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AESO/SE
02-21-03-F-0364

November 12, 2003

Ms. Cindy Lester
Army Corps of Engineers
Regulatory Branch
3636 North Central Avenue, Suite 760
Phoenix, Arizona 85012-1936

RE: Salt River Project's Upper Verde River Flume

Dear Ms. Lester:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was dated June 12, 2003, and received by us on June 13, 2003. At issue are impacts that may result from Salt River Project's (SRP) Upper Verde River Flume located in Yavapai County, Arizona. You concluded that the proposed action may affect spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*) and their critical habitat. You concluded "no effect" for four other Verde River listed species, the bald eagle *(Haliaeetus leucocephalus*), southwestern willow flycatcher (*Empidonax trailli extimus*), razorback sucker (*Xyrauchen texanus*), and Colorado pikeminnow (*Ptychocheilus lucius*). Those four species will not be addressed further in this opinion.

This biological opinion is based on information provided in the June 12, 2003 biological assessment, telephone conversations with SRP personnel (John Keane, Curt Kennedy, and Greg Kornrumph), field investigations, additional correspondence, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the spikedace and/or loach minnow, construction in riverbeds and its effects, or other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

Spring 2002 -	FWS, SRP, and Arizona Game and Fish Department staff conducted a Verde flume site visit.
July - October 2003 -	FWS, SRP, and Arizona Game and Fish Department staff met together periodically and separately to discuss project specific plans.
June 12, 2003 -	ACOE requested formal consultation.
July 18, 2003 -	30-day letter from FWS to ACOE confirming initiation of section 7 consultation.
October 20, 2003 -	A draft biological opinion was mailed to ACOE for review.
November 6, 2003 -	We received correspondence from the ACOE dated 11/5/03 to finalize the biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The upper Verde River Monitoring Flume project will be located in the upper Verde River on the Campbell Ranch property owned by the Arizona Game and Fish Department (Section 7, Township 17 North, Range 1 West). This site is located just a little over four miles east (or downstream) of Sullivan Lake and Arizona Highway 89 (the headwaters of the Verde River) (Map 1).

The action area of the upper Verde River Monitoring Flume will be larger than the final footprint of the flume due to the flow of water, sedimentation, fish or eggs that exist or move upstream and downstream, staging of work materials and equipment, and retrieval of flume material after large floods. As a result, we are defining the action area as the 100-year floodplain of the Verde River ½ mile upstream and downstream of the flume.

The project is expected to be constructed over seven days in October or November of 2003, but could occur in early 2004. Larger flood flows with an average return interval of seven years could damage the flume or affect its measurements, requiring SRP to do repair work in the low flow channel, or to completely re-construct the flume and retrieve materials downstream. The flume is expected to be maintained indefinitely, or until measures exist which would protect the natural flow of the Verde River. However, for section 7 purposes, this consultation is expected to cover construction, operation, and maintenance of the flume for 50 years (C. Kennedy, SRP, pers. comm.). Therefore, the flume is expected to be re-built approximately seven times, but the number will be dependent on the magnitude, frequency, and duration of flood flows. SRP will maintain

measurement records at the site, and will restore any river channel and gradient changes caused by the impact of high flows on its measurement structures.

The purpose of installing the flume is to detect whether expected pumping from the Big Chino aquifer by the City of Prescott and adjacent communities adversely affects the Verde River's base flow. Existing stream gauges on the Verde River are inadequate to determine whether or not pumping will reduce flow. The upper Verde River flume and the physical hydraulic stabilizing components will allow measurement of Verde base flows with an accuracy of 1 to 2 percent. The new flume is expected to provide much more accurate data to detect and quantify the suspected impacts on base flow from major new groundwater pumping proposed in the Verde River headwaters area.

A complete description of the Verde Flume is available from SRP and is summarized below. Steel sheet pile (interconnected curved sections of steel, forming a fence-like structure) will be used to surround the concrete flume and stabilize the gradient of the river around the flume. The sheet pile is expected to be driven into the alluvium to a depth of about eight feet. The steel sheet pile will establish a 25 x17-foot form around the concrete flume. Another section of sheet pile will extend away from the flume (perpendicular to the river channel) on the flume's upstream side. Two additional perpendicular sections of sheet pile will be installed about 200 to 270 feet upstream and 75 feet downstream of the flume to maintain the existing gradient for flume maintenance and measurement accuracy (about a 350-foot project footprint). All sheet pile will be vibrated into the alluvial substrate in a relatively straight reach of the low flow channel by a backhoe and a vibratory attachment on the backhoe's boom. The backhoe is expected to enter a portion of the stream in order to reach the opposite end. At the end of installation (after the concrete flume is set), the top of the sheet pile will be cut down to 0.1 foot below the original surface of the low flow channel, and existing channel substrate material will cover the sheet pile. The sheet pile is expected to be a minimum disturbance alternative to more common grade-stabilizing trenches filled with "riprap." Using sheet piles is expected to reduce in-channel excavation, turbidity, and downstream sedimentation during construction.

The sheet pile will initially extend above the water, acting as a rectangular barrier between the stream and concrete, to prevent any leaching of concrete into the river. Water will then be pumped from the rectangular flume location to provide a dry work location. Riverbed material will be excavated with a backhoe and forms will be placed in this dry work location to dimensionally outline the flume's shape. Concrete will then be pumped into the dry work location forming the flume. After the concrete has set, the sheet pile will be cut off at the concrete level and removed. This will allow water to flow through the flume and be accurately measured. Using this process, wet concrete will not contact the stream. This will help keep turbidity levels low and avoid changes in water chemistry from concrete contamination. Measurements of pH, dissolved oxygen, and turbidity will be collected three times daily before, during, and after construction at the site, to detect and correct any effects that could lead to fish mortality.

The concrete flume and the sheet piles that will bracket it upstream and downstream will be the largest area of disturbance. The total area disturbed will be about 50 feet by 65 feet. After the sheet piles and flume are put in place, they will be covered with the native stream gravel, so that the concrete of the flume will be visible only at the narrowest part or "neck" of the flume. Actual measurement of stream flow occurs in the flume itself, and this is the only place where the stream geometry at low flow will be changed. For a length of about 25 feet, the river flow will be constrained first to about 5 feet in the mouth or approach of the flume, then to about 2.5 feet in the throat of the flume. After the water flows through the throat of the flume, it returns to its original low flow channel width. The flume is designed to ease this transition back to wider flow. No "pools" are expected to be created by the construction in this reach of the low flow channel. The original stream gradient will be maintained.

It is expected that the largest flood events, on the average at seven-year intervals, will damage the existing flume requiring either repair or complete re-construction of the flume. Flume materials such as concrete and steel sheet piles are expected to be sent downstream by the flows. SRP has budgeted to detect and retrieve materials with a helicopter and by foot. A helicopter will be able to detect and lift large pieces of concrete or steel piles out of the river. No re-bar will be placed inside the concrete of the flume which will allow the flood forces to easily break the concrete as it is forced downstream. Some steel piles are expected to be detected and removed by ground crews by hand; however in more remote or difficult locations, the helicopter may be required to retrieve steel piles.

Conservation measures

1. In order to determine whether the presence of federally-listed fish occur in the action area when construction, re-construction, or extensive repair of the flume is needed, fish surveys will occur and extend ½ mile upstream and downstream of the flume within 5 days of construction. Fish surveys will specifically use methods that will target spikedace and other sensitive native fish, and will be conducted by permitted, qualified, and experienced fish biologists. No additional surveys will occur for the initial construction (if it occurs in 2003) due to negative results from the May 2003 surveys. If initial construction occurs in 2004, surveys, within 5 days of construction, will be initiated to determine presence or absence of listed fish.

2. Should any spikedace be detected in the action area, block nets will be established upstream and downstream of the project foot print. Block nets will enclose the entire footprint of any work inside the river channel (approximately 350 feet apart) to account for the area between the upstream and downstream sheet piles. As many listed and other native fish that can be reasonably collected and removed in a single day will be moved and placed upstream (preferably) or downstream of the block nets and footprint of the action area in order to reduce and minimize direct mortality. Capture, removal, and transportation of fish from the netted area will be conducted by permitted, qualified, and experienced fish biologists. This work will occur within 5 days of the construction, re-construction, and extensive repair with block nets maintained until construction is completed. No work will be needed for the initial construction (if it occurs in 2003) due to negative results from the May 2003 surveys.

3. The use of sheet pile is expected to be a minimum disturbance alternative to more common grade-stabilizing trenches filled with "riprap." Using sheet piles is expected to reduce in-channel excavation, turbidity, and downstream sedimentation during construction.

4. The sheet pile will initially extend above the water, acting as a rectangular barrier between the stream and concrete, to prevent any leaching of concrete into the river.

5. The concrete will be set and hardened adequately before the top of the sheet pile is cut and water is allowed to flow in order to ensure that concrete does not leach into the stream and alter water chemistry.

6. Measurements of pH, dissolved oxygen, and turbidity will be collected three times daily before, during, and after construction at the site to detect and correct any effects that could lead to fish mortality.

7. Staging of equipment will occur outside of the 100-year floodplain. Flume and sheet pile installation locations were chosen so that no woody riparian vegetation will need to be removed.

8. Flume materials will be collected that are sent downstream as a result of flood flows.

STATUS OF THE SPECIES

Spikedace

Spikedace was listed as a threatened species on July 1, 1986 (U.S. Fish and Wildlife Service 1986a). Critical habitat was designated on April 25, 2000 (65 FR 24328) and 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 recently known only from the upper 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, Arizona Game and Fish Department 1999, 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).

Of the large streams where spikedace were historically recorded in Arizona, the only recent detections have occurred on the upper Verde River. Spikedace were first detected in Arizona in the mid-1800s (Minckley 1973). It was considered widespread throughout the Gila Basin, including the Salt, Verde, San Pedro, and Gila rivers, and their major tributaries. Spikedace are

no longer found on the Salt and San Pedro rivers, or the Gila River in Arizona. Spikedace can, however, be found on the upper Gila River in New Mexico.

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 spawn 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 that eggs are laid over gravel and cobble where they adhere to the substrate. Spikedace live 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).

Constituent elements of critical habitat include those habitat features required for the physiological, behavioral, and ecological needs of the species. For spikedace, these include:

1. Permanent, flowing, unpolluted water;

2. Living areas for adult spikedace with slow to swift flow velocities in shallow water with shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand and gravel bars, and eddies at downstream riffle edges;

3. Living areas for juvenile spikedace with slow to moderate flow velocities in shallow water with moderate amounts of instream cover;

4. Living areas for larval spikedace with slow to moderate flow velocities in shallow water with abundant instream cover;

5. Sand, gravel, and cobble substrates with low to moderate amounts of fine sediment and substrate embeddedness;

6. Pool, riffle, run, and backwater components present;

7. Low stream gradient;

8. Water temperatures in the approximate range of 35-85°F with natural diurnal and seasonal variation;
9. Abundant aquatic macroinvertebrate food base [prey may include the taxa Ephemeroptera, Chironomidae, and Trichoptera (Sublette *et al*.1990)];

10. Periodic natural flooding;

11. A natural, unregulated hydrograph or, if the flows are modified or regulated; then a hydrograph that demonstrates an ability to support a native fish community; and

12. Habitat devoid of nonnative aquatic species detrimental to spikedace, or habitat in which detrimental nonnative species are at levels which allow persistence of spikedace.

The constituent elements are generalized descriptions and ranges of selected habitat factors that are critical for the survival and recovery of spikedace. The appropriate and desirable level of these factors may vary seasonally and is highly influenced by site-specific circumstances. Therefore, assessment of the presence/absence, level, or value of the constituent elements must include consideration of the season of concern and the characteristics of the specific location. The constituent elements are not independent of each other and must be assessed holistically, as a functioning system, rather than individually. In addition, the constituent elements need to be assessed in relation to larger habitat factors, such as watershed, floodplain, and streambank conditions, stream channel geomorphology, riparian vegetation, hydrologic patterns, and overall aquatic faunal community structure.

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 are 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, Tibbets 1993).

The status of spikedace is declining rangewide. In Arizona, reliable detections of spikedace are currently known from Aravaipa and Eagle creeks. Although it is currently listed as threatened, we have 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 (U.S. Fish and Wildlife Service 1994).

Loach Minnow

Loach minnow was listed as a threatened species on October 28, 1986 (U.S. Fish and Wildlife Service 1986b). Critical habitat was designated on April 25, 2000 (65 FR 24328) and 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). Historical 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, U.S. Bureau of Land Management 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). Loach minnows feed exclusively on aquatic insects (Schrieber 1978, Abarca 1987). Spawning occurs in March through May (Britt 1982, Propst *et al*. 1988); however, under certain circumstances loach minnows also spawn in the autumn (Vives and Minckley 1990). The eggs of loach minnows 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).

The primary constituent elements for loach minnow critical habitat include:

1. Permanent, flowing, unpolluted water;

2. Living areas for adult loach minnows with moderate to swift flow velocities in shallow water with gravel, cobble, and rubble substrates;

3. Living areas for juvenile loach minnows with moderate to swift flow velocities in shallow water with gravel, cobble, and rubble substrates;

4. Living areas for larval loach minnows with slow to moderate flow velocities in shallow water with sand, gravel, and cobble substrates and abundant instream cover;

5. Spawning areas for loach minnow with slow to swift flow velocities in shallow water with uncemented cobble and rubble substrate;

6. Low amounts of fine sediment and substrate embeddedness;

7. Pool, riffle, run, and backwater components present;

8. Low to moderate stream gradient;

9. Water temperatures in the approximate range of 35-85°F with natural diurnal and seasonal variation;

10. Abundant aquatic macroinvertebrate food base [prey may include chironomids, simuliids, ephemeropterans, plecopterans, and tricopterans and juvenile loach minnows generally take chironomids (Sublette *et al.* 1990)];

11. Periodic natural flooding;

12. A natural, unregulated hydrograph or, if the flows are modified or regulated; then a hydrograph that demonstrates an ability to support a native fish community; and

13. Habitat devoid of nonnative aquatic species detrimental to loach minnow, or habitat in which detrimental nonnative species are at levels which allow persistence of loach minnow.

These constituent elements are generalized descriptions and ranges of selected habitat factors that are critical for the survival and recovery of loach minnow.

As noted under spikedace, the appropriate and desirable level of these factors may vary seasonally and is highly influenced by site-specific circumstances. Therefore, assessment of the presence/absence, level, or value of the constituent elements must include consideration of the season of concern and the characteristics of the specific location. The constituent elements are not independent of each other and must be assessed holistically, as a functioning system, rather than individually. In addition, the constituent elements need to be assessed in relation to larger habitat factors, such as watershed, floodplain, and streambank conditions, stream channel geomorphology, riparian vegetation, hydrologic patterns, and overall aquatic faunal community structure.

Recent biochemical genetic work on loach minnow indicate that 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, we have 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 (U.S. Fish and Wildlife Service 1994).

Spikedace and Loach Minnow Critical Habitat

The Verde River complex, which is comprised of the Verde River and some of its main tributaries, has been segregated into six distinct geographical units based upon relative proximity to a major tributary or the Verde River itself. Critical habitat includes 106 miles of the Verde River, extending from Sullivan Dam downstream to the confluence with Fossil Creek.

Critical habitat has also been designated in 5th code watersheds, specifically in major tributaries to the Verde River. These tributaries include Fossil Creek (5 miles), West Clear Creek (7 miles), Beaver/Wet Beaver Creek (21 miles), Oak Creek (34 miles), and Granite Creek (1.4 miles). The tributary streams within the Verde River complex are believed to be unoccupied at the present time although they offer potential habitat for spikedace and loach minnow (U.S. Fish and Wildlife Service 2000).

The relatively stable hydrologic and thermal regimes of the Verde River complex are unique compared to other river systems of the arid southwestern United States (U.S. Fish and Wildlife Service 2000). The combination of these factors provides a promising prospect of future recovery efforts for these species within the reaches in the Verde River complex.

Formal consultation has documented various effects from Federal actions to spikedace and loach minnow which contribute to the status of the species on the Verde River (Appendix 1). Some of these actions contained components that lessened adverse effects of ongoing actions or were aimed at improving watershed conditions in the context of the proposed action (livestock grazing management changes, etc.). Although take was authorized in many instances, actions to reduce and minimize take through reasonable and prudent measures were mandated.

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 which are contemporaneous with the consultation process. The environmental baseline defines the current 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.

The Verde River monitoring flume location will be at an elevation of approximately 4250 feet on Arizona Game and Fish Department's Campbell Ranch. The upper Verde watershed includes extensive areas of the Prescott National Forest, private and State land, as well as land managed by the Kaibab and Coconino national forests. The surrounding uplands of the watershed include a mixture of juniper woodlands and desert grasslands. At the project site, the river bottom has widened. The Verde River has left an older, higher terrace. A lower terrace of sand, gravel, and cobble is only two to three feet above the low flow channel. This low terrace on the north side of the Verde River has a discontinuous, relatively narrow string of riparian trees typically set back some 10 to 15 feet from the low flow channel. The dominant trees are Goodding willow (*Salix gooddingii*) and cottonwood (*Populus fremontii*), with an occasional alder (*Alnus oblongifolia*).

There are a complex variety of issues in the Verde River watershed that influence the habitat and threatened and endangered fish throughout the action area. The effects of habitat-related stressors caused by numerous land uses are made more difficult to assess by the added presence of non-native predatory fish. Past and current stockings of exotic fish, main-stem Verde River

impoundments (such as Horseshoe Lake, Stillman Lake, and Peck's Lake), illegal private stockings, stock tanks, and impoundments on tributaries (such as Watson Lake) all provide sources and habitat for exotic predatory fish in the action area. Watson Lake, developed for municipal use along Granite Creek, supports non-native predatory fish and the creek flows into the Verde River near the project site. Overall, approximately nine nonnative fish species occur within the Verde River system and six exotic fish species were recently detected within the action area. Crayfish (*O. virilis*) and bullfrogs, other nonnative species present in the Verde River system and in the action area, also pose a threat to native fish through direct predation.

Development in the Verde River watershed has become a considerable threat to perennial flow of the Verde River in the action area and it is exacerbated by land exchanges between public and private entities. Towns such as Prescott, Prescott Valley, and Chino Valley are continuing to search for land to develop as the human population in Yavapai County continues to increase (SWCA 2001). Increasing human populations require more water and systems to deliver water, and this particular area of Arizona depends upon pumping of regional aquifers for domestic use. The Town of Prescott has acquired the rights to purchase a large section of land (CV Ranch) on top of the Big Chino aquifer that is expected to be a pumping site (G. Kornrumph, Salt River Project, pers. comm.). While some groundwater pumping has taken place historically from the Big Chino aquifer, the growing Prescott area has increasingly focused its future water supply planning on use from this aquifer. Water entrepreneurs, private developers, and now the City of Prescott have all formulated plans to pump from this aquifer. Controversy exists on how pumping from the Big Chino aquifer will affect the flow of the Verde River, and its aquatic and riparian communities. A recent U.S. Geologic Survey Report (Wirt and Hjalmarsson 2000) concluded that the Big Chino Aquifer provides 80 percent of the baseflow of the Verde River. This portion of Arizona was declared by the Department of Interior as one of the most critical concerns for water supply over the next 25 years.

The construction site of the flume is inside Arizona Game and Fish Department's Campbell Ranch. While public access and trespass cattle exert some pressure on the river and riparian habitat from trampling, road use, herbivory, etc., the land is protected from development or surface water withdrawls. The flow of the Verde River in this area is primarily base flow from the Verde River headwaters.

In and surrounding the action area, livestock grazing on small portions of private lands and on U.S. Forest Service land throughout the Verde River floodplain and watershed has occurred since the 1880s, soon after settlers moved into the Valley (Tellman *et al.* 1997). By 1913, erosion, from damage to the watershed, had deepened the river channel. Beginning in the mid to late 1990s, the Prescott and Coconino national forests began to fence livestock grazing out of the floodplain on portions of the Verde River on Forest Service lands. Concerns still persist on the adverse effects of grazing in upland ranges on stream function. Current soils analysis of the upper most portion of the Verde River watershed determined that conditions were approximately 37 percent satisfactory and 73 percent impaired or unsatisfactory. Consultation on 16 grazing allotments on the upper Verde River watershed (U.S. Forest Service, 2001b, U.S. Fish and

Wildlife Service, 2002) concluded that the proposed grazing system would continue to adversely affect spikedace and loach minnow critical habitat. Because of the small size of the action area (one-mile) no consultations have occurred at the specific location of the flume.

Recent improvement to the upper Verde River riparian area and stream function has been detected in some areas from the improved fencing of livestock out of the floodplain. While livestock still access the Verde River floodplain on private land, and trespass cattle persist on Forest lands, improved streamside vegetation, stream function, and geomorphology have been detected since the mid-1990s when cattle were better managed. Currently, many critical habitat concerns are being met in the action area except for the significant presence of non-native exotic aquatic predators (fish, invertebrates, and amphibians) and continued watershed effects from degraded uplands. However, existing plans to develop and pump from the Big Chino aquifer threaten to significantly adversely affect the base flow of the Verde River, critical habitat for spikedace and loach minnow, and the ecosystem those fish depend upon.

Status of the species and critical habitat within the action area

Spikedace

Since 1996, spikedace detections from the upper most reach of the Verde River (Rinne 1999) have been rare, with none found in 1997 and 1998, and one found in 1999 (Arizona Game and Fish Department 1999). The most recent 1999 detection occurred 1.5 river miles downstream from where the Verde Flume is proposed for construction. Spikedace were detected regularly throughout much of the 1980s and 1990s between the Verde River headwaters and Sycamore Creek (about 38 miles of river including the action area) (Map 2 and 3). However, about 40 miles downstream (from Sycamore Creek) near Camp Verde, sightings of spikedace last occurred in 1938 and 1950 (U.S. Forest Service 2001a).

The lack of spikedace detections may be related to the lack of recent search effort. Comprehensive surveys for spikedace for the entire upper Verde River are lacking (R. Bettaso, Arizona Game and Fish Department, pers. comm.). The most consistent and recent surveys that have regularly and systematically targeted spikedace over the last seven years have occurred over a 1.3 mile stretch (separated into seven 980 foot sections) on the upper-most reach of the Verde River (U.S. Forest Service 2001a). Because of this species' small size, it is difficult to detect small populations with existing methodologies such as backpack shocking and seining, which are not as effective when fish are more rare. Native fish biologists from the Arizona Game and Fish Department (R. Bettaso), U.S. Fish and Wildlife Service (S. Leon), and U.S. Forest Service (J. Rinne) believe that spikedace, while rare, still persist in the upper-most reach of the Verde River.

While recent detections of spikedace have been rare, that does not ensure or necessarily indicate that the species is extirpated or will be rare in the future. Spikedace distribution and abundance go through dramatic fluctuations as a result of natural and regional conditions such as flood events (U.S. Fish and Wildlife Service 1991). As a result, it would not be unexpected for small mobile fish populations to naturally expand and contract within the action area. Constituent elements of the species' critical habitat are generally met with the exception of "habitat devoid of non-native aquatic species detrimental to the spikedace."

Other factors are expected to influence the distribution and abundance of spikedace in the action area. Because of the recent changes in grazing management within the floodplain, we expect riverine habitat, stream geomorphology, and riparian habitat to change as a result of drought and flooding, thus altering the location and/or possibly increasing preferred habitat for spikedace. In addition, it is possible that future management will directly reduce nonnative exotic species predation levels leading to increased spikedace abundance. Also, it is possible that improved survey intensity and frequency will result in a more conclusive status of the species (more comprehensive surveys have just been funded). Finally, captive rearing techniques are being refined (R. Bettaso, Arizona Game and Fish Department, pers. comm.) that we hope will provide spikedace for future stocking.

On May 15, 2003, Arizona Game and Fish Department Fisheries staff from Region III sampled the Verde River at the project footprint. An electrofish unit was used and special emphasis was given to small-bodied fish such as spikedace. A total of 508 fish were detected in about 50 minutes of electro-fishing. Fish species detected were desert sucker, Sonora sucker, roundtail chub, smallmouth bass, yellow bullhead, green sunfish, common carp, mosquitofish, and red shiner. Smallmouth bass and red shiner represented 396 of the fish detected, while native fish totaled 98 fish. Crayfish and bullfrogs were also detected. No spikedace, loach minnow, or other federally-listed fish were detected.

Loach minnow

Loach minnows are considered extirpated from the entire Verde River system, with the last confirmed observations occurring in 1938 above Camp Verde (Minckley 1993, U.S. Forest Service 2001a, Girmendock and Young 1997). Ongoing surveys for loach minnow in tributaries of the Verde River have been negative (U.S. Fish and Wildlife Service unpubl. data). No loach minnows were detected in the May 2003 fish survey of the project footprint.

Based on existing information, it is unlikely loach minnow persist in the upper Verde River and in the action area. However, similar to spikedace, the upper Verde River was designated as critical habitat with the expectation that this portion of the stream would provide habitat for its recovery. Therefore, future management actions and stockings may result in loach minnows occurring in the action area. The current quality of critical habitat is less than desirable mainly because of the persistence of exotic nonnative predatory aquatic wildlife.

The action area represents approximately 1 mile of the 106 miles of spikedace and loach minnow critical habitat designated on the main stem of the Verde River.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent

actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Effects to spikedace and loach minnow critical habitat

The installation and periodic re-construction or repair of the Verde Flume has been proposed and designed in a way that is expected to cause the least amount of impact to the Verde River and critical habitat. However, to collect the low river flow data needed, intrusive measures, repeated periodically over a 50-year period, will result in some adverse affects to spikedace and loach minnow critical habitat. Short-term adverse affects to critical habitat are anticipated to occur from flume construction and future repair and re-construction, and long-term effects from stream and gradient stabilization, changes in river flow, and loss of fish habitat.

In order to maintain accurate measurements, the gradient and stream around the Verde Flume must be stabilized by steel sheet piles to allow the water to move through the "mouth and throat" of the flume and be measured accurately. This stabilization, while expected to be less intrusive than more elaborate designs using rip-rap or other heavier and more permanent materials, could lead to some stream adjustments downstream, thereby disturbing the river channel's dynamic equilibrium. Maintenance of the stream's dynamic equilibrium requires the full range of flows occurring in nature and "it is an important characteristic of a natural channel to accept both high and low flows with their associated sediment load without long-term changes in morphology" (Leopold 1997). Floods may rearrange materials within the channel and floodplain, but the channel returns to a state that is determined by geology, gradient, and sediment load, among other factors. The stream's dynamic equilibrium does not mean the stream channel always returns to exactly the same location. "The manner in which a channel moves across the valley floor, eroding one bank and building a nearly flat floodplain on the other, while maintaining a cross section approximately constant in shape and size, is an aspect of the dynamic equilibrium that characterizes many channel systems" (Leopold 1997).

Some increased sedimentation and alteration of channel configuration could be expected from the disruption of the river's dynamic equilibrium. Human disturbance of the watershed, floodplain, and stream channel alters many of the factors determining channel configuration. When the dynamic equilibrium has been disrupted, the channel begins a process of adjustment as it attempts to restore a dimension, pattern, and profile that are consistent with controlling hydraulic variables (Rosgen 1996). These adjustments may lead to changes (often downstream) in the stream channel width, depth, and geometry, altering habitat for spikedace and loach minnow. While the 350 feet of river gradient and stabilization measures created for the Verde Flume are comparatively conservative, the river channel is expected to adjust downstream, possibly by increasing sedimentation. As a result, there is an anticipated adverse effect to spikedace and loach minnow critical habitat over the life of the project due to stabilization of 350 feet of the Verde River.

Installation of steel sheet piles driven approximately eight feet into the alluvium and in-stream excavation for flume construction are expected to create a short-term increase in downstream sedimentation. Steel sheet piles will be driven into the alluvium, forming a rectangle at the location of the concrete flume, and perpendicular sections of sheet pile will occur at the upstream end of the flume, and upstream and downstream of the flume. Driving steel piles into the alluvium by a backhoe with a boom vibration attachment is expected to create sediment. In order to install the concrete flume, the riverbed must be excavated in order to create space for the flume. Excavation of riverbed material is expected to increase downstream sedimentation during flume construction and any future repairs or re-construction. The backhoe used for steel pile driving and excavation is expected to enter into the stream to reach the opposite sides of the river, resulting in an increase in sedimentation. An increased amount of fine sediment adversely affects critical habitat, because both species require low amounts of fine sediment and substrate embeddedness.

Critical habitat will be adversely affected by pouring concrete into the riverbed (forming the shape of the flume) and forcing base flows through the flume's 5 foot "mouth" and 2.5 foot "throat." While native riverbed materials will be placed on top of the flume after construction, we do not expect this material to persist. Only 0.1 feet of riverbed material will sit on top of the concrete flume. At a minimum, we expect that the new concrete sides lining the river channel (forcing water into the flume's "mouth and throat" for measurement) will be exposed. Additionally, the flow of water throughout the riverbed along this 25 foot section of river will be altered by constraining its flow through the flume and not allowing it to move across the riverbed. Because concrete will replace a portion of the riverbed habitat, and low flows will be funneled and altered through the narrower "mouth and throat" of the flume, spikedace and loach minnow critical habitat will be adversely affected.

Indirect and direct effects to species

A combination of factors including the natural history of the spikedace, the long-term nature of the project, and proposed conservation measures will influence and determine whether incidental take of spikedace is reasonably certain to occur. Spikedace are expected to have natural and managed variations in their distribution and abundance over time. Throughout the 1980s and 1990s, spikedace were detected upstream and downstream of the action area. The most recent spikedace detection in 1999 occurred 1.5 miles downstream from the project footprint. The flume will require periodic re-construction and repair over the 50-year consultation period following the largest flood events (average of once every 7 years). Surveys proposed and implemented by SRP before any work is initiated will determine if spikedace are present in the one mile action area at the time of construction and future repair/re-construction, and as a result, whether incidental take is reasonably certain to occur.

No loach minnows have been detected in the Verde River for 65 years. As a result, unless the status of loach minnow changes, we do not expect incidental take of loach minnow to occur. Reinitiation of consultation may be required if loach minnows are detected or introduced into the upper Verde River near the action area.

Any damage to the Verde River Flume is expected to occur from winter or early spring floods with re-construction or repair work following the flood season in the spring. It is important to repair or re-construct the flume as soon as possible to minimize loss of data. Thus, work in the stream channel is expected to occur during the March-to-May spikedace spawning season.

The shocking, seining, handling, and moving of spikedace from the netted project footprint is expected to minimize direct mortality from riverbed excavation, steel pile driving, and concrete pouring. However, this interrelated action will result in taking of any spikedace present, and some fish may die in this process.

Increased sedimentation from installation of steel pilings, the backhoe entering the river, and excavation of river bed material for the 25 x 17-foot concrete flume is expected to cause direct mortality of spikedace eggs and fry at and downstream of the project footprint. Adverse effects of stream sedimentation to fish and fish habitat have been extensively documented (Murphy et al. 1981, Wood et al. 1990, Newcombe and MacDonald 1991, Barrett 1992, Waters 1995). Excess sediment fills the interstitial spaces where eggs live and may smother them (Propst et al. 1988) or newly formed juvenile fish.

Direct mortality to spikedace, eggs, and/or fry is anticipated to occur during excavation, pumping, and de-watering the 25x17-foot concrete flume area and installation of steel pilings. Electro-fishing and seining are not expected to be 100 percent effective in detecting and removing all spikedace from the 350-foot project footprint. As a result, the driving of piles, pumping of water, the backhoe entering the river, excavation of riverbed material, and pouring of concrete into the riverbed could cause direct mortality to fish and/or eggs/fry by crushing, impact, exposure, or being smothered.

Riverbed disturbance and construction related aspects of the Verde flume are expected to happen about seven times over the next 50 years, and over that time spikedace distribution and abundance are expected to be dynamic. In some years, spikedace may be present in the action area, and at other times, spikedace may be absent.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Water quantity in the action area is likely to be reduced from future residential and commercial development in Yavapai County surrounding the headwaters of the Verde River. The Arizona Department of Economic Security predicted that the year-round population in Yavapai County from 1997 to 2010 would increase about 37 percent, or about 2.8 percent annually (SWCA 2001). As a result, residential and commercial developments will escalate use of the Verde River's resources for water, recreation, agriculture, etc.

The future availability of surface water and groundwater to maintain river flow and other important river functions for listed species and critical habitat is threatened by groundwater pumping from the Big Chino aquifer at the headwaters of the Verde River. This aquifer provides 80 percent of the base flow of the upper Verde River (Wirt and Hjalmarsson 2000). Several cities, including Prescott, Prescott Valley, and Chino Valley have developed proposals to pump water from this aquifer and deliver water through a pipeline to these growing communities (Office Assist Enterprises, 1999). Future projects such as the pumping of the Big Chino aquifer are anticipated to significantly alter the hydrology and groundwater of the Verde River, and subsequently the maintenance and recovery of habitat for listed species.

The cumulative effects of development on fish habitat in the upper Verde River are significant. The expected growth, development, recreation, and reliance on the resources of the Verde River will escalate. While the immediate area surrounding the project footprint is protected from development through from management by the Arizona Game and Fish Department, the water flowing through it is significantly threatened.

CONCLUSION

After reviewing the current status of spikedace and loach minnow, the environmental baseline for the action area, the effects of the proposed Verde River flume, and the cumulative effects, it is the U.S. Fish and Wildlife Service's biological opinion that the Verde Flume, as proposed, is not likely to jeopardize the continued existence of spikedace or loach minnow, and is not likely to destroy or adversely modify designated spikedace and loach minnow critical habitat.

The direct and indirect effects of the action on spikedace are expected to occur about seven times over 50 years. Currently, loach minnow are believed to be extirpated from the Verde River. While spikedace are currently considered rare, we believe that the species will be reasonably certain to occur in the action area over the 50-year life of the flume. During instances when spikedace are present during construction, direct mortality to fish will be minimal due to localized nature of effects and proposed conservation measures. If spikedace are detected during formalized surveys immediately before construction, fish will be moved out of harm's way and prevented from accessing the project footprint until construction is finished. Effects of sedimentation to fish, eggs, or fry are not expected to be significant and are expected to be restricted to the one-mile action area during construction.

Critical habitat will be adversely affected for the 50-year length of this consultation. However, of the 106 miles of critical habitat in the Verde River complex, only about a 350-foot portion of river will be stabilized and a 25-foot reach of river where the flume exists will be significantly altered. The loss of this habitat to the flume is not expected to adversely modify or destroy critical habitat because water will still be flowing, and the loss and alteration of critical habitat is small compared to the overall amount. Critical habitat will be periodically disrupted for re-construction of the flume, but those disruptions will only occur for about 7 weeks over 50 years.

While aspects of this project are expected to cause some mortality, disrupt a portion of habitat, and permanently alter a section of the riverbed, the overall intent of installing the flume is to protect Verde River water flow. Maintaining river flow is the most essential component to preserving fish. Because the results from information collected by the flume are expected to be used to help maintain Verde River flow, this project should benefit spikedace, loach minnow, critical habitat, and other aquatic-dependent species on the Verde River.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is defined (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Incidental take of spikedace is expected to occur during construction and re-construction of the Verde Flume over the 50-year life of this consultation. Excavation, water pumping, de-watering the river, backhoe operations, pouring concrete, steel pile driving, and the subsequent sedimentation from these tasks are expected to cause direct mortality to spikedace adults, eggs, and/or fry from crushing, smothering, exposure, or impact. Incidental take in the form of harassment, capture, and direct mortality is expected to occur when spikedace are electro-shocked, seined, handled, and transported away from the project footprint.

The measures described below are non-discretionary, and must be undertaken by the Army Corps of Engineers so that they become binding conditions of any grant or permit issued to the Salt River Project, as appropriate, for the exemption in section 7(o)(2) to apply. The Army Corps of Engineers has a continuing obligation to regulate the activity covered by this incidental take statement. If the Army Corps of Engineers (1) fails to assume and implement the terms and conditions or (2) fails to require the Salt River Project to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant

document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Army Corps of Engineers and/or Salt River Project must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The FWS does not anticipate the proposed action will incidentally take any loach minnows. The fish has not been detected in the Verde River for about 65 years.

The FWS anticipates incidental take of spikedace will be difficult to observe for the following reasons. Spikedace eggs, fry, and fish are small, blend into their environment, and occur underwater in a flowing river. Project implementation will increase sedimentation, thus creating a turbid river environment making it difficult to see fish. Water flow may move specimens out of the immediate area of detection. Heavy equipment will be used and, as a result, safety concerns are expected to prevent observers from being near the area of impact to see small items. As a result, we provide a surrogate measure to estimate the extent of take and when authorized incidental take will be considered exceeded:

1. We anticipate the extent of incidental take to include all fish, fry, and eggs in the action area when spikedace are known to be present during seven construction or reconstruction periods. Authorized incidental take will be exceeded if, over the 50-year consultation period, more than seven instances of flume construction and/or re-construction occurs when spikedace are known to be present.

EFFECT OF TAKE
In the accompanying biological opinion, we determined that this level of anticipated take is not likely to result in jeopardy to spikedace.

REASONABLE AND PRUDENT MEASURES and TERMS AND CONDITIONS

The following reasonable and prudent measures and terms and conditions are necessary and appropriate to minimize take of spikedace. In order to be exempt from the prohibitions of section 9 of the Act, the Army Corps of Engineers must comply with the following terms and conditions, which implement the reasonable and prudent measures and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The Army Corps of Engineers shall monitor and report results of any surveys and incidental take resulting from the proposed action to the FWS.

    1.1 The Army Corps of Engineers and Salt River Project shall submit monitoring reports to the Arizona Ecological Services Field Office within 90 days of the completion of any Verde flume construction or re-construction activities. These reports shall briefly

document the effectiveness of project implementation, locations of listed species observed and, if any are found dead, the suspected cause of mortality. The report shall also summarize tasks accomplished under the proposed minimization measures such as survey results, movement success, etc. The report shall make recommendations for modifying or refining proposed conservation measures or these terms and conditions to enhance listed species protection.

2. The Army Corps of Engineers shall protect stream quality of the Verde River for spikedace.

2.1 The Army Corps of Engineers and Salt River Project shall ensure that when heavy machinery, such as a backhoe, enters the riverbed and/or live stream it will be for the least amount of time possible to minimize the likelihood and/or extent of toxic compounds entering the Verde River, sedimentation, and fish mortality.

2.2 The Army Corps of Engineers and Salt River Project shall ensure that any heavy machinery not continuously in use will immediately leave Verde River.

2.3 The Army Corps of Engineers and Salt River Project shall ensure that any heavy machinery will be staged at the end of each work-day out of the 100-year floodplain.

2.4 The Army Corps of Engineers and Salt River Project shall ensure that all heavy equipment used to enter the stream has been examined and determined to not have toxic compounds on the surface of the machine that would cause fish mortality and does not leak any fluids that could enter the river and cause mortality.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Army Corps of Engineers must immediately provide an explanation of the causes of the taking and review with the AESO the need for possible modification of the reasonable and prudent measures.

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Due to the long-term nature of this project, we recommend that the Army Corps of Engineers periodically review and discuss with us the status of critical habitat and federally listed fish in order to determine whether reinitiation of consultation is appropriate.

2. We recommend the Army Corps of Engineers contribute to recovery efforts for spikedace and loach minnow by participating in recovery teams and implementing and/or assisting in funding recovery actions.

3. We recommend that the Army Corps of Engineers work with managing agencies and communities in finding innovative ways to protect and maintain natural base flow in the upper Verde River.

4. We recommend the Army Corps of Engineers work with managing agencies to fund and implement more thorough, comprehensive, and regular surveys along occupied and historical streams in order to better determine the status of spikedace and other small-bodied listed fish species.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in your June 12, 2003 request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect 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 not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The FWS appreciates the Army Corps of Engineers efforts to identify and minimize effects to listed species from this project. For further information please contact Greg Beatty (x247) or Debra Bills (x239). Please refer to the consultation number, 02-21-03-F-0364, in future correspondence concerning this project.

Sincerely,

/s/ Steven L. Spangle
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
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LITERATURE CITED

Abarca, F.J. 1987. Seasonal and diet patterns of feeding in loach minnow (*Tiaroga cobitis*). Proceedings of the Desert Fishes Council 20:20.

Anderson, R.M. 1978. The distribution and aspects of the life history of Meda fulgida in New Mexico. MS Thesis. New Mexico State University, Las Cruces. 62 pp.

Anderson, A.A. and D.A. Hendrickson. 1994. Geographic variation in morphology of spikedace, Meda fulgida, in Arizona and New Mexico. The Southwestern Naturalist 39(2):148-155.

Arizona Game and Fish Department. 1999. Annual Summary; Statewide Fisheries Management (Work Plan 1, Job 3); Project Numer F-7-02-41).

Bagley, B.E., G.W. Knowles, and T.C. Inman. 1995. Fisheries surveys of the Apache-Sitgreaves National Forests, trip reports 1-9. May 1994 to September 1995. Arizona State University, Tempe, Arizona. 50 pp.

Bagley, B.E., G.H. Schiffmiller, P.A. Sowka, and P.C. Marsh. 1996. A new locality for loach minnow, Tiaroga cobitis. Proceedings of the Desert Fishes Council 28:8.

Barber, W.E. and W.L. Minckley. 1966. Fishes of Aravaipa Creek, Graham and Pinal Counties, Arizona. The Southwestern Naturalist 11(3):313-324.

Barber, W.E., D.C. Williams, and W.L. Minckley. 1970. Biology of the Gila spikedace, Meda fulgida, in Arizona. Copeia 1970(1):9-18.

Barber, W.E. and W.L. Minckley. 1983. Feeding ecology of a southwestern Cyprinid fish, the spikedace, Meda fulgida Girard. The Southwestern Naturalist 28(1):33-40.

Barrett, J.C. 1992. Turbidity-induced changes in reactive distance of rainbow trout. Transactions of the American Fisheries Society 121:437-443.

Britt, K.D. 1982. The reproductive biology and aspects of the life history of Tiaroga cobitis in southwestern New Mexico. New Mexico State University, Las Cruces. 56 pp.

Douglas, M.E., P.C. Marsh, and W.L. Minckley. 1994. Indigenous fishes of western North America and the hypothesis of competitive displacement: Meda fulgida (Cyprinidae) as a case study. Copeia 1994(1):9-19.

Girmendock, A.L. and Young, K. L. 1997. Status review of the roundtail chub (Gila robusta) in the Verde River basin. Nongame and Endangered Wildlife Program Technical Report 114, Arizona Game and Fish Department, Phoenix, AZ. 94 pp.

Jakle, M. 1992. Memo February 26, 1992 - Summary of fish and water quality sampling along the San Pedro River from Dudleyville to Hughes Ranch near Cascabel, October 24 and 25, 1992, and the Gila River from Coolidge Dam to Ashurst/Hayden Diversion Dam, October 28 - 31, 1991. U.S. Bureau of Reclamation, Phoenix, Arizona. 11 pp.

Knowles, G.W. 1994. Fisheries survey of the Apache-Sitgreaves National Forests, third trip report: Eagle Creek, June 05 - 07 and August 02, 1994. Arizona State University, Tempe, Arizona. 6 pp.

Leopold, L.B. 1997. Water, rivers and creeks. University Science Books, Sausalito, CA. 185 pp.

Marsh, P.C., F.J. Abarca, M.E. Douglas, and W.L. Minckley. 1989. Spikedace (Meda fulgida) and loach minnow (Tiaroga cobitis) relative to introduced red shiner (Cyprinella lutrensis). Arizona Game and Fish Department, Phoenix, Arizona. 116 pp.

Marsh, P.C., J.E. Brooks, D.A. Hendrickson, and W.L. Minckley. 1990. Fishes of Eagle Creek, Arizona, with records for threatened spikedace and loach minnow (Cyprinidae). Journal of the Arizona-Nevada Academy of Science 23(2):107-116.

Miller, R.R. 1961. Man and the changing fish fauna of the American southwest. Papers of the Michigan Academy of Science, Arts, and Letters XLVI:365-404.

Miller, D. 1998. Fishery survey report. Negrito Creek within the Gila National Forest, New Mexico. 29 and 30 June 1998. Gila National Forest, Silver City, New Mexico. July 14, 1998. 7 pp.

Minckley, W.L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix, Arizona. 293 pp.

Minckley, W.L. 1993. A review of fishes in the Coconino National Forest Region, Arizona. U.S. Forest Service, Flagstaff, AZ.

Murphy, M.L., C.P. Hawkins, and N.H. Anderson. 1981. Effects of canopy modification and accumulated sediment on stream communities. Transactions of the American Fisheries Society 110:469-478.

Newcombe, C.P. and D.D. McDonald. 1991. Effects of suspended sediments on aquatic ecosystems. North American Journal of Fisheries Management 11:72-82.

Office Assist Enterprises. 1999. Yavapai County Arizona. Retrieved October 24, 2001, www.pe.net/~rksnow/azyavapaicounty.htm

Propst, D.L. and K.R. Bestgen. 1991. Habitat and biology of the loach minnow, Tiaroga cobitis,

in New Mexico. Copeia 1991(1):29-38.

Propst, D.L., P.C. Marsh, and W.L. Minckley. 1985. Arizona survey for spikedace (Meda fulgida) and loach minnow (Tiaroga cobitis): Fort Apache and San Carlos Apache Indian Reservations and Eagle Creek, 1985. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 8pp. plus maps.

Propst, D.L., K.R. Bestgen, and C.W. Painter. 1986. Distribution, status, biology, and conservation of the spikedace (Meda fulgida) in New Mexico. Endangered Species Report No. 15. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 93 pp.

Propst, D.L., K.R. Bestgen, and C.W. Painter. 1988. Distribution, status, biology, and conservation of the loach minnow (Tiaroga cobitis) Girard in New Mexico. U.S. Fish and Wildlife Service Endangered Species Report 17, Albuquerque, NM. 75 pp.

Rinne, J.N. 1989. Physical habitat use by loach minnow, Tiaroga cobitis (Pisces: Cyprinidae), in southwestern desert streams. The Southwestern Naturalist 34(1):109-117.

Rinne, J.N. 1999. The status of spikedace (Meda fulgida) in the Verde River, 1999: implications for management and research. Hydrology and Water Resources of Arizona and the Southwest. Proceedings of the 1999 meetings of the hydrology section, Arizona-Nevada Academy of Science, Volume 29.

Rinne, J.N., and E. Kroeger. 1988. Physical habitat use by spikedace, Meda fulgida, in Aravaipa Creek, Arizona. Proceedings of the Western Assocation of Fish and Wildlife Agencies Agenda 68:1-10.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

Schreiber, D.C. 1978. Feeding interrelationships of fishes of Aravaipa Creek, Arizona. Arizona State University, Tempe, Arizona. 312 pp.

Silvey, W. and M.S. Thompson. 1978. The distribution of fishes in selected streams on the Apache-Sitgreaves National Forest. Completion Report to USDA Forest Service. Arizona Game and Fish Department, Phoenix, Arizona. 49 pp.

Sublette, J. E., M. D. Hatch, and M. Sublett. 1990. The Fishes of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 393 pp.

SWCA Inc. 2001. Biological Assessment for the Homestead at Camp Verde. Submitted to Harvard Investments and Environmental Protection Agency. SWCA, Inc. Environmental Consultants, Flagstaff, AZ.

Tellman, B., R. Yarde, and M.G. Wallace. 1997. Arizona's changing rivers. Water Resources Research Center, College of Agriculture, University of Arizona, Tucson, AZ.

Tibbets, C.A. 1992. Allozyme variation in populations of the spikedace Meda fulgida and the loach minnow Tiaroga cobitis. Proceedings of the Desert Fishes Council 24:37.

Tibbets, C.A. 1993. Patterns of genetic variation in three cyprinid fishes native to the American southwest. MS Thesis. Arizona State University, Tempe, Arizona. 127 pp.

U.S. Bureau of Land Management. 1995. File report on fishery inventory of Oak Grove Canyon, Graham County, and Deer Creek, Pinal County. July 1995. U.S. Bureau of Land Management, Tucson, Arizona. 19 pp.

U.S. Fish and Wildlife Service. 1986a. Endangered and threatened wildlife and plants; determination of threatened status for the spikedace. Federal Register 51(126):23769-23781. July 1, 1986.

U.S. Fish and Wildlife Service. 1986b. Endangered and threatened wildlife and plants; determination of threatened status for the loach minnow. Federal Register 51(208):39468-39478. October 28, 1986.

U.S. Fish and Wildlife Service. 1991. Spikedace Recovery Plan. U.S. Fish and Wildlife Service. Region 2. Albuquerque, NM.

U.S. Fish and Wildlife Service. 1994. Notice of 90-day and 12-month findings on a petition to reclassify spikedace (Meda fulgida) and loach minnow (Tiaroga cobitis) from threatened to endangered. Federal Register 59(131):35303-35304. July 11, 1994.

U.S. Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants; final designation of critical habitat for the spikedace and loach minnow. Federal Register 65(80):24328-24372.

U.S. Fish and Wildlife Service. 2002. Biological opinion for ongoing grazing of 16 alloments on the Verde River watershed. Arizona Ecological Services Office, U.S. Fish and Wildlife Service, Phoenix, AZ.

U.S. Forest Service. 2001a. Biological evaluation for livestock grazing on selected allotments within Verde River watershed for spikedace and loach minnow critical habitat. Chino Valley and Verde Ranger Districts. Prescott National Forest.

U.S. Forest Service. 2001b. Watershed condition assessment for select Verde River 5th code watersheds. Chino Valley and Verde Ranger Districts. Prescott National Forest. 98 pp.

Vives, S.P. and W.L. Minckley. 1990. Autumn spawning and other reproductive notes on loach minnow, a threatened cyprinid fish of the American southwest. The Southwestern Naturalist 35(4):451-454.

Waters, T.F. 1995. Sediment in streams. Sources, biological effects, and control. American Fisheries Society, Monograph 7, Bethesda, MD. 251 pp.

Wirt, L. and H. W. Hjalmarson. 2000. Sources of springs supplying base flow to the Verde River headwaters, Yavapai County, Arizona. Open-File Report 99-0378. U.S. Geological Survey, Tucson, Arizona.

Williams, J.E., D.B. Bowman, J.E. Brooks, A.A. Echelle, R.J. Edwards, D.A. Hendrickson, and J.J. Landye. 1985. Endangered aquatic ecosystems in North American deserts with a list of vanishing fishes of the region. Journal of the Arizona-Nevada Academy of Science 20(1):1-62.

Wood, D.J., S.G. Fisher, and N.B. Grimm. 1990. Pools in desert streams: limnology and response to disturbance. Journal of the Arizona-Nevada Academy of Science 26:171-182.

TABLES, MAPS, AND FIGURES

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-21-83-F-013 reconsulted as 2-21-97-F-416	CR	Tonto National Forest Plan	planning	Salt Tonto Verde Gila	spikedace loach minnow Gila topminnow bald eagle peregrine falcon Yuma clapper rail AZ hedgehog cactus AZ agave	07-26-85 superceded by new consultation 12-19-97	ongoing	USFS	RO
2-21-83-F-020 reconsulted as 2-21-97-F-419	CR	Prescott National Forest Plan	planning	Verde Agua Fria	spikedace Gila trout bald eagle peregrine falcon	03-04-86 superceded by new consultation 12-19-97	ongoing	USFS	RO
2-21-83-F-14 reconsulted as 2-21-97-F-416	CR	Coconino National Forest Plan	planning	Verde	spikedace Little Colorado spinedace bald eagle peregrine falcon AZ cliffrose San Fran. peaks groundsel	04-01-86 superceded by new consultation 12-19-97	ongoing	USFS	RO
2-21-93-F-477	NJ	Emergency watershed protection, George Yard property	flooding	Verde	spikedace razorback sucker Colorado squawfish bald eagle	12-27-93	completed	SCS	State Office

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-21-92-F-550	J AM	Arizona water quality standards	pollution	Gila Salt Black White San Francisco Blue Eagle Bonita Tonto Verde Agua Fria San Pedro Aravaipa Santa Cruz Colorado Virgin Little Col. Bill Williams Yaqui	spikedace (J) loach minnow (J) Apache trout (J) beautiful shiner (NJ/AM) bonytail (J) desert pupfish (J/AM) Gila topminnow (J) Gila trout (J) humpback chub (J) Little Colorado spinedace (J/AM) razorback sucker (J) Sonora chub (J/AM) Virgin chub (J) woundfin (J) Yaqui catfish (NJ/AM) Yaqui chub (J/AM) Yaqui topminnow (J) brown pelican (NJ) bald eagle (J) Yuma clapper rail (J)	2-16-94	ongoing	EPA	San Francisco
2-21-96-F-187 this may have been reinitiated additonal times	NJ	1996 modifications			all those above plus whooping crane Canelo Hills ladies tresses Huachuca water umbel Sonora tiger salamander SW willow flycatcher	12-11-98			
2-21-90-F-119	J AM	Central Arizona Project potential to introduce and spread nonnative aquatic species	water development	Gila Salt Black White San Francisco Blue	spikedace (J/AM) loach minnow (J/AM) razorback sucker (J/AM) Gila topminnow (J) desert pupfish (NJ) Colorado squawfish (NJ) bald eagle (NJ)	04-20-94 amended 06-22-95 05-06-98 07-15-98 01-13-00 06-30-00	ongoing	BR	PAO
	NJ	Reinitiation		Eagle Bonita Tonto Verde Agua Fria San Pedro Aravaipa	Apache trout (NJ) Gila trout (NJ)	04-17-01			

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**									
NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-21-93-F-395	NJ NAM	Verde Valley Ranch Dev	Housing	Verde	Razorback sucker (NJ/NAM)	11-09-94	completed	ACOE	DC
2-21-94-F-020	NJ NAM				Razorback sucker (NJ/NAM) SW willow flycatcher (J/AM) Razorback sucker, ch (NJ/NAM) SW willow flycatcher, ch (NJ/NAM)	02-23-96		ACOE	DC
2-21-94-F-309	NJ NAM					10-07-97		EPA	DC
unnumbered	NE	Rainbow trout stocking in Verde River	stocking	Verde	spikedace razorback sucker Gila topminnow bald eagle	02-06-95	ongoing	FWS	Federal Aid
unnumbered	NJ NAM	Sycamore Canyon Road Stabilization	road	Verde	razorback sucker, ch	02-29-95	completed	FEMA	DC
2-21-95-F-291	NJ/NAM	Cedar Bench Allotment	grazing	Verde	razorback sucker, ch	09-08-95	ongoing	USFS	Tonto NF, Cave Creek RD
2-22-89-F-071	J/AM	West Bear/Del Rio livestock grazing management	grazing	Verde	spikedace (J/AM) razorback sucker (NJ)	draft 09-19-95 withdrawn 07-17-96	ongoing	USFS	Prescott NF Chino Valley RD
no number	INLAA	Ongoing grazing				unknown[2]			
part of 000089RO	INLAA	Ongoing grazing			spikedace (INLAA) razorbacksucker (NLAA) peregrine falcon(INLAA) Colorado squawfish(NLJ) MX spotted owl (INLAA)	04-30-98[2] 09-29-98[2]			
part of 2-22-99-F-016	INLAA	Term permit				verbal in 2000-grazing team			
In consultation	??	ongoing grazing and term permit			spikedace ch loach minnow ch	??-??-			

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**									
NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-21-94-F-505	NJ/NAM	Tuzigoot bridge repair	construction	Verde	razorback sucker, ch (NJ/NAM) sw willow flycatcher, ch (NJ/NAM)	09-25-95	completed	NPS	State
unnumbered	NE	Stocking of sportfish into 90 locations in Arizona	stocking	Gila Salt Black San Francisco Eagle Tonto Verde Agua Fria San Pedro Santa Cruz Colorado Yaqui	spikedace loach minnow rrazorback sucker humpback chub bonytail chub desert pupfish Gila topminnow Little Colorado spinedace Apache trout beautiful shiner Yaqui chub Yaqui catfish Yaqui topminnow	10-31-95	ongoing	FWS	Federal Aid
2-21-95-F-413	NJ/NAM	Eureka Ditch	repair	Verde	razorback sucker & ch	12-04-95	completed	NRCS	State
2-21-95-I-440	INLAA	China Dam livestock grazing permit	grazing	Verde	spikedace razorback sucker bald eagle	12-??-95[2]	ongoing	USFS	Prescott NF Chino Valley RD
part of 000089RO	INLAA	ongoing grazing			spikedace loach minnow razorback sucker Colorado squawfish bald eagle peregrine falcon MX spotted owl	04-30-98[2]			
part of 2-22-99-F-016	INLAA	term permit			same as above plus Gila topminnow woundfin	04-20-00[2]			
In consultation	??	ongoing and permit			spikedace ch loach minnow ch	??			

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-21-91-I-075	INLAA	Fish stocking in Little Colorado, Agua Fria, Salt, and Verde River drainages	stocking	Agua Fria Salt Black Tonto Verde Little Col	spikedace loach minnow razorback sucker Gila topminnow Colorado squawfish bonytail chub Apache trout Little Colorado spinedace bald eagle	12-15-95	ongoing	FWS	AZFRO
2-21-94-I-386	INLAA	Baker's Pass Ecosystem Management Area (included Perkinsville, Horseshoe and Antelope Hills allotments)	grazing	Verde	spikedace razorback sucker bald eagle peregrine falcon	07-08-97[2] (date of FONSI)	ongoing	USFS	Prescott NF
part of 000089RO	INLAA	Antelope Hills and Perkinsville allotments - ongoing grazing			spikedace loach minnow razorback sucker Colorado squawfish bald eagle peregrine falcon MX spotted owl SW willow flycatcher	04-30-98[2]			
part of 2-22-99-F-016	INLAA	Antelope Hills and Perkinsville - term permit Antelope Hills only			as above plus Gila topminnow	04-20-00[2]			
2-21-01-I-011	??	Antelope Hills, Perkinsville, and Horseshoe			SW willow flycatcher ch	??			
In consultation	??				spikedace ch loach minnow ch	??			
2-21-95-F-399 2-21-95-F-500 2-21-95-F-732	INLAA	Windmill grazing allotment	grazing	Verde	spikedace (INLAA) loach minnow (INLAA) razorback sucker (NJ) AZ cliffrose (NJ) Gila trout (INLAA) SW willow flycatcher (INLAA) MX spotted owl (INLAA)	10-28-97	ongoing	USFS	Coconino NF

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-000098RO 2-21-97-F-416	NJ	11 Forest Plans	planning	Gila Salt Black White San Francisco Blue Eagle Bonita Tonto Verde Agua Fria San Pedro Aravaipa Santa Cruz Little Col.	spikedace loach minnow razorback sucker desert pupfish Gila topminnow Little Colorado spinedace Apache trout Chihuahua chub Gila trout Sonora chub Yaqui catfish Yaqui chub 13 plants 2 herps 3 birds 3 mammals	12-19-97	ongoing	USFS	RO
no number	INLAA	Red Creek grazing allotment	grazing	Verde	Gila topminnow SW willow flycatcher	??-??-98[2]	ongoing	USFS	Tonto NF, Cave Creek RD
part of 000089RO	INLAA				lesser long-nosed bat bald eagle MS spotted owl SW willow flycatcher	04-30-98[2]			
part of 2-22-99-F-416	LAA				spikedace (INLAA) loach minnow Gila topminnow razorback sucker(NLAA) lesser long-nosed bat (INLAA) MX spotted owl (INLAA) SW willow flycatcher	04-20-00[2]			
2-21-99-F-022	NJ				loach minnow Gila topminnow SW willow flycatcher cactus ferr. pygmy owl	12-19-00			

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-21-98-F-403	INLAA	State Route 260 widening and bridge construction Cottonwood to Camp Verde	bridge	Verde	loach minnow razorback sucker (NJ) SW willow flycatcher(NJ)	10-01-98 3-5-99 (BO)	completed	FHWA	Phoenix
2-21-98-F-403R1	NJ	Reinitiation spikedace and loach minnow and their critical habitat			loach minnow & ch (LAA, NAM) spikedace & ch (LAA, NAM) pikeminnow (NJ)	7-24-2002	completed		
2-21-98-F-403R2	NJ	Reinitiation spikedace, loach minnow, razoraback sucker and their critical habitat			loach minnow&ch (LAA, NAM), spikedace &ch (LAA, NAM), razorback sucker & ch (LAA, NAM), pikeminnow (NJ)	1-31-03	completed		

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
000089RO	NJ	Ongoing livestock grazing on 21 allotments Bear Valley Boneyard Buck Springs Bush Creek Chrysotile Colter Creek Cow Flat Dark Canyon Double Circles East Eagle Foote Creek Hickey Hicks/Pikes Peak Limestone Montana Mud Springs Nutrioso Pigeon Pleasant Valley Red Hill Sapillo Sardine Sears-Club/Chalk Mtn Sheep Spgs/Heber-Reno Sheep driveway South Escudilla Tule Wildbunch Williams Valley	grazing	Gila Eagle San Francisco Blue Black Salt Tonto Verde Little Col. Altar	spikedace loach minnow Gila topminnow Little Colorado spinedace Sonora chub razorback sucker peregrine falcon MX spotted owl lesser long-nosed bat AZ hedgehog cactus	02-02-99	ongoing	USFS	RO

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
000089RO continued	INLAA (for spikedace & loach minnow only)	13 Mile Rock Alexander Alma Alma waterlane Antelope Hills Apache Canyon Basin Beaver Creek Bee Springs Big Dry Black Bob Bobcat-Johnson Brown Springs Buckhorn Canyon Creek Cedar Breaks China Dam Chrysotile Citizen Colter Creek Copper Canyon Copper Creek Corduroy Corner Mountain Cow Creek Cow Flat Cross Bar Cross V Dark Canyon Deep Canyon Devil's Peak	grazing	Gila Eagle San Francisco Blue Black Salt Tonto Verde Little Col. Altar	spikedace loach minnow (many other species also were INLAA for these and other allotments)	04-30-98[2]	ongoing	USFS	RO

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**									
NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
		Double Circles Dry Creek Eagle Peak East Eagle Fishhook Foote Creek Fossil Creek Frisco Plaza Gila River Govina Hackberry/Pivot Rock Harden Cienga Harve Gulch Haystack Butte Hickey Hicks-Pikes Peak Jerome Jordan Mesa Kelly Leggett Lightening Mesa Little Rough Luna Mangas Valley McCarty Mud Springs Negrito Perkinsville Pleasanton Pool Corral Red Creek							

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**									
NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
		Red Hill Roberts Park Rudd Knoll Sardine Sedona Sedow Silverdale Squaw Peak Steeple-Mesa Stone Creek Strayhorse Taylor Tule Springs Upper Campbell Blue West Bear/Del Rio XSX Yeguas Young							
9-98-F-001	NJ	Army Corps of Engineers implementation of Nationwide permit 29 with the framework for development of Standard Local Operating Procedures - Endangered Species	many	all	all listed and proposed species	?? - ??-99	ongoing	COE	DC
2-21-00-I-099	INLAA	Rio Salado Town Lake stocking of rainbow trout and roundtail chub	stocking	Salt Gila Verde Agua Fria Tonto Black Blue White San Fran. upper Gila Eagle Bonita San Pedro Santa Cruz	spikedace loach minnow Gila topminnow desert pupfish razorback sucker Colorado squawfish Gila chub Chiricahua leopard frog brown pelican Yuma clapper rail SW willow flycatcher cactus ferr. pygmy owl bald eagle	01-10-01	completed	FWS	Federal Aid

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**									
NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
In consultation see also 000089RO and 2-22-99-F-016	?	Livestock grazing, ongoing and term permits, on 15 allotments on Prescott NF Antelope Hills Brown Springs China Dam Copper Canyon Horseshoe Jerome Limestone Muldoon Perkinsville Sand Flat Squaw Peak Sycamore Verde West Bear/Del Rio Young	grazing	Verde	spikedace ch loach minnow ch	?	In consultation	USFS	Prescott NF Chino Valley and Verde RDs
2-21-01-F-124	??	13-mile Rock allotment management plan	grazing	Verde	spikedace ch loach minnow ch	??		USFS	Coconino NF
2-21-99-F-300	NJ	20 allotments on Tonto NF	grazing	Salt Verde Tonto	spikedace ch loach minnow ch	2-28-2002	completed	USFS	Tonto NF
2-21-01-F-272	NJ	Bayless watershed protection - Kellner jacks	flooding	Verde	spikedace & ch (LAA, NAM) loach minnow & ch (LAA, NAM) razorback sucker & ch (LAA, NAM) Colorado squawfish (NJ) SW willow flycatcher &ch (NLAA, NAM)	8-15-01	completed	NRCS	Phoenix, AZ
2-21-01-F-148	NJ	The Homestead Housing Development	housing	Verde	spikedace & ch (NLAA, NAM) loach minnow & ch (NLAA, NAM) razorback sucker & ch (NLAA, NAM) Colorado squawfish (NJ) SW willow flycatcher &ch (LAA, NAM)	12-26-01	completed	EPA	San Francisco, CA

Table 1 - SECTION 7 CONSULTATION HISTORY - SPIKEDACE, LOACH MINNOW, RAZORBACK SUCKER on Verde River**

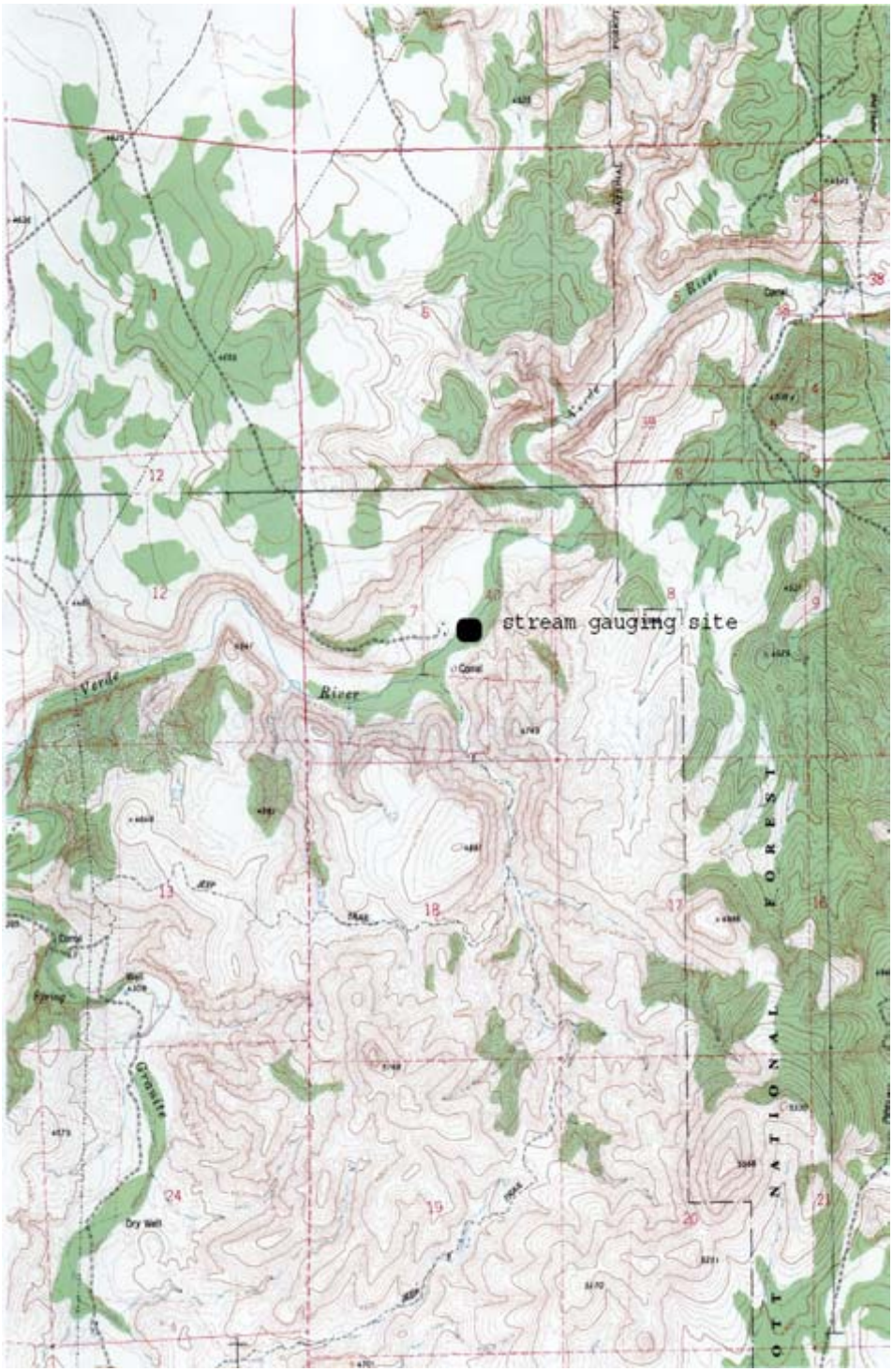
NUMBER	FINDING[1]	NAME	ACTION TYPE	SUB-BASIN	SPECIES	DATE OF FINDING	PROJECT STATUS	ACTION AGENCY	AGENCY SUBOFFICE
2-21-03-F-0364	NJ LAA	Verde Flume	construction and maintenance of river flow measuring device	Verde	spikedace & ch (LAA, NAM) loach minnow & ch (LAA, NAM)	10-10-03	completed	ACOE	Phoenix, AZ

**Includes all biological opinions, known "is not likely to adversely affect" findings, and known "no effect" findings where significant effects to spikedace, loach minnow and razorback sucker may have occurred.

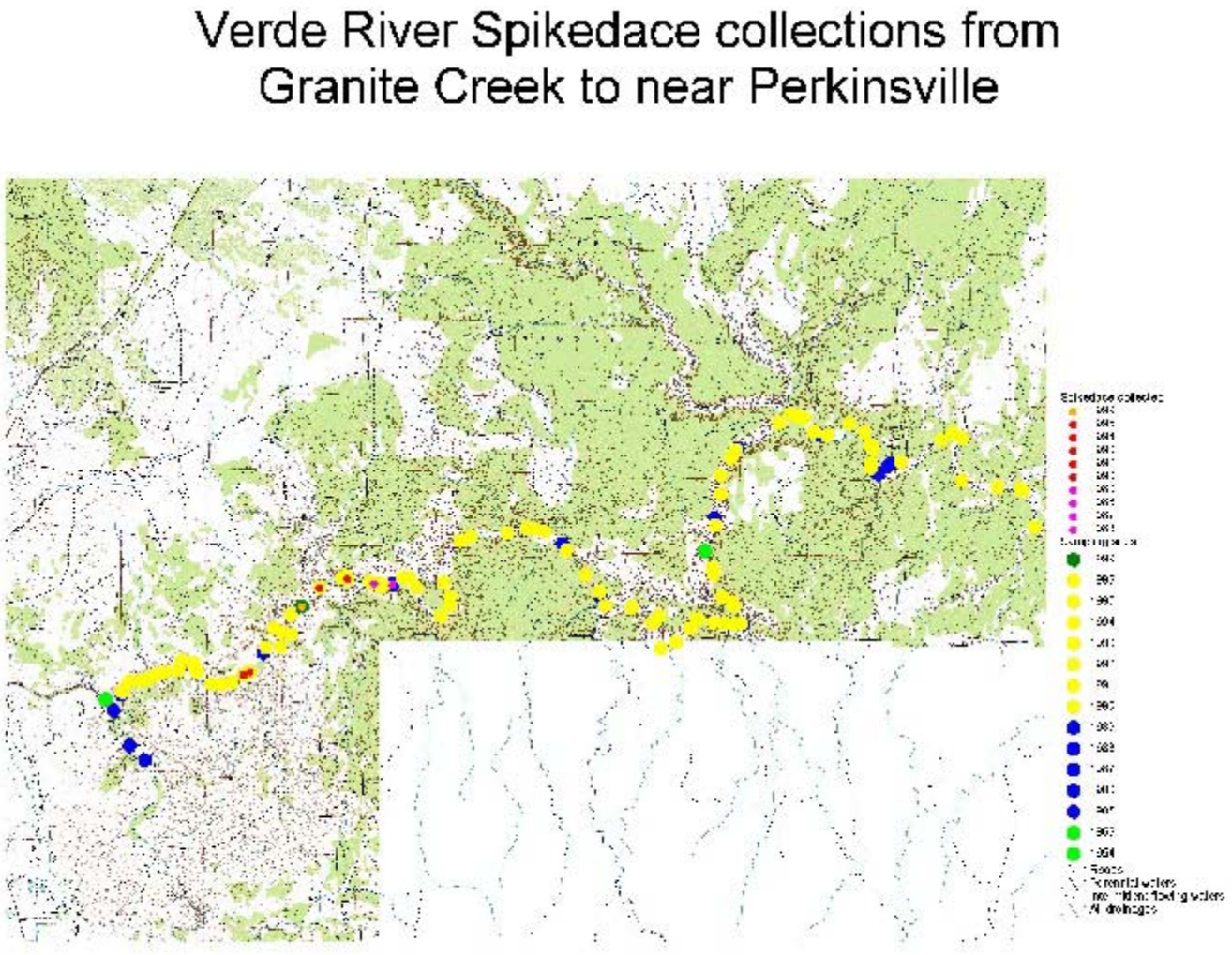
[1] (when multiple species are involved, this is the most restrictive finding for spikedace, loach minnow, or razorback sucker)
AM = adverse modification of critical habitat
BC = beneficial concurrence
CR = conference report
E = emergency
J = jeopardy
INLAA (or NLAA) = is not likely to adversely affect
LAA = likely to adversely affect
NAM = non-adverse modification of critical habitat
NC = nonconcurrence
NE = no effect
NJ = nonjeopardy

[2]This is the date of the biological assessment in which the USFS determined INLAA. These findings did not require concurrence from the FWS, but received a blanket concurrence or went through the grazing team, which did not document individual INLAA findings. The first blanket concurrence was on 05-05-95 and allotments for which this concurrence was used are generally not known. The second blanket concurrence was on 03-05-98 for ongoing grazing; the INLAA findings for this are documented in the USFS 04-30-98 and 09-29-98 biological assessments. The third blanket concurrence was on 09-10-98 and in a slightly different form on 09-18-98 for term grazing permits; the INLAA findings for this are documented in the USFS 04-20-00 biological assessment. In addition to the biological assessment INLAA findings, others were made verbally by the grazing team; no documentation is available for those.

Map 1. Location of Verde Flume gauge and action area ½ mile upstream and downstream of site within the 100-year floodplain



Map 2. Arizona Game and Fish Department spikedace survey locations and detections, Granite Creek to Perkinsville, Verde River, Arizona



Map 3. Arizona Game and Fish Department spikedace survey locations and detections, Perkinsville to Sycamore Creek, Verde River, Arizona

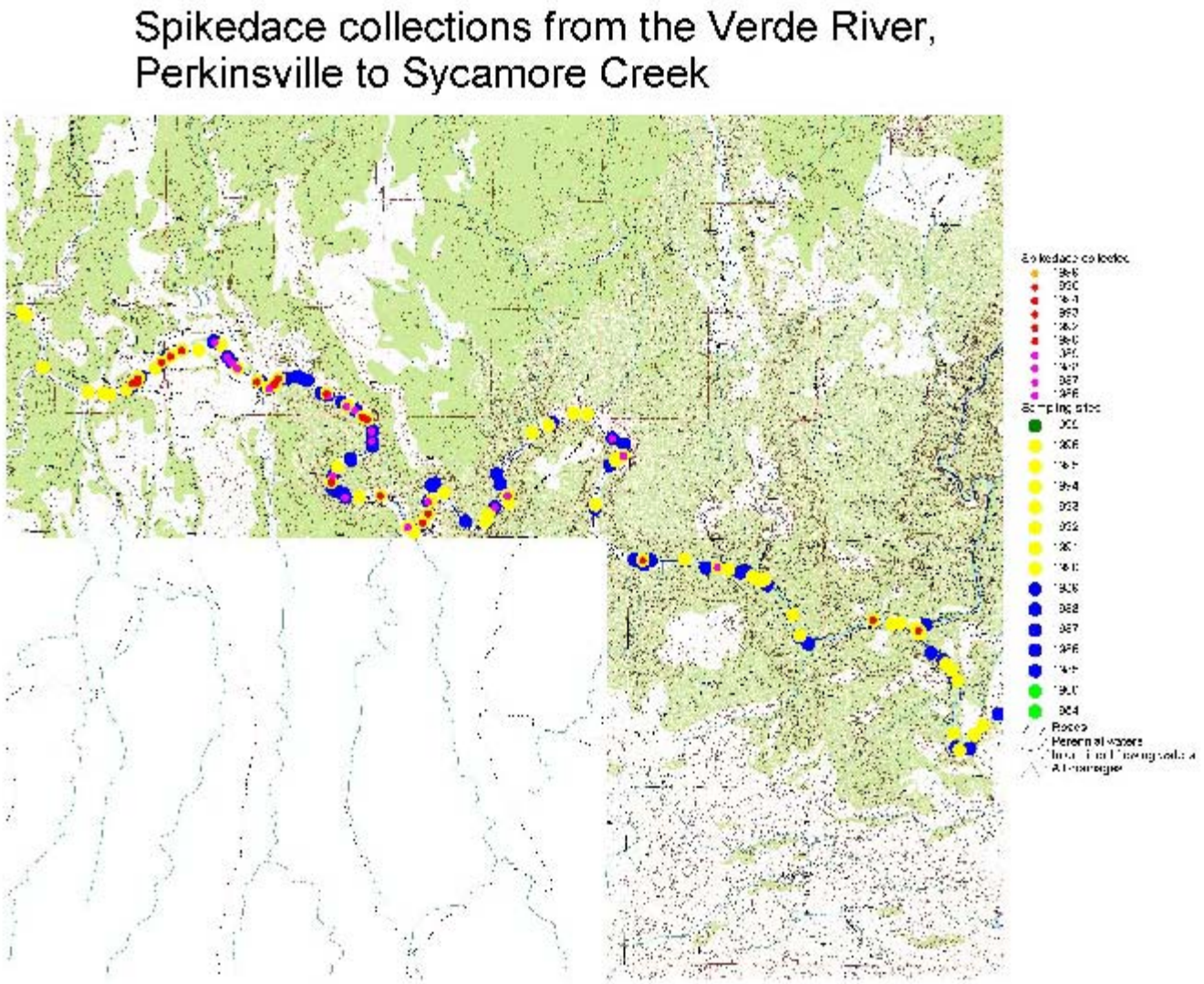


Figure 1. Campbell Ranch where Verde Flume will be located, Verde River, Arizona

Figure 2. River location where flume will be placed, Verde River, Arizona