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In Reply Refer To:

AESO/SE
2-21-00-F-364

August 22, 2000

MEMORANDUM

TO: Area Manager, Bureau of Reclamation, Phoenix, Arizona (Attn: Chief, Environmental Resource Management Division)

FROM: Field Supervisor

SUBJECT: Biological Opinion on Geological Field Investigations Association with Design of a Fish Barrier and Permanent Low-Water Crossing on Blue River, Arizona

This biological opinion responds to your request of July 7, 2000 for formal consultation pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended, on performance of geological field investigations to study feasibility of construction of a fish barrier and a permanent low-water road crossing on the lower Blue River, Greenlee County, Arizona. This is "phase II" of this barrier study, phase I having determined that potential barrier sites exist. Consultation began on July 10, the date your memorandum was received by this office.

The species of concern in this consultation are the threatened loach minnow (*Tiaroga cobitis*) and its critical habitat and the critical habitat for the threatened spikedace (*Meda fulgida*).

The following biological opinion is based on the information provided in the July 7, 2000 biological assessment (BA), the August 8, 2000 addendum to the BA, the February 1998 "phase I" report (USBR, 1998), data in our files and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern or other subjects considered in this opinion. A complete administrative record of this consultation is on file in this office.

CONSULTATION HISTORY

Phase II of the Blue River fish barrier feasibility and design study is being funded with money available under reasonable and prudent alternative 4 of the April 1994 biological opinion on the Central Arizona Project and its potential to introduce and spread nonnative aquatic species in the Gila River basin. Although the funding originates from an earlier biological opinion, that opinion does not cover actions taken using the funding. The Service has been closely involved in the effort to place fish barriers on the lower Blue River, and that involvement comprises the informal consultation on these field investigations.

The proposed action would be conducted by the Bureau of Reclamation, which has taken the role of lead agency for this consultation. The Forest Service, which manages the potential barrier and low-water crossing sites, in a letter of June 14, 2000, authorized Reclamation to act as lead in this consultation, which will cover the actions of both agencies. This biological opinion, including the incidental take statement, applies to both agencies, as appropriate under their differing authorities.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

The purpose of the project is to conduct preconstruction geological investigations at two potential fish barrier sites and a low-water crossing on the lower Blue River in Greenlee County, Arizona on the Clifton Ranger District of the Apache-Sitgreaves National Forests (figures 1, 2, and 3). The barrier sites (1 and 2) were identified during phase I of this project, which was funded by the Forest Service. The barriers are needed to prevent incursion of additional nonnative fish into the Blue River, which sustains a native fish community of six species. The Forest Service, Arizona Game and Fish Department, and Fish and Wildlife Service have identified the Blue River as a high priority site for restoration of native fish, including federally listed species. The low-water crossing on Forest Road (FR) 475 is proposed for improvement to minimize erosion. This crossing is also known as the Juan Miller or Stacy crossing.

Sites 1 and 2 are located on the Blue River about 0.7 miles upstream from its confluence with the San Francisco River (T.2S., R.31E., NW1/4 of SW1/4 of SW1/4 Sec. 31 and SW1/4 of NE1/4 of SW1/4 Sec. 31). Site 2 is approximately 2000 feet upstream from site 1. Additional information on these sites can be found in the 1998 phase I report (USBR, 1998).

Access to sites 1 and 2 requires vehicular use of Forest roads and tracks, and also of areas presently closed to such use. Forest road 212 leads from State highway 78 to the San Francisco River, and is steep and difficult in places, generally requiring four-wheel drive. After descending to the river at Martinez Ranch, FR 212 becomes a primitive track winding downstream about 1.5 miles along the San Francisco River valley bottom, crossing and recrossing the river to reach the mouth of the Blue River. At the Blue River, the river corridor is officially closed to vehicle use, both continuing down the San Francisco River and up the Blue River (figure 1). Prior to 1968, road use continued down the San Francisco River to Clifton, but at that time, the Forest Service issued a notice that the road was closed between the RU inholding on the San Francisco River (about 4.5 miles below the confluence with the Blue River) upstream to the mouth of the Blue and up the Blue River to the Smith Place on the upper part of the river. Thus, although access for sites 1 and 2 is mostly along existing authorized roadways, the last 0.7 miles would require driving along the Blue River canyon bottom, which is officially closed to vehicle use. In a May 1, 2000 letter to Reclamation, the Forest Service waived the closure to allow phase II of this barrier project to proceed. As a condition of that waiver, Reclamation will attempt to obliterate evidence of vehicular activity along the Blue River following completion of the phase II studies.

The FR 475 low-water crossing is located about 8 miles up the Blue River in T.2S., R.31E., NW1/4 Sec. 6. Construction of a fish barrier in conjunction with a road crossing was considered in phase I of this project, as was a barrier site (site 3) approximately 400 feet downstream of the road crossing. However, a barrier at this location would leave the lower one-fifth of the Blue River unprotected from nonnative fish; a situation not biologically desirable. Phase II investigations in this area are for the low-water crossing improvement only. Access to site 3 would be on FR 475 and all activity would be confined to the area already disturbed by the road and recreational activities adjacent to it. Additional information on the road crossing site can be found in the 1998 phase I report (USBR, 1998).

The investigative methods to be used would include surveying, backhoe pits, bedrock determination, and determination of abutment characteristics. The work would require four vehicles (an auger vehicle, a truck and trailer for the backhoe, a vehicle for the drillers, and a vehicle for the geologist). Work is expected to begin in late summer 2000 and extend for 2 weeks. The work would be in two 1-week phases, the first including augering and backhoe pits and the second surveying and abutment determinations.

Surveying would be conducted and wooden stakes placed. Survey information would be used to locate additional explorations, calculate hydrologic characteristics, and provide information for barrier and road crossing design.

The backhoe pits are to determine streambed materials at the potential sites for analysis regarding foundation conditions, erodibility, and suitability of on-site materials for construction. Backhoe pits would be dug across the transect of the potential barrier and at locations 50 and 100 feet downstream. The pits would reach a maximum depth of 15 feet, but would likely not exceed 5 feet due to subsurface water. They would be approximately 3 feet wide and 6 to 9 feet long. Two one-pound materials samples would be taken from each different stratum. The pits would be backfilled upon completion of work.

Depth to bedrock determinations would be conducted either by a geophysical survey across the potential barrier sites or by standard penetration tests using a drill rig, depending upon final design requirements. A geophysical survey uses geophones and a shotgun device or small explosive charges. Standard penetration tests would include at least two auger-holes with a driven sampler. Holes are anticipated to be about 50-feet deep. The holes would be backfilled upon completion of work.

Abutment characterization would be done through inspection by a geologist. No significant surface disturbance would occur.

II. STATUS OF THE SPECIES (Range-wide)

Loach Minnow

Loach minnow was listed as a threatened species on October 28, 1986 (USFWS, 1986a). Critical habitat was designated for loach minnow on March 8, 1994 (USFWS 1994a), but was set aside by order of the federal courts in Catron County Board of Commissioners, New Mexico V. U.S. Fish and Wildlife Service, CIV No. 93-730 HB (D.N.M., Order of October 13, 1994). Critical habitat was subsequently revoked by the Service (USFWS, 1998). It was again designated on April 25, 2000 (USFWS, 2000). Critical habitat includes portions of the Verde, Black, middle Gila, San Pedro, San Francisco, Tularosa, Blue, and upper Gila Rivers and Eagle, Bonita, Tonto, and Aravaipa Creeks and several tributaries of those streams.

Loach minnow is a small, slender, elongate fish with markedly upwardly-directed eyes (Minckley, 1973). Historic range of loach minnow included the basins of the Verde, Salt, San Pedro, San Francisco, and Gila Rivers (Minckley, 1973, Sublette *et al.*, 1990). Habitat destruction plus competition and predation by nonnative species have reduced the range of the species by about 85 percent (Miller, 1961; Williams *et al.*, 1985; Marsh *et al.*, 1989). Loach minnow remains in limited portions of the upper Gila, San Francisco, Blue, Black, Tularosa, and White Rivers and Aravaipa, Turkey, Deer, Eagle, Campbell Blue, Dry Blue, Pace, Frieborn, Negrito, Whitewater, and Coyote Creeks in Arizona and New Mexico (Barber and Minckley, 1966; Silvey and Thompson, 1978; Propst *et al.*, 1985; Propst *et al.*, 1988; Marsh *et al.*, 1990; Bagley *et al.*, 1995; USBLM, 1995; Bagley *et al.*, 1996; Miller, 1998).

Loach minnow is a bottom-dwelling inhabitant of shallow, swift water over gravel, cobble, and rubble substrates (Rinne, 1989, Propst and Bestgen, 1991). Loach minnow uses the spaces between, and in the lee of, larger substrate for resting and spawning (Propst *et al.*, 1988; Rinne, 1989). It is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen, 1991). Some studies have indicated that the presence of filamentous algae may be an important component of loach minnow habitat (Barber and Minckley, 1966). The life span of loach minnow is about 2 years (Britt, 1982; Propst and Bestgen, 1991). Loach minnow feeds exclusively on aquatic insects (Schreiber, 1978; Abarca, 1987). Spawning occurs in March through May (Britt, 1982; Propst *et al.*, 1988); however, under certain circumstances loach minnow also spawn in the autumn (Vives and Minckley, 1990). The eggs of loach minnow are attached to the underside of a rock that forms the roof of a small cavity in the substrate on the downstream side. Limited data indicate that the male loach minnow may guard the nest during incubation (Propst *et al.*, 1988; Vives and Minckley, 1990).

Recent biochemical genetic work on loach minnow indicate there are substantial differences in genetic makeup between remnant loach minnow populations (Tibbets, 1993). Remnant populations occupy isolated fragments of the Gila River basin and are isolated from each other.

Based upon her work, Tibbets (1992, 1993) recommended that the genetically distinctive units of loach minnow should be managed as separate units to preserve the existing genetic variation.

The status of loach minnow is declining rangewide. Although it is currently listed as threatened, the Service has found that a petition to uplist the species to endangered status is warranted. A reclassification proposal is pending, however, work on it is precluded due to work on other higher priority listing actions (USFWS, 1994c).

Spikedace

Spikedace was listed as a threatened species on July 1, 1986 (USFWS 1986b). Critical habitat was designated for spikedace on March 8, 1994 (USFWS 1994b), but was set aside by order of the federal courts in Catron County Board of Commissioners, New Mexico V. U.S. Fish and Wildlife Service, CIV No. 93-730 HB (D.N.M., Order of October 13, 1994). Critical habitat was subsequently revoked by the Servce (USFWS, 1998). It was again designated on April 25, 2000 (USFWS, 2000). Critical habitat includes portions of the Verde, middle Gila, San Pedro, San Francisco, Blue, and upper Gila Rivers and Eagle, Bonita, Tonto, and Aravaipa Creeks and several tributaries of those streams.

Spikedace is a small silvery fish whose common name alludes to the well-developed spine in the dorsal fin (Minckley, 1973). Spikedace historically occurred throughout the mid-elevations of the Gila River drainage, but is currently known only from the Verde, middle Gila, and upper Gila Rivers, and Aravaipa and Eagle Creeks (Barber and Minckley, 1966; Minckley, 1973; Anderson, 1978; Marsh *et al.*, 1990; Sublette *et al.*, 1990; Jakle, 1992; Knowles, 1994, Rinne 1999). Habitat destruction along with competition and predation from introduced nonnative species are the primary causes of the species decline (Miller, 1961; Williams *et al.*, 1985; Douglas *et al.*, 1994).

Spikedace live in flowing water with slow to moderate velocities over sand, gravel, and cobble substrates (Propst *et al.*, 1986, Rinne and Kroeger, 1988). Specific habitat for this species consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at the downstream riffle edges (Propst *et al.*, 1986). Spikedace spawns from March through May with some yearly and geographic variation (Barber *et al.*, 1970; Anderson, 1978; Propst *et al.*, 1986). Actual spawning has not been observed in the wild, but spawning behavior and captive studies indicate eggs are laid over gravel and cobble where they adhere to the substrate. Spikedace lives about two years with reproduction occurring primarily in one-year old fish (Barber *et al.*, 1970; Anderson, 1978; Propst *et al.* 1986). It feeds primarily on aquatic and terrestrial insects (Schreiber, 1978; Barber and Minckley, 1983; Marsh *et al.*, 1989).

Recent taxonomic and genetic work on spikedace indicate there are substantial differences in morphology and genetic makeup between remnant spikedace populations. Remnant populations occupy isolated fragments of the Gila basin and are isolated from each other. Anderson and Hendrickson (1994) found that spikedace from Aravaipa Creek is morphologically distinguishable from spikedace from the Verde River, while spikedace from the upper Gila river and Eagle Creek have intermediate measurements and partially overlap the Aravaipa and Verde populations. Mitochondrial DNA and allozyme analyses have found similar patterns of geographic variation within the species (Tibbets, 1992, 1993).

The status of spikedace is declining rangewide. Although it is currently listed as threatened, the Service has found that a petition to uplist the species to endangered status is warranted. A reclassification proposal is pending, however, work on it is precluded due to work on other higher priority listing actions (USFWS, 1994c).

III. ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Action Area

The action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. In streams, the action area is often much larger than the area of the proposed project because impacts may be carried downstream with the flow and radiating channel adjustments, both upstream and downstream, are normal whenever stream channels are altered (see Dunne and Leopold 1978). For the proposed project, the action area is expected to include the lower Blue River from approximately 0.25 miles upstream of the Juan Miller crossing of FR 475 downstream approximately 5 miles, and from approximately 1 mile above the confluence of the Blue River with the San Francisco River downstream to the confluence. Also included in the action area is the San Francisco River from Martinez Ranch downstream to approximately 4 miles below the confluence with the Blue River. The distance affected downstream is difficult to predict and may vary greatly depending upon weather conditions during the project and other factors.

General Environmental Baseline

The following is a summary of the environmental baseline for the project and affected area. For further details, see the June 16, 1997 biological opinion on the normal maintenance and repair of the Blue River road (FR 281), issued to the Forest Service and U.S. Army Corps of Engineers (USFWS, 1997a) and the April 15, 1997 biological opinion on the maintenance and repair of 7 low-water crossings on the lower San Francisco River, issued to the Forest Service and Bureau of Land Management (USFWS, 1997b).

The Blue River aquatic and riparian communities are a badly damaged ecosystem, the remnants of which are in peril (Chamberlain 1904; Olmstead, 1919; Leopold, 1921; Leopold, 1946; Miller, 1961; Dobyns, 1981; Coor, 1992). Nine fish species -- 65% of the native fish fauna -- have been extirpated from the river system, although one is being reintroduced with limited success. The floodplain soils have been mostly lost and riparian vegetation throughout most of the river has been reduced to sparse stands with little reproduction and little understory or herbaceous cover. The Blue River channel has been substantially altered and is now mostly a wide, unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channels. Base flows in the river become critically low during dry periods and in some areas all surface flow may be lost.

The degraded nature of the Blue River channel and aquatic habitat have removed much of the resilience needed to support the ecosystem over the long-term. Human uses of the watershed and valley bottom are the major factor in this degradation (Chamberlain, 1904; Leopold, 1921; Leopold, 1924; Dobyns, 1981; Coor, 1992). Overgrazing by cattle and goats depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation; increasing the volume and decreasing the duration of high flows; and decreasing the volume and increasing the duration of low flows. Trapping of beaver contributed to channel degradation and depletion of water storage. Timber harvest, fuelwood, and railroad tie cutting depleted vegetative cover of the watershed, created eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water. Development of fields on river terraces removed stabilizing vegetation. Irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river destroyed riparian vegetation, eroded terraces, destabilized streambanks, and channeled floodwaters into new areas thus eroding new channels or widening the existing channel. Cattle drives along the river bottom broke down streambanks, cut erosion paths, and damaged riparian vegetation. Flood control and protection measures increased velocities, decreased habitat complexity, and destablized the river through modification and constraint of natural channel geometry.

Today, much of the Blue River channel is a wide, unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channel (Papoulias *et al.*, 1989; Bagley *et al.* 1995). Aquatic habitat is highly simplified, consisting primarily of open runs and riffles. River terraces or benches are small eroding remnants of former river banks. Riparian vegetation is sparse and lacking in structural diversity. It consists primarily of seep willow (*Baccharis salicifolia*) and cottonwood (*Populus fremontii*) seedlings and saplings. Some large cottonwoods and sycamore (*Platanus wrighti*) are present, with willow increasingly common in the upper reaches, where ponderosa pine (*Pinus ponderosa*) also enters the riparian corridor. Sedges (*Carex* sp.), which are a key element in healthy, stable streambanks, are uncommon along much of the river. Local residents recall a much larger component of bushy willows along the upper Blue River earlier in the century (Coor, 1992). Over time, these were replaced by large cottonwood, boxelder, sycamore, and alder, although local accounts also describe the loss of these big trees in some areas to flooding.

In the area of sites 1 and 2, the channel is about 200-250 feet wide (USBR, 1998) and much of the valley walls are vertical. The stream bottom is primarily cobble and gravel with large amounts of sand and silt. The stream channel is unstable with extensive lateral migration evident. Aquatic habitat complexity is low and consists mostly of shallow gravel-bottomed riffles, although some large pools associated with bedrock walls are present.

In the area of the FR 471 crossing, the channel is about 300 feet wide (USBR, 1998) with valley walls vertical on the west. Substrate is mainly cobble and gravel and aquatic habitat is mostly riffles and runs with a few pools formed by bedrock outcrops. Efforts at the road crossing by the Forest Service since 1993 have allowed riparian vegetation to stabilize the west streambank and contain the river within a channel on the east side of the valley bottom. The road crossing is an unimproved ford, although the Forest Service has attempted to stabilize the crossing by placing large boulders on the downstream side of the roadway. This has caused deposition on the crossing and raised it about 18 inches above the river bed below the boulders. The road receives light to moderate use by recreationists, Forest Service staff, livestock permittees, and one private resident with land on the east side of the river.

The only stream discharge gauge on the Blue River is located just downstream from the FR471 crossing. That gauge functioned on a continuous basis from 1967 to 1991, when it was discontinued. It was maintained as a partial-record station, with only maximum annual discharges reported from 1992-1995, when it was reinitiated as a continuous record gauge. The Blue River has a bimodal high flow pattern; a snow-melt hydrograph with high flows in late winter and spring and a second high flow period associated with monsoon rains in late summer. The lowest flows generally occur in early summer. At the gauge, the maximum instantaneous discharge for the period of record is 30,000 cubic feet per second (cfs) in October 1972; the minimum daily discharge is 1.4 cfs from October 1978; the monthly mean discharges range from 16 cfs in June to 166 cfs in March; and the 50% exceedance level is 22 cfs (USGS, 1999). The Blue River is "flashy" (see Gordon *et al.*, 1992) with summer storm discharge sometimes an order of magnitude greater than the mean daily discharge on the day of the storm (USGS records).

Although it is thought that human actions in the Blue River watershed and valley bottom have altered the hydrologic regime of the river, there are no discharge data available prior to the major changes to the river that occurred around the turn of the century. However, increased flashiness of flood flows and depletion of base flows are widely documented results of reduction of vegetative and soil cover from the watershed, loss of floodplain terraces and soils, and reduction of riparian vegetation (Ffolliott and Throud, 1975; Dunne and Leopold, 1978; DeBano and Schmidt, 1989; Gebhardt *et al.*, 1989; Meehan, 1991; Gordon *et al.*, 1992; Naiman, 1992; Belsky and Blumenthal, 1997). It is likely that these phenomena are partially responsible for the low base flow that currently exists in the upper Blue River. Local residents recall that there was formerly a more dependable water supply in the Blue River (Coor, 1992). Over time the irrigation diversions have become unusable due to streambed and bank erosion and reduced flows and many residents have been forced to drill wells to obtain dependable irrigation water. Earlier practices such as floating logs from the upper Blue to Clifton became impossible due to low flows and altered stream channel.

Present uses of the Blue River watershed and valley bottom continue to contribute to the deteriorated condition of the river, although at a level much reduced from that of the late 1800's. Timber harvest, roads, recreation, aquaculture, and grazing activities within the watershed continue to contribute erosion, vegetation change, and alteration of the hydrologic regime. Cropping and irrigated agriculture continue on remnant terraces on private lands in the upper 30 miles of river bottom. There are a number of small diversion structures and irrigation canals and an unknown number of wells, at least some of which pump from the alluvial aquifer. Subdividing of ranch lands and construction of residences or summer homes has occurred, but at a fairly low level. The County road (FR 281) along the upper river is a continuous source of bank and channel damage and erosion, although efforts are underway to lessen this impact. Numerous low-water ford crossings exist, although most are in the upper Blue River, but all contribute to localized destabilization and sedimentation. In the middle and lower Blue, unauthorized off-road-vehicle use in the river bottom is an ongoing problem that causes bank and channel damage and contributes pollutants. Livestock grazing in the valley bottom continues on private lands in the upper Blue. There is livestock grazing on Forest Service lands within the watershed, but grazing along the river bottom is being curtailed. Despite its seriously degraded state, and the impacts from existing uses, efforts by the Forest Service to remove or mitigate some of the most destructive human activities are improving conditions on the Blue River, although significant restoration will take many decades.

The San Francisco River has also undergone substantial modification within the past century and a half. In 1846, the mouth of the San Francisco River was described as having thick borders of flags (*Iris* sp.) and willows with some larger cottonwood, and beaver dams in "great numbers." (Emory, 1848). Beavers were abundant along the San Francisco River in the 1800's (Pattie, 1833). By the turn of the century, beaver had been reduced to a minor element in the system and agriculture, livestock grazing, roads, mining, timber harvest, and other human activities within the watershed had substantially altered the hydrologic and sediment regimes and the river channel (Olmstead, 1919; Leopold, 1946). Extensive wood harvest of all types for timbers and fuel at the mines at Clifton-Morenci, and the fuelwood needs of the local population decimated both the upland and riparian woodlands (Bahre, 1991). In addition to the water diversion, wood harvest, roads, and toxic discharges resulting from the mines in the Clifton area, placer mining was practiced on the San Francisco River above Clifton (Dobyns, 1981). Like the Blue River, large floods in the 1890-1906 period accelerated the erosion of the destablized watershed and stream resulting in a river channel similar to that present today.

Although the San Francisco River in New Mexico underwent many of the same degradations as previously described for it and the Blue River in Arizona, the canyon upstream from the confluence with the Blue ameliorates many of the channel problems. Because of the canyon influence, the San Francisco River channel upstream from the Blue River remains relatively well-defined and moderately vegetated with cottonwood, willow, ash (*Fraxinus velutina*), walnut (*Juglans major*), sycamore, and seep willow. The substrate is boulder, cobble, gravel and sand. After joining with the Blue River, the lower San Francisco River channel becomes progressively wider, and is a sparsely vegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting wide, shallow low-flow channel. River terraces, which were only moderately eroded above the mouth of the Blue River become small, eroding remnants of former river banks. Riparian vegetation consists primarily of seep willow, cottonwood, and nonnative salt cedar and is lacking in structural diversity.

A stream discharge gauge is located on the San Francisco River at Clifton. The period of record of that gauge is continuous from 1927 to present, with sporadic records from 1910 to 1927. The San Francisco River shows the same bimodal discharge pattern discussed earlier for the Blue River. At the gauge, the maximum instantaneous discharge for the period of record is 90,900 cfs from October 1983; the minimum daily discharge is 6.1 cfs from June 1971; the monthly mean discharges range from 57 cfs in June to 454 in March; and the 50% exceedance level is 76 cfs (USFS, 1999). Like the Blue River, the San Francisco River is "flashy" with storm discharges substantially larger than mean daily discharge on the day of the storm (USGS records).

Present uses of the San Francisco River watershed and valley bottom continue to contribute to the deteriorated condition of the river, although at a level reduced from that of the late 1800's to early 1900's. Timber harvest, road, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Although there is little private land along the river in Arizona, there are substantial areas of private land on the river in New Mexico. Near the towns of Glenwood, Pleasanton, and Reserve there are farms, ranches, and towns along the river bottom as well as pastures and irrigated agriculture. There are a number of small diversion structures and irrigation canals. The river is completely diverted near Glenwood and Pleasanton during the low flow periods and substantial nutrient loads are added in irrigation return flows (Propst *et al.*, 1988). Although the lower San Francisco River above Martinez Ranch was closed to vehicle use in 1987, some unauthorized use continues. On the road below Martinez Ranch there are several low-water crossings. On the road from the RU Ranch to Clifton, there are 26 low-water crossings in 8.7 miles. Forest Service lands along the San Francisco River in Arizona have been excluded from livestock grazing, although occasional trespass use occurs. Livestock grazing in the river continues on BLM and State lands.

Status of the Species (Within the Action Area) - Loach Minnow and Spikedace

For many years, the fish fauna of the Blue and San Francisco Rivers was poorly known. Surveys were few and tended to concentrate on the tributary streams (Chamberlain, 1904; Anderson and

Turner, 1977; Silvey and Thompson, 1978; Minckley and Sommerfeld, 1979; J.M. Montgomery Consulting Engineers, 1985; Sheldon and Hendrickson, 1988; Marsh *et al.*, 1989; Papoulias *et al.*, 1989). Anecdotal accounts from area residents recall that the Blue River formerly had "a lot" of fish, but now no longer does (Coor, 1992). The fish fauna of the lower San Francisco River is depauperate in species and in numbers. In 1904, Chamberlain found no fish of any species during surveys from the mouth of the San Francisco River up to the Blue River. He reports local stories of previously abundant fish and speculates that the loss of those fish is due to flooding, heavy silt loads, mining effluent, and extensive water diversion. In 1979, surveys found the lower San Francisco to support "few individual fishes and little biomass" (Minckley and Sommerfeld, 1979).

Loach minnow was first documented from the Blue River in 1977 (Anderson and Turner 1977). There are no known records of spikedace from the Blue River. The 1977 survey was the first documented survey in the area since Chamberlain's work in 1904. Chamberlain surveyed the Blue River up to KP Creek and found a highly depleted fish fauna; "The only fish seen in Blue Creek was a small school of *Agosia* of which samples were obtained." It appears that many of the species of native fish in the Blue River were highly depleted or extirpated prior to 1904, including spikedace. Although its presence has never been documented in the Blue River it has been documented from the connecting San Francisco River and suitable habitat exists in the Blue River, making it highly likely that spikedace occupied the Blue River before the massive habitat changes the occurred in the late 1800's and early 1900's.

Loach minnow survived those changes and are now distributed in suitable habitat from the middle reaches of Campbell Blue Creek downstream to the confluence with the San Francisco River (Silvey and Thompson, 1978; J.M. Montgomery Consulting Engineers, 1985; Hendrickson, 1987; Sheldon and Hendrickson, 1988; Marsh *et al.*, 1989; Papoulias *et al.*, 1989; AGFD, 1994; Bagley *et al.*, 1995, Bagley *et al.*, 1998). Loach minnow are also found in Dry Blue Creek and its tributaries Pace and Freiborn Creeks. Earlier it was also documented from KP Creek just above its confluence with the Blue River. Recent surveys have found loach minnow to be relatively common, although it is not present at all sites and is the least abundant of the five native species, rarely constituting more than 10%, and often less than 5% of the fish population (AGFD, 1994; Bagley *et al.*, 1995; Bagley *et al.*, 1998).

Like the Blue River, the San Francisco River has few historic fish surveys. After Chamberlain found no fish in the lower San Francisco River in 1904, the next documented fish survey in the Arizona portion of the river was by Anderson and Turner in 1977. This was the first survey to document loach minnow in the Arizona portion of the river, although it had been recorded in the upstream New Mexico portion since the early 1940's (LaBounty and Minckley, 1972). Since 1977, loach minnow have been found throughout the Arizona portion of the San Francisco River upstream of Clifton, although in low numbers and they are the rarest of the five remaining native species (Minckley and Sommerfeld, 1979; J.M. Montgomery Consulting Engineers, 1985; Papoulias *et al.*, 1989; Bagley *et al.*, 1995). Spikedace have never been found in the San Francisco River in Arizona. Given Chamberlain's 1904 findings, it is likely that several native species, including spikedace, were extirpated from this portion of the river in the early part of this century due to human activities, although they continued to be present in the New Mexico portion until at least 1950 (Anderson, 1978).

In addition to loach minnow and razorback sucker, the Blue River continues to support four other native fishes, speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus* [*Pantosteus*] *clarki*), and Sonora sucker (*Catostomus insignis*). The San Francisco River in Arizona supports the same and also has Gila chub (*Gila intermedia*) in two tributaries (Bagley *et al.*, 1995). The Blue and San Francisco Rivers, like all streams remaining in the Gila River basin have been subject to introduction of a number of nonnative fish and other aquatic species. Although the nonnative species present in the Blue River are relatively fewer than in most Gila basin streams, nonnatives adversely affect the native fish community through competition and predation (see Courtenay and Stauffer, 984; Bestgen, 1986; Marsh and Brooks, 1989; Marsh *et al.*, 1989; Propst *et al.*, 1992; Blinn *et al.*, 1993; Carmichael *et al.*, 1993; Douglas *et al.*, 1994). Nonnative species reported in the Blue River system include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), red shiner (*Cyprinella lutrensis*), channel catfish (*Ictalurus punctatus*), and crayfish (*Orconectes virilus*) (Anderson and Turner, 1977; J.M. Montgomery Consulting Engineers, 1985; AGFD, 1994; Bagley *et al.*, 1995; Bagley *et al*, 1998). The scarcity of large pools, the paucity of habitat structure, and the flashiness of flooding in the Blue River may make many of the existing nonnatives susceptible to death or removal downstream during large flood events. Differential effects of flooding have been observed on native and nonnative fishes in southwestern streams (Rinne, 1975; Meffe, 1983; Minckley and Meffe, 1987; Pearson *et al.*, 1992). Fish barriers in the lower Blue River may act to control nonnative species in several ways. They would prevent upstream movement of new nonnative species and augmentation of populations of nonnative species already present, and barriers may also help control nonnative species already present by preventing their reinvasion after major flooding reduces or removes them from the Blue River. In addition to the nonnative species in the Blue River, the San Francisco River also contains flathead catfish (*Pylodictus olivaris*), carp (*Cyprinus carpio*), smallmouth bass (*Micropterus dolomeiui*), and softshell turtle (*Trionyx spiniferus*) (Anderson and Turner, 1977; Minckley and Sommerfeld, 1979; J.M. Montgomery Consulting Engineers, 1985; Papoulias *et al.*, 1989; Bagley *et al.*, 1995.).

Although the historic records of the Blue and San Francisco Rivers fish fauna are few, those records, plus some from the San Francisco River upstream and the Gila River downstream can be used to construct a list of 14 native fish species that are likely to have historically occupied these two rivers. This information can be combined with early descriptions of the rivers and their valley bottom (e.g. Emory, 1948; Chamberlain, 1904; Olmstead, 1919; Leopold, 1921; Dobyns, 1981; Coor, 1992), from which it appears that the rivers were much narrower with more distinct streambanks and floodplain and wider, denser riparian cover and that the aquatic habitats were much more varied and complex. From this information, it can be concluded that nine species, or 65% of the native fish species, have been extirpated from the Blue River in the past century and eight species of native fish, or 60% of the native fish species, have been extirpated from the San Francisco River in the period.

Section 7 Consultation Environmental Baseline in the Action Area

At sites 1 and 2, section 7 consultation has been conducted for land management planning and livestock grazing. Consultations have also occurred for actions nearby on the San Francisco River. These consultations are summarized in Table 1.

TABLE 1. SECTION 7 CONSULTATIONS IN ACTION AREA			
Project	Date of Opinion or Concurrence	Species[1]	Finding
FORMAL CONSULTATIONS			
Apache-Sitgreaves NF Land and Resource Management Plan	May 1986	loach minnow[2]	net benefit
Maintenance and repair of FR 475 low-water crossing	April 21, 1995	loach minnow & its critical habitat	nonjeopardy / no adverse modification
Maintenance and repair of 7 low-water crossings along lower San Francisco River	April 15, 1997 October 4, 1999 (additional emergency consultation	loach minnow	nonjeopardy
Land and resource management plans, as amended, for 11 Nat. Forests & grasslands	December 19, 1997	loach minnow spikedace	nonjeopardy nonjeopardy
Pigeon, Pleasant Valley, and Wildbunch livestock grazing allotments - ongoing grazing	February 2, 1999	loach minnow	nonjeopardy

[1]Only species also in this biological opinion are included here

[2]Proposed at time of consultation

INFORMAL CONSULTATIONS - IS NOT LIKELY TO ADVERSELY AFFECT CONCURRENCES			
Vehicle closure of San Francisco River from AZ/NM line to Martinez Ranch	September 16, 1988	loach minnow	beneficial effect (=is not likely to adversely affect)
Programmatic on Forest Service grazing permits - unknown allotments	May 1995 (FWS programmatic concurrence)1995/6 Forest use of programmatic concurrence	loach minnow spikedace	concurrence
Ongoing grazing activities on Forest Service lands - Hickey & Sardine allotments	May 1, 1998	loach minnow	concurrence

IV. EFFECTS OF THE ACTION

The ultimate purpose of the proposed action is construction of a fish barrier to prevent incursion of nonnative species that are detrimental to spikedace and loach minnow and their critical habitat. The Service strongly supports the need for a fish barrier on the Blue River and believes that the overall effects of such a barrier are beneficial to the two species. However, as with many actions to benefit listed species, there may be both long and short-term adverse impacts associated. Although the overall effect is beneficial, those adverse impacts must be disclosed and if possible removed or minimized. In addition, an improved low-water crossing is being contemplated on FR 475 at the Blue River. This action is primarily to benefit human activities, but would help minimize the adverse effects from those activities. Therefore, while the action may adversely affect spikedace and loach minnow critical habitat, there may be long-term beneficial impacts associated.

The more immediate purpose of the action being analyzed by this biological opinion is only to conduct activities to investigate the feasibility and design needs of such a barrier. Consulting on these investigations separately may appear to be "piecemealing," where portions of an action are analyzed separately to the detriment of an understanding of the overall effects. This is not the case here. The effects of potential barrier and/or low-water construction cannot be understood and analyzed until the information from this study is obtained. Carrying out the feasibility investigations does not require a commitment to barrier or low-water crossing construction and so the overall effects of that construction and operation are not an irrevocable result of the feasibility investigation. Only the effects of the feasibility investigation will result from this proposed action and if the barrier and/or low-water crossing are eventually constructed, the effects of the feasibility investigations would be factored into the overall effects through their inclusion in the environmental baseline of consultation conducted at that time.

The fact that both the Blue and San Francisco Rivers are substantially degraded increases the severity of the consequences of any adverse effects to loach minnow and its critical habitat and to spikedace critical habitat, but also decreases some adverse effects because there may be less probability of damaging channel features that are already substantially damaged. Which direction the degraded baseline will push the adverse effects is specific to the type of effect. For example, damage to stream terraces on the lower Blue River from vehicle movement is expected to be minimal because few terraces remain and those that exist are eroded to an extent they would not likely be crossed by the vehicles. However, increases in fine sediment production are of greater consequence because of the already large amounts of fine sediment moving through the system.

Access for vehicles needed for the proposed work would create the greatest adverse effects. This applies only to sites 1 and 2, as access at FR 475 is on an existing improved roadbed and areas adjacent to the crossing are already disturbed by moderate recreational use. The numerous adverse effects of roads to streams and wetlands are well documented (Dobyns, 1981; Brozka, 1982; Patten, 1989; Waters, 1995; Jones *et al.*, 1999; Findlay and Bourdages, 1999; Trombulak and Frissell, 1999). Roads along the rivers in both the Blue and San Francisco Rivers have been a major factor in the erosion, loss of terraces and riparian vegetation, simplification of aquatic habitat, and general destabilization of both of those rivers.

The increased vehicle use of the track along the San Francisco River would increase erosion on the streambanks at stream crossings and increase compaction and loss of infiltration on the track itself. The stream substrate within the low-water crossings would undergo increased disturbance, compaction, and sedimentation. And, the likelihood of crushing loach minnow and their eggs would increase. These increases are expected to be small relative to the existing use of that road.

The use of vehicles in the floodplain of the lower 1 mile of the Blue River (the area closed to vehicular use) is of most concern. This use would increase erosion, cause loss of some riparian vegetation, and result in compaction of floodplain gravels. Because the low-flow channel meanders across the floodplain and the canyon walls are often vertical or near-so, the vehicles would need to cross the river at several places. As with the San Francisco River crossings, this would disturb and compact substrate, increase sedimentation, and result in the likely crushing of some loach minnow or their eggs. These effects are expected to be greater than in the San Francisco River because of the need to move repeatedly between sites and back and forth across the floodplain at each site.

Increased erosion of the streambank at low-water crossings increases the instability of the banks and may result in increased loss of terraces and riparian vegetation. Such losses are incremental and over time may result in serious destabilization and loss of natural function to the stream channel. Increased compaction and decreased infiltration on terraces may create similar results. Such damage to, or loss of, stream terraces reduces bank storage and thus, in the long-term, alters the hydrologic regime of the river. Disturbance of stream substrates on low-water crossings would be similarly incremental. Increases in sediment production from these effects would result in increased deposition on loach minnow and spikedace habitats. Because of their benthic habitat, loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.*, 1988).

In addition to direct effects of access, roads (or in this case tracks) carry many indirect adverse impacts, such as increased pollution, increased recreational use, increasing channelization, and increased removal of wood debris and many others Obviously some of these are negligible here, such as increasing channelization. Although eventual construction of the proposed barriers and low-water crossing will be channel constraints, the feasibility studies themselves would not require any modification of the channel. However, the use of machinery in the river and its floodplain would have a short-term increased risk from pollution from petroleum products associated with the vehicles and other machinery, both minor leakage or deposition and the possibility of an accident that causes release of substantial quantities of oil, gas, etc.

Increased vehicle use also carries with it the potential to increase recreational use. This is not a factor on the San Francisco track, which is already in use by recreationists. The track would not be improved by the proposed action and nothing about the use should alter recreational use. However, driving up the Blue River in the closed area would leave tracks that would encourage, and result in, increased unauthorized use by recreationists. Unauthorized use of the Blue River floodplain by four-wheel drive and off-highway vehicles is a continuing problem that the Forest Service has found difficult to control. In addition, local user groups are sensitive to "loss" of what they believe is their right to a road along the Blue River and may resent the government granting itself a privilege they are not allowed While there is little Reclamation can do to ameliorate the resentment, the Forest Service can provide explanations and information to anyone who inquires. Increased unauthorized use due to the existence of vehicle tracks from the proposed action would be mostly ameliorated by obliteration of tracks, to the extent possible. However, until flooding removes the remainder of the signs of vehicle use and until the knowledge and resentment of this "privilege" fades, some increased unauthorized vehicle use by recreationists is likely to occur, with adverse impacts to the loach minnow and their critical habitat and spikedace and their critical habitat.

Improvement of the FR 475 crossing may make the crossing more easily negotiated. This may increase use of the crossing and thus increase recreational use on the east side of the Blue River. However, recreational use in the area is only light to moderate due to the remoteness of the area and the long, rough drive out FR 475. Increased use of the east side of the river is not likely to be substantial enough to affect watershed parameters that would in turn affect the river and the loach minnow and their critical habitat or spikedace critical habitat. On the east side of the river, FR

475 already contributes sediment into the Blue River, as is usual for unimproved dirt roads, and the increased use is not likely to cause significant changes.

Apart from the access to accomplish it, the surveying itself is expected to have little or no effect on loach minnow and its critical habitat or on spikedace critical habitat. The same applies to the abutment characterization.

In addition to the above effects of the vehicles and machinery, the digging of pits in the stream channel for streambed determinations and drilling of holes for bedrock depth determinations are expected to have similar effects. If these pits and holes are dug in the wetted channel, substrate would be disturbed and redistributed in nonnatural patterns, thus destroying existing habitat and creating "new" habitat that may or may not be suitable for loach minnow or spikedace. Algal and invertebrate communities on the substrate in the pit and hole areas would be substantially destroyed or buried as the rocks are redistributed in depth upon backfilling. This would adversely affect the food supply of loach minnow in the area. These effects are expected to be localized and short-term. Loach minnow or eggs present in the work area may be killed by crushing or dessication. Eggs are sessile and adults tend to hide among the rocks in response to disturbance, thus both are very vulnerable to mortality during activities that disturb the streambed.

Excavation and drilling may also disturb hyporheic flora and fauna and thus have short-term effects on the function of the aquatic ecosystem. Digging of the pits and holes within the floodplain may alter stream flows on a localized and short-term basis. The pits will intercept subsurface flows and may capture some surface flow through intergravel movement. This is not expected to be significant enough to dewater any areas of the stream. However, depletion of flow in loach minnow habitat can cause distress to loach minnow or their eggs.

Digging and backfilling would also increase the fine sediment moving downstream. The activity would occur during low flow periods when flushing is at a minimum and may alter loach minnow and spikedace habitat and may smother loach minnow eggs.

V. CUMULATIVE EFFECTS

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities on endangered or threatened species or critical habitat that are reasonably certain to occur during the Federal activity subject to consultation. Future Federal actions are subject to the consultation requirements and therefore, are not considered cumulative in the proposed action.

Most of the land within the Blue River watershed is under the administration of the U.S. Forest Service and activities affecting loach minnow and its critical habitat and spikedace critical habitat, such as grazing and timber harvest, would be Federal actions subject to section 7 consultation. Recreation in the area is light to moderate and in general has localized impacts on the river. The primary cumulative effects originate from private lands in the valley bottom on the upper Blue

River. Livestock grazing, cropping, and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. An aquaculture operation feeds predatory nonnative trout into the Blue River, diverts water from the river, and adds to the nutrient load of the river.

On the San Francisco River the majority of land in the action area and upstream is under the jurisdiction of the Forest Service and activities affecting loach minnow and its critical habitat or spikedace critical habitat would be Federal actions subject to section 7 consultation. Recreation in the area is light to moderate and in general has minor impact on the river, with the exception of the roads and tracks. Some cumulative effects derive from the private lands in the valley bottom nearby and upstream. These lands are used almost entirely for livestock grazing which is generally managed in conjunction with the grazing on adjacent Federal land. The private lands upstream from the action area have a number of ongoing activities that contribute to the cumulative effects. These activities have been discussed in the Environmental Baseline section of this opinion.

VI. CONCLUSION

After reviewing the current status of loach minnow and spikedace, the environmental baseline for the action area, the direct and indirect effects of the proposed feasibility field investigations on the Blue River, and the cumulative effects, it is the Service's biological opinion that implementation of the action, as proposed, is not likely to jeopardize the continued existence of the loach minnow. It is also the Service's biological opinion that the proposed action is not likely to destroy or adversely modify the critical habitat of loach minnow or spikedace.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicants, as appropriate, in order for the exemption in section 7(o)(2) to apply. No applicants or permittees are involved in this proposed action.

AMOUNT OR EXTENT OF TAKE

Take is anticipated to occur through direct mortality of adult, juvenile, and larval loach minnow and eggs by crushing due use of vehicles and machinery in the water, through removal from the water in materials removed during digging and drilling, through exposure to toxic materials, such as petroleum products, or smothered by sediment input Indirect take may occur through destruction or alteration of habitat resulting from modification or destabilization of the substrate, channel, streambanks, and riparian vegetation. Such habitat loss or modification would alter behavioral patterns, food availability, access to cover, and availability of habitat thus reducing survival of individual loach minnow and potentially reducing or precluding reproduction.

No take of spikedace is anticipated due to the apparent absence of the species from the Blue and San Francisco Rivers at this time.

The anticipated level of incidental take of loach minnow cannot be directly quantified due to the low level of data on loach minnow populations in the area and because of technical difficulties in determining loach minnow numbers and mortalities. Because of their small size and benthic habit, the velocity of the river, and the rapid consumption of dead or dying fish by predators, it is unlikely that loach minnow or their eggs killed as a result of the proposed project would be observed. In addition, adequate loach minnow population estimates are difficult to obtain without serious adverse impacts to the population, and populations exhibit relatively rapid fluctuations due to the short life span of the species and seasonal and other natural factors. Therefore, anticipated levels of take are indexed to the total fish community and habitat. Anticipated take for loach minnow for the proposed action would be considered to have been exceeded if at any time during project activities any of the following occur:

1. more than 20 dead fish of any species are found in the area of any project activities or within 500 yards downstream,

2. more than 5 vehicles, plus the backhoe, are used or projects activities exceed the 2 week total predicted activity period by more than 4 days, or

3. any spill of toxic materials occurs in the Blue or San Francisco Rivers or their floodplains during, and as a result of, project activities.

If, during the course of the action, the amount or extent of the incidental take anticipated is exceeded, Reclamation and the Forest Service must reinitiate consultation with the Service immediately to avoid violation of section 9. Operations must be stopped in the interim period between the initiation and completion of the new consultation, if it is determined that the impact of the additional taking would cause an irreversible and adverse impact on the species. Reclamation and the Forest Service should provide an explanation of the causes of the taking.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to the loach minnow or destruction or adverse modification of the critical habitats of loach minnow or spikedace.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental taking authorized by this biological opinion. Some of the reasonable and prudent measures and their implementing terms and conditions are already an implicit or explicit part of the proposed project and their inclusion in the incidental take statement is only an affirmation of their importance in minimizing take. Where the proposed project already adequately fulfills the following reasonable and prudent measures and terms and conditions, this incidental take statement does not imply any requirement for additional measures.

1. Conduct all proposed actions in a manner that will minimize direct mortality of loach minnow.

2. Conduct all proposed actions in a manner that will minimize loss and alteration of loach minnow habitat.

3. Monitor the fish community and habitat to document levels of incidental take.

4. Maintain complete and accurate records of actions which may result in take of loach minnow and their habitat.

TERMS AND CONDITIONS FOR IMPLEMENTATION

In order to be exempt from the prohibitions of section 9 of the Act, Reclamation and the Forest Service are responsible for compliance with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. The following terms and conditions will implement reasonable and prudent measure 1.

    1.1 All reasonable efforts shall be made to minimize activities within the wetted channel of the Blue and San Francisco Rivers.

    1.2 All reasonable efforts shall be made to avoid project activities during the loach minnow spawning seasons (March 1 to June 1 and September 1 to October 31). However, due to the importance of this project for loach minnow recovery, work may proceed until September 20, if necessary.

1.3 No water shall be removed from the Blue or San Francisco Rivers during project activities, except for minor amounts (no greater than 5 gallons at one time).

1.4 All reasonable efforts shall be made to ensure that no pollutants enter surface waters during action implementation. No toxic chemicals (including petroleum products) shall be stored or deposited within the floodplain during the project. An appropriate spill response kit for cleaning up accidental releases of petroleum products will be available at the work site whenever vehicles or machinery are present and at least one person present shall have training in use of that kit.

2. The following terms and conditions will implement reasonable and prudent measure 2.

2.1 All reasonable efforts shall be made to minimize damage to or loss of riparian vegetation.

2.2 When traveling in the portion of the Blue River closed to vehicles, and where possible without creating significantly more damage to streambanks and riparian vegetation, vehicles will avoid using the same track repeatedly. The purpose is to avoid leaving a distinct vehicle track that will encourage nonauthorized people to follow.

2.3 All reasonable efforts shall be made to obliterate vehicle tracks so that it is not readily apparent that vehicles have passed along the Blue River. Emphasis should be placed on those tracks near the mouth of the Blue River in an area where people using the San Francisco track would see them.

2.4 All reasonable efforts shall be made to minimize channel and floodplain alterations during project implementation. Materials backfilled into project pits and holes should be contoured to resemble the surrounding natural areas.

3. The following terms and conditions will implement reasonable and prudent measure 3.

3.1 At all times when project activities are ongoing, all reasonable efforts shall be maintained to monitor for the presence of dead or dying fish in or within 500 yards downstream of the project area. The Service shall be notified immediately by telephone upon detection of more than 20 dead or dying fish of any species. Operations must be stopped in the interim period between the detection and completion of a new consultation if it is determined that the impact of the additional taking will cause an irreversible and adverse impact to loach minnow or their habitat.

3.2 A biologist shall be available to advise and assist in application of these terms and conditions. However, the biologist does not need to be on-site during project activities.

4. The following terms and conditions will implement reasonable and prudent measure 4.

4.1 A written report shall be submitted to the Service within 60 days of completion of project activities. The report shall document the project, as implemented, and shall include photographs of the project area before project initiation and after project completion. The report shall also include a discussion of compliance with the above terms and conditions.

Notice: While the incidental take statement provided in this consultation satisfies the requirements of the Endangered Species Act, as amended, it does not constitute an exemption from the prohibitions of take of listed migratory birds under the more restrictive provisions of the Migratory Bird Treaty Act.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. The term conservation recommendations has been defined as Service suggestions regarding discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information. Recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's 7(a)(1) responsibility for these species. The Service has no conservation recommendations for the feasibility studies for the Blue River barrier.

REINITIATION NOTICE

This concludes formal consultation on the feasibility field studies for a fish barrier and low-water crossing on the lower Blue River in Greenlee County, Arizona. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: (1) the amount or extent of take is exceeded; (2) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If we can be of further assistance, please contact Sally Stefferud.

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FIGURE 1

PROJECT AREA

SHOWING OPEN AND CLOSED AREAS FOR VEHICLES

(modified from the July 7, 2000 Biological Assessment by Bureau of Reclamation)

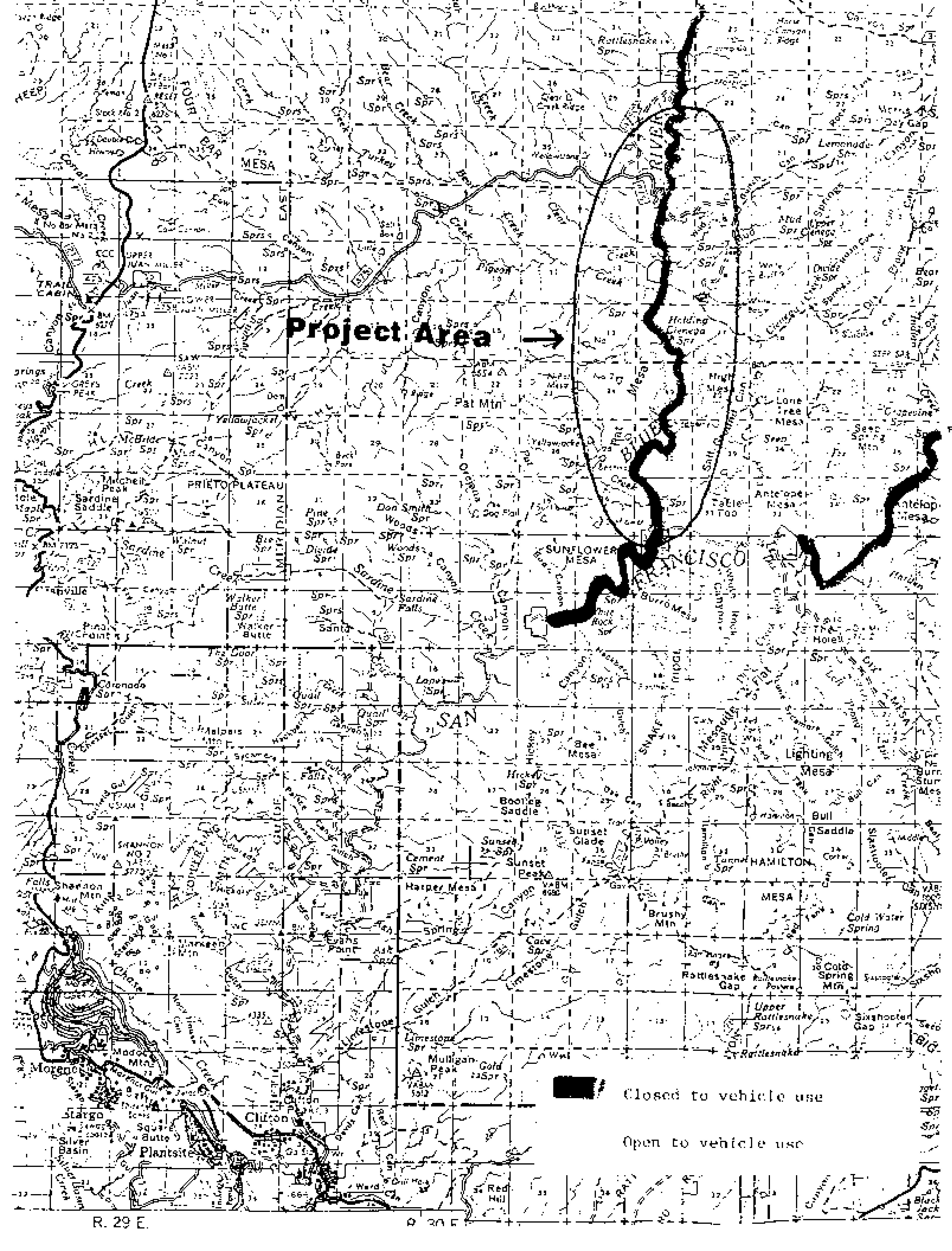
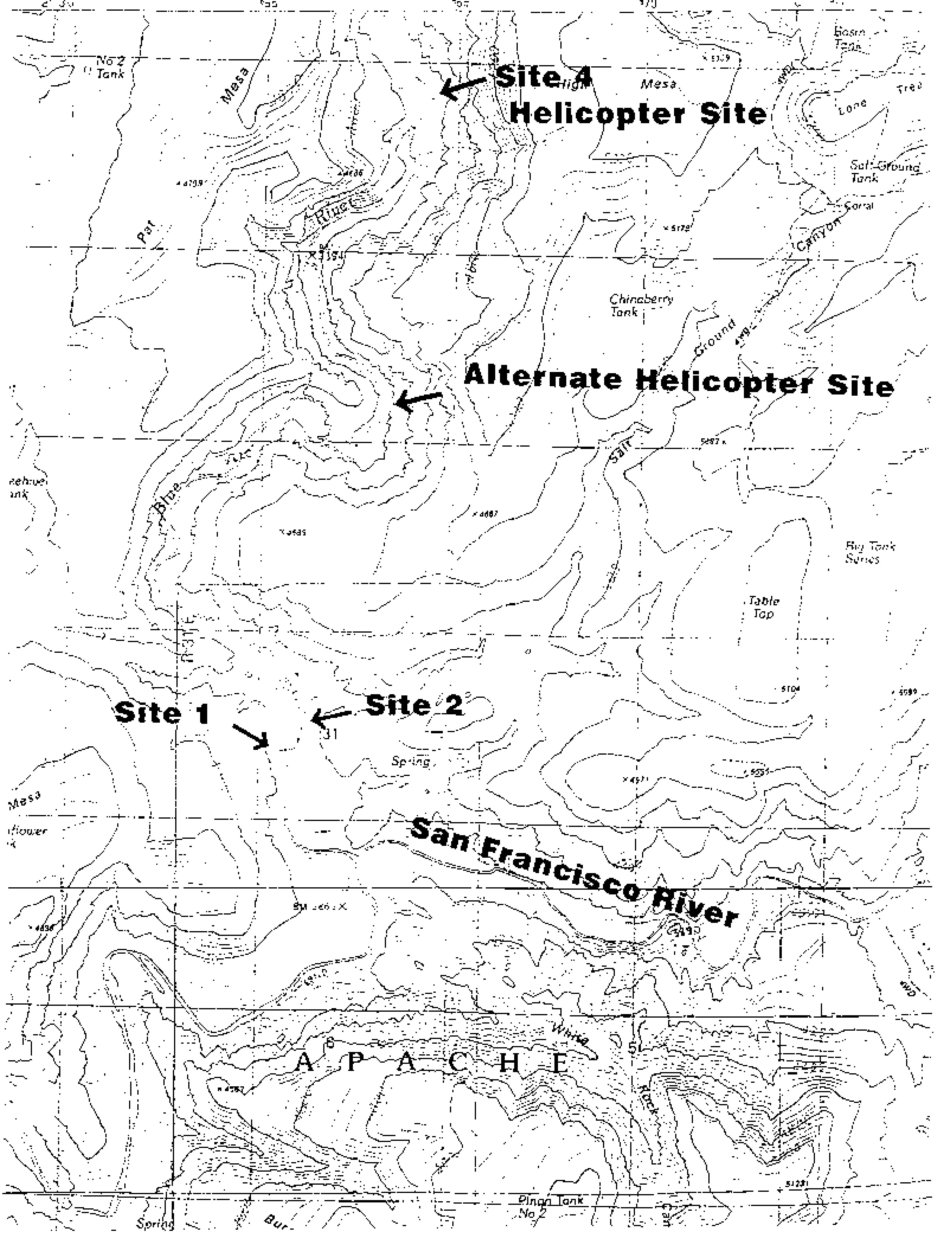

Project Area
Closed to vehicle use
Open to vehicle use
SUNFLOWER MESA
FRANCISCO
SAN
PRIETO PLATEAU
Pat Mtn
Antelope Mesa
Lone Tree Mesa
Table Top
Holding Cienega Spr
Lighting Mesa
HAMILTON
MESA
Bootleg Saddle
Sunset Peak
Harper Mesa
Brushy Mtn
Rattlesnake Gap
Mulligan Peak
Clifton
Morenci
Stargo
Plantsite
Silver Basin
Coronado
R. 29 E.

FIGURE 2

BARRIER SITES 1 AND 2

(excerpted from the July 7, 2000 Biological Assessment by Bureau of Reclamation)



Site 4
Helicopter Site
Alternate Helicopter Site
Site 1
Site 2
San Francisco River
No 2 Tank
Mesa
High Mesa
Lone
Salt Ground Tank
Corral
Canyon
Pat
Blue River
Chinaberry Tank
Ground
Salt
Big Tank Series
Table Top
Spring
White Rock
A P A C H E
Pinon Tank No 2
Spring

FIGURE 3

FOREST ROAD 475 (JUAN MILLER) LOW-WATER CROSSING SITE

(excerpted from the July 7, 2000 Biological Assessment by Bureau of Reclamation)


Juan Miller Crossing
Site 3
Garage Tank
Yellowstone Tank
Spring
Creek
Wild
Spring
Creek
Blue
Spring
Stacy Ranch
Spring
Mesa