.TIF	deep pool near bridge
76 N		444413	3808120	C:\GIS\fossilcrk\photos\03052090.TIF	travertine
77 N		443621	3807110	C:\GIS\fossilcrk\photos\03052091.TIF	travertine from flume runoff
78 N		443621	3807110	C:\GIS\fossilcrk\photos\03052092.TIF	travertine from flume runoff
79 NW		444456	3808083	C:\GIS\fossilcrk\photos\03053002.TIF	travertine stalactites in cave
80 NE		444456	3808083	C:\GIS\fossilcrk\photos\03053003.TIF	travertine in cave
81 MW		444456	3808083	C:\GIS\fossilcrk\photos\03053005.TIF	travertine in cave
82 N		444456	3808083	C:\GIS\fossilcrk\photos\03053006.TIF	tavertine deposit over basalt
83 N		444466	3808079	C:\GIS\fossilcrk\photos\03053007.TIF	horizontal travertine deposit
84 NE		444450	3808084	C:\GIS\fossilcrk\photos\03053008.TIF	travertine cave

<u>photo id</u>	<u>photo dir</u>	<u>easting</u>	<u>northing</u>	<u>photo path</u>	<u>description</u>
85 N		444457	3808080	C:\GIS\fossilcrk\photos\03053009.TIF	travertine fossils
86 N		444457	3808080	C:\GIS\fossilcrk\photos\03053011.TIF	travertine fossils
87 S		444457	3808080	C:\GIS\fossilcrk\photos\03053012.TIF	rattlesnake
88 SE		440312	3805390	C:\GIS\fossilcrk\photos\03053015.TIF	veg canopy
89 E		440312	3805390	C:\GIS\fossilcrk\photos\03053016.TIF	cutbank, canyon wall
90 W		440269	3805410	C:\GIS\fossilcrk\photos\03053017.TIF	livestock coral
91 N		440269	3805410	C:\GIS\fossilcrk\photos\03053018.TIF	camp road, livestock fencing
92 SW		440267	3805373	C:\GIS\fossilcrk\photos\03053019.TIF	campsite and road
93 N		440188	3805361	C:\GIS\fossilcrk\photos\03053020.TIF	road accessible campsite
94 S		440124	3805351	C:\GIS\fossilcrk\photos\03053021.TIF	road accessible campsite
95 E		440063	3805361	C:\GIS\fossilcrk\photos\03053022.TIF	FR502 and dispersed camping road
96 E		440020	3805538	C:\GIS\fossilcrk\photos\03053023.TIF	canyonwall
97 SE		439890	3805190	C:\GIS\fossilcrk\photos\03053026.TIF	pool and smooth boulders
98 SW		445322	3810369	C:\GIS\fossilcrk\photos\00000001.TIF	overlooking canyon riparian
99 SW		446591	3808916	C:\GIS\fossilcrk\photos\00000002.TIF	overlooking riparian ridgeline, tan slope
100 SE		447120	3808892	C:\GIS\fossilcrk\photos\00000003.TIF	campsite near springs, firering, logs
101 S		447132	3809024	C:\GIS\fossilcrk\photos\00000004.TIF	riparian canopy, pinyon/juniper ridge
102 SW		449261	3809046	C:\GIS\fossilcrk\photos\00000005.TIF	blackberries and groundcover at springs
103 SE		449261	3809046	C:\GIS\fossilcrk\photos\00000006.TIF	trees, vines boulders, creek
104 SE		447369	3809078	C:\GIS\fossilcrk\photos\00000007.TIF	campsite, firering at springs
105 S		447399	3809077	C:\GIS\fossilcrk\photos\00000008.TIF	campsite
106 N		447399	3809077	C:\GIS\fossilcrk\photos\00000009.TIF	campsite
107 N		447391	3809142	C:\GIS\fossilcrk\photos\00000010.TIF	springs along trail
108 E		447391	3809142	C:\GIS\fossilcrk\photos\00000011.TIF	channel from springs calm pool
109 W		447415	3809202	C:\GIS\fossilcrk\photos\00000012.TIF	drainage upstream of springs
110 S		447415	3809202	C:\GIS\fossilcrk\photos\00000013.TIF	small springs on right large boulder, down tree
111 N		447440	3809149	C:\GIS\fossilcrk\photos\00000014.TIF	channel, falls, large sycamore
112 N		447443	3809104	C:\GIS\fossilcrk\photos\00000015.TIF	pool, 2 channels merging, lush veg.
113 S		447443	3809104	C:\GIS\fossilcrk\photos\00000016.TIF	falls into large pool at springs
114 N		447414	3809063	C:\GIS\fossilcrk\photos\00000017.TIF	falls, ledge, pool roots
115 S		447467	3809138	C:\GIS\fossilcrk\photos\00000018.TIF	campsite trampled firerings
116 N		447425	3809050	C:\GIS\fossilcrk\photos\00000019.TIF	large pool at springs
117 SW		447427	3809047	C:\GIS\fossilcrk\photos\00000020.TIF	hanging garden on right creek dropping
118 W		447427	3809047	C:\GIS\fossilcrk\photos\00000021.TIF	right bank lush groundcover
119 NE		447428	3809052	C:\GIS\fossilcrk\photos\00000022.TIF	spring gushing from right bank
120 N		447428	3809052	C:\GIS\fossilcrk\photos\00000023.TIF	spring close up gushing from bank
121 W		447428	3809052	C:\GIS\fossilcrk\photos\00000024.TIF	overhanging veg. Spring on right
122 N		447357	3809023	C:\GIS\fossilcrk\photos\00000025.TIF	rasberries tree overhanging pool
123 NW		447262	3809005	C:\GIS\fossilcrk\photos\00000026.TIF	spring
124 E		447262	3809005	C:\GIS\fossilcrk\photos\00000027.TIF	pool, lush veg.
125 NW		447154	3808948	C:\GIS\fossilcrk\photos\00000028.TIF	pool, large boulder
126 NW		447154	3808948	C:\GIS\fossilcrk\photos\00000029.TIF	sedimentary above
127 SW		447154	3808948	C:\GIS\fossilcrk\photos\00000030.TIF	lush veg, calm channel
128 NW		447150	3808100	C:\GIS\fossilcrk\photos\00000031.TIF	pool beyond dam
129 NW		447150	3808100	C:\GIS\fossilcrk\photos\00000032.TIF	dam
130 N		447150	3808100	C:\GIS\fossilcrk\photos\00000033.TIF	pool below dam

<u>photo_id</u>	<u>photo_dir</u>	<u>easting</u>	<u>northing</u>	<u>photo_path</u>	<u>description</u>
131 NW		447150	3808100	C:\GIS\fossilcrk\photos\00000034.TIF	pool
132 SE		447105	3808774	C:\GIS\fossilcrk\photos\00000035.TIF	cave, pool, travertine
133 N		447105	3808774	C:\GIS\fossilcrk\photos\00000036.TIF	cave, pool, travertine
134 N		447105	3808774	C:\GIS\fossilcrk\photos\00000037.TIF	cave, pool, travertine
135 S		447105	3808774	C:\GIS\fossilcrk\photos\00000038.TIF	travertine on streambed
136 S		446998	3808731	C:\GIS\fossilcrk\photos\00000039.TIF	travertine ledge
137 W		446998	3808731	C:\GIS\fossilcrk\photos\00000040.TIF	travertine boulder in calm pool
138 N		446887	3808690	C:\GIS\fossilcrk\photos\00000041.TIF	travertine ledge, grasses
139 NE		446887	3808690	C:\GIS\fossilcrk\photos\00000042.TIF	travertine deposits
140 NW		446887	3808690	C:\GIS\fossilcrk\photos\00000043.TIF	large travertine wall, pool beneath
141 S		446887	3808690	C:\GIS\fossilcrk\photos\00000044.TIF	travertine above red sandstone
142 N		446800	3808668	C:\GIS\fossilcrk\photos\00000045.TIF	weathered travertine
143 SW		446742	3808663	C:\GIS\fossilcrk\photos\00000047.TIF	calm water, veg.
144 N		446742	3808663	C:\GIS\fossilcrk\photos\00000048.TIF	large sycamore, veg background
145 W		446673	3808648	C:\GIS\fossilcrk\photos\00000049.TIF	travertine, trunk on right
146 SW		446647	3808620	C:\GIS\fossilcrk\photos\00000050.TIF	travertine, tree above
147 SW		446647	3808620	C:\GIS\fossilcrk\photos\00000051.TIF	travertine, prickly pear
148 E		446777	3808707	C:\GIS\fossilcrk\photos\00000053.TIF	riparian canopy, sandstone ridge
149 NE		446617	3808893	C:\GIS\fossilcrk\photos\00000055.TIF	flume, canopy
150 SE		446432	3808929	C:\GIS\fossilcrk\photos\00000056.TIF	limestone rim, riparian slopes into canyon
151 S		446432	3808929	C:\GIS\fossilcrk\photos\00000057.TIF	pinyon/juniper canyon slope
152 S		446157	3808810	C:\GIS\fossilcrk\photos\00000058.TIF	canyon rim, drainage
153 SE		445624	3809060	C:\GIS\fossilcrk\photos\00000059.TIF	scenic view of upper canyon
154 NE		444769	3808810	C:\GIS\fossilcrk\photos\00000060.TIF	upper canyon
155 N		444231	3808336	C:\GIS\fossilcrk\photos\00000061.TIF	left canyon wall
156 N		443242	3806605	C:\GIS\fossilcrk\photos\00000062.TIF	small falls, cattails, bare overhanging branches
157 NE		443149	3806562	C:\GIS\fossilcrk\photos\00000063.TIF	falls, large pool, cattails
158 NE		442864	3806549	C:\GIS\fossilcrk\photos\00000064.TIF	falls over travertine dam
159 N		442739	3806519	C:\GIS\fossilcrk\photos\00000065.TIF	tri-falls grasses, dense veg.
160 NW		442739	3806519	C:\GIS\fossilcrk\photos\00000066.TIF	falls into pool
161 NE		442716	3806517	C:\GIS\fossilcrk\photos\00000067.TIF	large pool, basalt and flume
162 N		442591	3806438	C:\GIS\fossilcrk\photos\00000068.TIF	travertine ledge deposit into deep pool
163 S		442591	3806438	C:\GIS\fossilcrk\photos\00000069.TIF	closeup of travertine dam
164 N		442591	3806438	C:\GIS\fossilcrk\photos\00000070.TIF	steep stream bank, falls, pool
165 W		442510	3806331	C:\GIS\fossilcrk\photos\00000073.TIF	close up of current and travertine
166 N		442514	3806331	C:\GIS\fossilcrk\photos\00000074.TIF	sequence of travertine pools, lush veg.
167 E		442268	3806194	C:\GIS\fossilcrk\photos\00000075.TIF	travertine veins, boulder on left, lush veg.
168 W		442268	3806194	C:\GIS\fossilcrk\photos\00000076.TIF	veg overhanging smooth water
169 N		442237	3806211	C:\GIS\fossilcrk\photos\00000078.TIF	travertine dam
170 W		442237	3806211	C:\GIS\fossilcrk\photos\00000079.TIF	large trunk, shaded creek
171 SW		442073	3806050	C:\GIS\fossilcrk\photos\00000080.TIF	debris pile swift current
172 SE		442073	3806050	C:\GIS\fossilcrk\photos\00000081.TIF	trees overhanging stream gradient
173 NW		442073	3806050	C:\GIS\fossilcrk\photos\00000082.TIF	sequence of travertine pools
174 S		442096	3805968	C:\GIS\fossilcrk\photos\00000083.TIF	calm water surrounded by trees
175 NE		442718	3806511	C:\GIS\fossilcrk\photos\00000090.TIF	overlooking riparian, basalt cliffs on slope

176 E	440476	3805792	C:\GIS\fossilcrk\photos\00000093.TIF	canyon wall sloping into riparian, prickly pear	
<u>photo id</u>	<u>photo dir</u>	<u>easting</u>	<u>northing</u>	<u>photo path</u>	<u>description</u>
177 S	440476	3805792	C:\GIS\fossilcrk\photos\00000094.TIF	overlooking riparian canopy	
178 SE	439887	3805204	C:\GIS\fossilcrk\photos\00000098.TIF	pool, rope swing, basalt	
179 NW	446996	3807274	C:\GIS\fossilcrk\photos\00000100.TIF	travertine ledge at springs area, north rim	
180 N	446929	3807290	C:\GIS\fossilcrk\photos\00000101.TIF	travertine ledge at springs and view north	
181 NW	446580	3807340	C:\GIS\fossilcrk\photos\00000102.TIF	overlooking canyon, flume along wall	
182 NW	446580	3807340	C:\GIS\fossilcrk\photos\00000104.TIF	drainage canopy, steep canyon wall	
183 W	446580	3807340	C:\GIS\fossilcrk\photos\00000105.TIF	view of Fossil canyon and distant ridges	
184 E	444635	3806814	C:\GIS\fossilcrk\photos\00000106.TIF	sandstone slopes into riparian bottom	
185 N	444635	3806814	C:\GIS\fossilcrk\photos\00000107.TIF	view of Irving facilities	
186 SW	440064	3805308	C:\GIS\fossilcrk\photos\00000110.TIF	creek through lush narrow veg.	
187 E	439798	3805097	C:\GIS\fossilcrk\photos\00000111.TIF	creek, basalt banks, veg.	
188 W	439743	3805114	C:\GIS\fossilcrk\photos\00000112.TIF	narrow, basalt banks creek, dense riparian	
189 W	439607	3805102	C:\GIS\fossilcrk\photos\00000113.TIF	line of boulders, dense veg slopes	
190 NW	439543	3805011	C:\GIS\fossilcrk\photos\00000116.TIF	dense grasses	
191 N	439416	3804870	C:\GIS\fossilcrk\photos\00000121.TIF	deep pool, cutbank	
192 N	439487	3804870	C:\GIS\fossilcrk\photos\00000122.TIF	creek dropping over boulders	
193 NE	439487	3804870	C:\GIS\fossilcrk\photos\00000123.TIF	campsite, firerig livetree cutting	
194 E	439487	3804870	C:\GIS\fossilcrk\photos\00000124.TIF	camping area impact	
195 N	439538	3804671	C:\GIS\fossilcrk\photos\00000128.TIF	floodplain, boulders, large trees	
196 NE	439538	3804671	C:\GIS\fossilcrk\photos\00000129.TIF	camp on beech, pool, overhanging trees	
197 SE	439526	3804577	C:\GIS\fossilcrk\photos\00000130.TIF	cutbank	
198 SE	439470	3804348	C:\GIS\fossilcrk\photos\00000132.TIF	cutbank, canyon wall	
199 NE	439471	3804320	C:\GIS\fossilcrk\photos\00000134.TIF	pool, reeds, buterflies	
200 S	440226	3805300	C:\GIS\fossilcrk\photos\00000136.TIF	beech campsite, pool	
201 SW	440393	3805357	C:\GIS\fossilcrk\photos\00000139.TIF	sedimentary cutbank	
202 N	440440	3805550	C:\GIS\fossilcrk\photos\00000140.TIF	pool, small dam grasses, lush veg	
203 NE	440468	3805576	C:\GIS\fossilcrk\photos\00000141.TIF	pool, falls, overhanging veg.	
204 SE	440472	3805598	C:\GIS\fossilcrk\photos\00000142.TIF	debris piles against large logs	
205 W	440536	3805730	C:\GIS\fossilcrk\photos\00000143.TIF	debris pile floodplain	
206 NE	440536	3805730	C:\GIS\fossilcrk\photos\00000145.TIF	clear water, grass, steep bank	
207 SW	441029	3805779	C:\GIS\fossilcrk\photos\00000147.TIF	side channel falls	
208 NE	441725	3805717	C:\GIS\fossilcrk\photos\00000155.TIF	travertine dam, pool	
209 W	444617	3805658	C:\GIS\fossilcrk\photos\00000156.TIF	boulder, channel, veg	
210 NE	441617	3805658	C:\GIS\fossilcrk\photos\00000157.TIF	large pool behind travertine dam	
211 W	441725	3805717	C:\GIS\fossilcrk\photos\00000158.TIF	creek, large boulders, dense trees	
212 E	441997	3805726	C:\GIS\fossilcrk\photos\00000160.TIF	riparian treetops canyon rim	
213 SE	441997	3805726	C:\GIS\fossilcrk\photos\00000161.TIF	vegetation	
214 E	441997	3805726	C:\GIS\fossilcrk\photos\00000162.TIF	canopy, peak and ridge	
215 NE	442072	3805767	C:\GIS\fossilcrk\photos\00000163.TIF	series of travertine falls under tunnel canopy	
216 SE	442072	3805767	C:\GIS\fossilcrk\photos\00000164.TIF	side channel, falls, pool	
217 E	440960	3805880	C:\GIS\fossilcrk\photos\00000165.TIF	riparian canopy, canyon wall	
218 E	440478	3805780	C:\GIS\fossilcrk\photos\00000166.TIF	canyon, overlooking riparian	

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