United States Department of the Interior

FISH AND WILDLIFE SERVICE
P.O. Box 1306
Albuquerque, New Mexico 87103

In Reply Refer To:
R2/ES-SE

FEB 16 1994

Ms. Felicia A. Marcus
Regional Administrator
U. S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105-3901
Attn: Ms. Catherine Kuhlman
Chief, Water Quality Branch (W-3-1)

2-21-92-F-550

Dear Ms. Marcus:

This responds to your request of May 21, 1993, for formal Section 7 consultation as provided by the Endangered Species Act (Act) of 1973, as amended, on the Environmental Protection Agency's (EPA) proposed action of approving and/or disapproving the Arizona Water Quality Standards (AWQS) for Navigable Waters located in Arizona. Your request for formal consultation was received on May 21, 1993, starting the 90-day consultation period. This document represents the Fish and Wildlife Service's (Service) biological opinion on the effects of the AWQS on threatened Apache trout (*Oncorhynchus apache*), threatened beautiful shiner (*Cyprinella formosa*), endangered bonytail chub (*Gila elegans*), endangered desert pupfish (*Cyprinodon macularius*), endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*), endangered Gila trout (*Oncorhynchus gilae*), endangered humpback chub (*Gila cypha*), threatened Little Colorado spinedace (*Lepidomeda vittata*), threatened loach minnow (*Tiaroga cobitis*), endangered razorback sucker (*Xyrauchen texanus*), threatened Sonora chub (*Gila ditaenia*), threatened spikedace (*Meda fulgida*), endangered Virgin River chub (*Gila robusta seminuda*), endangered woundfin (*Plagopterus argentissimus*), threatened Yaqui catfish (*Ictalurus pricei*), endangered Yaqui chub (*Gila purpurea*), endangered Yaqui topminnow (*Poeciliopsis occidentalis sonoriensis*), endangered Kanab ambersnail (*Oxyloma haydeni kanabensis*), endangered American peregrine falcon (*Falco peregrinus*), endangered California brown pelican (*Pelecanus occidentalis californicus*), endangered bald eagle (*Haliaeetus leucocephalus*), endangered whooping crane (*Grus americana*), and endangered Yuma clapper rail (*Rallus longirostris yumanensi*).

Also occurring in the project area are the proposed Arizona willow (*Salix arizonica*) and southwestern willow flycatcher (*Empidonax traillii extimus*) and their proposed critical habitat, proposed critical habitat for the bonytail chub, humpback chub, loach minnow, razorback sucker, spikedace, and Virgin River chub, and the experimental, non-essential population of the Colorado squawfish (*Ptychocheilus lucius*). If the EPA concludes that their action may result in jeopardizing these proposed species or result in the destruction or adverse modification of proposed critical habitats, then EPA is required to initiate a conference with the Service. At this time, the Service will not address these proposed species and proposed critical habitats in this biological opinion.

The proposed action involves approving and/or disapproving the Arizona Administrative Code Title 18 (Environmental Quality), Chapter 11 (Water Quality Boundaries and Standards), Article 1 (Water Quality Standards for Navigable Waters), and Article 2 (Discharge Limitations) dated December 31, 1992. Article 1 contains the following 17 rules: antidegradation;

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salinity of the Colorado River; enforcement; schedules of compliance; designated uses including a list of navigable waters; narrative water standards; numeric water quality standards (fecal coliform, pH, temperature, turbidity, dissolved oxygen, radiochemicals, nutrient criteria for total phosphorus and nitrogen, toxic pollutants, chlorine (total residual), and ammonia; unique water classification; analytical methods; exclusions; mixing zones; nutrient waiver; resource management agencies; canals and municipal park lakes; dams and flood control structures; natural background and effluent dominated waters. The Service has included the EPA promulgated phosphate and nitrate criteria in this biological opinion. A complete administrative record of this consultation is on file in the Arizona Ecological Services Field Office.

Because of the length and complexity of this biological opinion, the following table of contents has been included.

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BIOLOGICAL OPINION

Findings of No Effect

Our evaluation concludes the proposed action will have no effect on the endangered Kanab ambersnail. This ambersnail occurs in spring-fed waters on a canyon wall in the Grand Canyon and this location is not subject to any point source or non-point source discharges covered under the AWQS program.

Our evaluation concludes the proposed action will have no effect on the threatened beautiful shiner, endangered Yaqui chub, and endangered Yaqui topminnow or affect critical habitat for the beautiful shiner, threatened Yaqui catfish, and Yaqui chub in the following locations: San Bernardino National Wildlife Refuge (NWR), Cochise County - Gamma, House, Mesquite, North, Twin and Two PhD Ponds; Robertson Cienega; Bathhouse, Bunting, Cienega, Cottonwood, Middle, and Upland Springs. The beautiful shiner, Yaqui catfish, Yaqui chub, and Yaqui topminnow and critical habitats occur in artesian well-fed created wetlands. These fish are located in areas that are not subject to any point source and non-point source discharges covered under the AWQS program.

Our evaluation concludes the proposed action will have no effect on the endangered Gila topminnow for the following four locations: Artesian Well #3 and Cottonwood Artesian, Gila County; Mud Springs and Charlebois Spring, Maricopa County. The Gila topminnow (Charlebois Spring population) exist in a spring system located in the Superstition Wilderness where no grazing occurs, and the other three topminnow populations exist in artesian well-fed cement watering troughs. These fish are located in areas that are not

subject to any point source and non-point source discharges covered under the AWQS program.

Our evaluation concludes the proposed action will have no effect on the endangered whooping crane. This species is an occasional winter migrant to the Wilcox playa, spends only a few days in the area, and has not been reported in this area since approximately 1990.

Our evaluation concludes the proposed action will have no effect on the endangered American peregrine falcon. The water quality standards rules would not cause a change in the prey base of the falcon.

Our evaluation concludes the proposed action for the **exclusion** rule addressing the waste treatment systems will have no effect on the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). Waters of the waste treatment systems are not located in navigable waters that provide habitat and critical habitat for these endangered and threatened species.

Our evaluation concludes the proposed action for the **resource management agencies** rule will have no effect on the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). The application of this rule by Federal agencies requires consideration of Section 7 consultation.

Our evaluation concludes the proposed action for the **canals and municipal park lakes** rule will have no effect on the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or affect the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). This rule does not apply to navigable waters that provide habitat and critical habitat for these species.

Our evaluation concludes the proposed action for the **natural background** rule will have no effect on the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or affect the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). These species and

their critical habitat occur in navigable waters with natural background levels.

Findings of Not Likely to Jeopardize or Adversely Modify Critical Habitat

It is my biological opinion that the proposed action for Article 2 and the following rules in Article 1: antidegradation; salinity of the Colorado River; enforcement; schedules of compliance; numeric water quality standards for fecal coliform, pH, temperature, turbidity, dissolved oxygen, nutrient criteria for the State's total phosphorus and nitrogen including EPA promulgated phosphate and nitrate criteria, radiochemicals, chlorine (total residual), and ammonia; unique water classification; analytical methods; mixing zones; nutrient waivers; dams and flood control structures, and effluent dominated water classification are not likely to jeopardize the continued existence of the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no affect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, nor are they likely to result in the destruction or adverse modification of critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, or Yaqui chub (Blackdraw).

It is my biological opinion that the proposed action for the **numeric water quality standards rule for toxic pollutants - bioaccumulation** is not likely to jeopardize the continued existence of the California brown pelican.

It is my biological opinion that the proposed action for the **numeric water quality standards rule for toxic pollutants - adequacy of aquatic and wildlife warm water fishery (A&Ww) criteria** is not likely to jeopardize the continued existence of the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect and Santa Cruz River), Gila trout, humpback chub, Little Colorado spinedace (populations other than Little Colorado River downstream from Holbrook, Arizona), loach minnow, razorback sucker (populations other than Colorado River from Parker to Yuma), Sonora chub, spikedace (populations other than Gila River), Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), bald eagle, California brown pelican, and Yuma clapper rail, nor is it likely to result in the destruction or adverse modification of critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, or Yaqui chub (Blackdraw).

Findings of Likely to Jeopardize or Adversely Modify Critical Habitat

It is my biological opinion that the proposed action for the **numeric water quality standards rule for toxic pollutants - bioaccumulation**, primarily mercury and selenium, is likely to jeopardize the continued existence of the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), bald eagle, and Yuma clapper rail and result in the destruction or adverse modification of critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw).

It is my biological opinion that the proposed action for the **numeric water quality standards rule for toxic pollutants - adequacy of A&Ww criteria** for cyanide and phenol in A&Ww areas is likely to jeopardize the continued existence of the Little Colorado spinedace (populations other than those of the Little Colorado River downstream from Holbrook), razorback sucker (populations other than those of the Colorado River below Parker) and spikedace (populations other than those of the Gila River from Coolidge Dam to Florence). And, it is my biological opinion that the proposed action for the **numeric water quality standards rule for toxic pollutants - adequacy of A&Ww criteria** for cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and toxaphene in aquatic and wildlife effuent dominated waters (A&Wedw) areas is likely to jeopardize the continued existence of the Gila topminnow (Santa Cruz River population).

It is my biological opinion that the proposed action for the **numeric water quality standards rule for toxic pollutants - criteria development** is likely to jeopardize continued existence of the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), and Yaqui topminnow (populations in Blackdraw and Leslie Creek), or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw).

BACKGROUND INFORMATION

Consultation History

Informal Section 7 consultation began when the Arizona Ecological Services Office (AESO) inquired by letter dated April 4, 1990, addressed to EPA Region IX, Water Quality Branch, regarding plans for Section 7 compliance by EPA relative to their approval of Arizona's pending adoption of water quality standards pursuant to section 303(c)(2)(B) and 303(c)(3) of the Clean Water Act (CWA). This inquiry occurred during Arizona's triennial review of the State's existing water quality standards. The Service received no reply.

The AESO provided a list of endangered and threatened species in Arizona to the Regional Director, Region 2 of the Service, on June 25, 1992. The Arizona list was incorporated into a July 2, 1992, list of listed and proposed endangered and threatened species in Region 2 which was provided to the Service's Director in response to EPA's request for a nationwide list of endangered species that may be affected by CWA aquatic life criteria. The AESO faxed a copy of the Arizona species list dated June 25, 1992, to EPA Region IX on October 7, 1992.

On September 17, 1992, EPA asked the AESO for guidance on Section 7 consultation procedures for their approval of Arizona water quality criteria for toxic pollutants and their pending action on the remaining portions of the standards. A response was sent on October 6, 1992, with guidance on the Act and Section 7.

On November 6, 1992, the AESO received a Biological Assessment (BA) from EPA on the effects to endangered and threatened species for the proposed approval of Arizona's adoption of numeric water quality criteria for toxic pollutants pursuant to CWA Section 303(c)(2)(B). The BA stated the following: (1) "We have no information that leads EPA to conclude that water quality criteria adopted by the State of Arizona . . . will adversely impact endangered and threatened species in the State;" and (2) "Our

analysis of the Service's endangered and threatened species listed for the State of Arizona . . . has led us to conclude that EPA's approval of Arizona Water Quality Standards . . . is unlikely to jeopardize the continued existence of endangered and threatened species . . . ." Our response, dated November 24, 1992, stated we could not concur with those conclusions because the biological information provided in the BA was insufficient to make such conclusions.

On February 1, 1993, AESO participated in a telephone conference call with EPA to discuss Service recommendations for contents of a biological evaluation (BE) or assessment. The AESO stated that each pollutant should be evaluated for each endangered and threatened species on our June 25, 1992, species list. EPA stated they did not have the time or personnel to evaluate each pollutant. The two agencies discussed the possibility that there may be several pollutants of concern in Arizona that could be evaluated rather than evaluating all pollutants. After the conference call, the AESO received an example format of EPA's BE on February 2, 1993, concluding "no effect" for each species for each chemical. We provided a written response, dated February 18, 1993, recommending that EPA prepare a second BE addressing endangered and threatened species individually for each chemical of concern in Arizona. We stated that we believed there is additional scientific and commercial data available that was not provided in the BE dated November 6, 1992. We also provided recommendations for assistance in preparation of a BE. One recommendation was to address the 10 chemicals on the EPA 304(l) short list.

A telephone conference call was held on March 22, 1993, between EPA and the AESO to discuss the consultation and timeframe concerns.

On April 8, 1993, the AESO received a BE, dated April 7, 1993, on certain revisions to the Arizona Water Quality Standards Rules. The BE provided data for and evaluated the 10 pollutants pertaining to the Arizona adopted numeric water quality criteria for toxic pollutants. EPA determined that the revisions are not likely to adversely affect any listed threatened or endangered species or critical habitat. The cover letter requested our written concurrence within 30 days or, if we were unable to concur within 30 days, they requested the initiation of formal consultation under the Act.

The EPA met with the AESO in Phoenix, Arizona, on April 12, 1993, to discuss the BE and whether it should evaluate water quality criteria for cold water fishes and additional numeric water quality standards for fecal coliform, pH, temperature, dissolved oxygen, turbidity, and nutrient criteria for total phosphorus and nitrogen. EPA said they would continue to evaluate only the toxic pollutants pertaining to warm water fishery and defer the evaluation of 304 (a) criteria pollutants (cold water fishery) to the national Memorandum of Understanding currently being negotiated among EPA, Service and National Marine Fisheries Service. Numeric water quality standards for fecal coliform, pH, etc., would not be addressed in this BE because the next Arizona triennial review for water quality standards began October 1993, and EPA would prefer to defer further evaluation until the next triennial review. The AESO inquired if it was possible to determine what pollutants were detected in Arizona waters to narrow down the list of toxic pollutants. EPA said they would run a search for pollutants detected in Arizona waters and provide us with a list. We recommended that the tables be redone to be species-specific for the 10 chemicals.

On April 27, 1993, EPA provided the AESO with the species-specific tables for the 10 pollutants evaluated in the BE. No information was provided on what pollutants have been detected in Arizona waters.

The AESO provided a response dated May 7, 1993, on the April 7, 1993, BE. Our position stated that a formal Section 7 consultation is required for any chemicals detected in Arizona waters if the water quality standards may affect any listed species or their critical habitat, and additional information was needed before the Service could make a determination to concur or not concur with the BE. We stated we would not concur until we received the requested information and that formal consultation had not yet started.

There was a telephone conference call between EPA and the AESO on May 12, 1993, to further discuss information needs. EPA stated that evaluation of numeric toxics criteria for aquatic life for the 10 pollutants is warranted for the remaining 94 pollutants.

On May 17, 1993, the EPA sent a letter to the AESO requesting an expedited response to EPA's request for formal consultation.

On May 19, 1993, there was a telephone conference call between EPA and the AESO. We discussed the proposed action and EPA's request for initiation of formal consultation and the possible consequences of a consultation without all data and without complete evaluation of the action. The proposed action is the EPA "approval of the Arizona water quality standards package." EPA stated that they preferred to pursue the initiation of formal consultation regardless of the consequences.

Formal consultation was initiated May 21, 1993, by letter from EPA to the AESO. This letter acknowledged EPA's awareness of the risks of initiation of formal consultation when insufficient information has been provided to evaluate the effects of the action.

The AESO provided a letter to EPA, dated June 2, 1993, acknowledging receipt of this request to initiate formal consultation and requesting additional information for the Service to adequately complete a formal consultation.

By letter dated, June 29, 1993, EPA stated they are in the process of disapproving portions of the AWQS. The substance of EPA's disapprovals was discussed in their letter to Arizona Department of Environmental Quality (ADEQ) dated January 13, 1993. The EPA requested the AESO's concurrence that all disapprovals, other than the mining exemption, would have no effect on endangered and threatened species; and the disapproval of the exemption for mining-related impoundments would have a beneficial effect for listed species. The AESO provided a written response, dated July 28, 1993, concurring with all disapprovals.

The EPA met with the Service (Regional Office [RO] and AESO) and ADEQ on July 12, 1993, in Phoenix to discuss the Service's request for additional information, the BE, and what information and data EPA would provide.

The AESO received a letter from EPA, dated July 27, 1993, discussing antidegradation regulations and their importance to the implementation of Arizona water quality standards and surrogate species. The letter also included a summary of additional information provided. Information included diskettes containing data sets that ADEQ used to derive priority pollutant numeric water quality criteria for aquatic and wildlife uses and an "Explanatory Statement" that provides ADEQ's rationale for each adopted rule of the entire water quality standards package. Included in the "Explanatory Statement" is a section responding to public comments the State received during the triennial review of standards. The letter also addressed what EPA recommended for review and analyses during the next triennial review of standards beginning in October 1993. These recommendations included: (1) analysis to confirm whether terrestrial

species dependent upon aquatic ecosystems are fully protected by water quality criteria; (2) further analyses of designated uses and the coincidence of listed species with an evaluation of applicable 304(a) water quality criteria and discharge and monitoring data for selected parameters of concern with consideration given to downstream effects; and (3) an analysis of the unique water classification and the protection it affords to listed (endangered and threatened) species occurring in and/or downstream of waters classified as such and determine if additional listing under the unique water classification would be beneficial to listed species.

In summary, this letter provided no further evaluation of the Arizona water quality standards package. Specifically, there was no further evaluation of numeric toxic criteria for the remaining 84 priority pollutants; salinity of the Colorado River; enforcement; schedules of compliance; new designated uses for aquatic and wildlife ephemeral and effluent dominated waters and fish consumption; narrative water quality standards; numeric water quality standards for fecal coliform, pH, temperature, turbidity, dissolved oxygen, nutrient criteria for total phosphorus and nitrogen, including EPA promulgated nutrient criteria, and radiochemicals; classification of unique waters; analytical methods; exclusions for waste water treatment ponds and mining impoundments; mixing zones; nutrient waiver; resource management agencies; canals and municipal park lakes; dams and flood control structures; natural background; and classification of effluent dominated waters; and Article 2.

A draft biological opinion dated October 15, 1993, was submitted to EPA. On November 4, 1993, a conference call took place between the EPA, Service (RO and AESO), and National Biological Survey (NBS) to discuss the jeopardy/adverse modification of critical habitat biological opinion for EPA promulgated nitrate standards, lack of narrative implementation procedures, and numeric water quality standards for toxic pollutants in the draft biological opinion.

The AESO received a letter dated November 22, 1993, from the EPA clarifying their promulgated nitrate standards for the Colorado River and their action regarding the lack of narrative implementation procedures for toxic pollutants.

The EPA met with the Service (RO and AESO), NBS, and ADEQ on November 30 and December 1, 1993, in Albuquerque. We discussed the jeopardy/adverse modification of critical habitat determination for toxic pollutants, reasonable and prudent alternatives, and conservation recommendations.

By letter dated December 23, 1993, EPA provided the Service with information on what chemicals occur in A&Ww criteria waters that are less stringent than aquatic and wildlife cold water fishery (A&Wc) criteria where endangered and threatened species exist, and proposed language for reasonable and prudent alternatives to address the Service's jeopardy/adverse modification of critical habitat biological opinion. There were eight chemicals with less stringent A&Ww criteria: cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, toxaphene, and 1, 2, 4,-trichlorobenzene.

Description of Proposed Action

Pursuant to section 303(c)(1) of the CWA, the State Governor or the State water pollution control agency, ADEQ, is required to hold public hearings for the purpose of reviewing their water quality standards and, as appropriate, revise and adopt standards every 3 years as part of a continuing triennial review process. Results of such review are submitted to EPA, pursuant to CWA section 303(c)(2)(A). The revised or new water

quality standards consist of the designated uses of navigable waters and the water quality criteria for such waters. Such standards should provide protection for both human health and aquatic life. Section 303(c)(2)(B) of the CWA requires the State to adopt numeric criteria for all toxic pollutants listed pursuant to the CWA section 307(a)(1) for which criteria have been published under section 304(a). Under section 304(a), EPA has produced a series of scientific water quality criteria guidance documents, which States consider when adopting regulatory criteria. Pursuant to section 303(c)(3) of CWA, the EPA approves and/or disapproves all or portions of the State's revised or new water quality standards. If EPA determines that any such revised or new standard is not consistent with the applicable requirements of the CWA, then EPA will notify the State of the disapproved portions and specify the changes needed to meet the requirements. EPA will promulgate standards for the disapproved portions, pursuant to section 303(c)(4), if the State has not rectified the problem.

The principal application of the EPA's approved and/or promulgated water quality criteria is the National Pollutant Discharge Elimination System (NPDES) permit program. The proposed approval and/or disapproval of the Arizona water quality standards will provide generic guidelines for the NPDES permit writers; to then develop conditions and limits for inclusion in such permits. Overall, Arizona's water quality criteria will be implemented in NPDES permits issued by the EPA Regional Office.

The action for this formal consultation is the EPA proposed approval and/or disapproval of the AWQS for Navigable Waters of Title 18, Chapter 11, Articles 1 and 2 pursuant to section 303(c)(2)(B) and (c)(3) of the CWA. Section 7 consultation has never been done for AWQS prior to this formal consultation.

The AWQS were adopted by ADEQ on January 10, 1992, and certified by the Arizona Attorney General on February 18, 1992. On March 2, 1992, EPA approved the State's adopted water quality criteria for toxic priority pollutants contained in Appendix A, pages A-1 through A-7. By letter dated January, 13, 1993, addressed to ADEQ, the EPA disapproved several rules and parts of rules: (1) the exclusion from water quality standards rule for mining related impoundments; (2) the lack of fish consumption as a designated use; (3) the lack of implementation procedures for the narrative water quality standard rule; (4) the lack of biomonitoring implementation procedures for implementation of the narrative toxicity standard rule; and (5) Appendix C Practical Quantitative Limits. These disapproved rules will not be addressed in this biological opinion and will require future Section 7 consultations when adopted by ADEQ or when addressed under NPDES permit applications. EPA will approve and/or disapprove portions of the State's water quality standards pending completion of this formal consultation.

Article 1 - Water Quality Standards for Navigable Waters

In 1992, ADEQ adopted several sections in Article 1 of the water quality standards without revisions to the previous 1986 standards. These adoptions include antidegradation, salinity of the Colorado River, enforcement, and schedules of compliance (ADEQ 1992a).

Antidegradation - This rule (R18-11-107) establishes a three-tiered approach to maintaining and protecting water quality and uses for navigable waters in Arizona. The rule includes antidegradation provisions that provide protection for water quality-limited waters (Tier-1), high quality waters (Tier-2), and unique waters (Tier-3). Protection under Tier-1 states that existing navigable water uses and the level of water quality necessary to protect existing uses shall be maintained and protected. Tier-2 provides protection for waters where existing water quality in a

navigable water is better than applicable water quality standards and the existing water quality shall be maintained and protected. Tier-3 provides the existing water quality to be maintained and protected in a navigable water that is classified as a unique water (outstanding national resource water). Endangered and threatened species may occur in unique waters. Activities covered by this provision include both point and non-point sources of pollution. Basically, this provision and implementation procedures assure that navigable waters in Arizona will not degrade below their present quality. The State, however, has not developed implementation procedures.

Salinity of the Colorado River - This rule (R18-11-110) establishes numeric criteria for the flow-weighted average annual salinities of the Colorado River for three monitoring stations below Hoover, Parker and Imperial dams. Salinity would not exceed concentrations of 723, 747 and 879 mg/l below Hoover, Parker, and Imperial dams, respectively. These criteria were established to meet the requirements of 303(a) and (b) of the CWA. Implementation of the salinity standards is contained in the document entitled, Water Quality Standards for Salinity, Colorado River System: 1990 Review.

Enforcement - This rule (R18-11-120) allows the State to take enforcement action for any violation of a State water quality standard or any provision of Article 1.

Schedules of Compliance - This rule (R18-11-121) provides the authority for EPA to establish schedules of compliance for existing point source discharges to be in compliance with the State-adopted water quality standards. A compliance schedule may (1) be established in a NPDES permit and (2) shall require compliance with a discharge limitation based upon a water quality standard no later than 3 years after the effective date of the water quality standard.

The adopted 1992 water quality standards also included revisions to several rules in Article 1 of the 1986 standards. These revisions in Article 1 of the Arizona water quality standards are as follows:

1. New designated uses were developed to protect aquatic life in aquatic and wildlife effluent dominated waters and aquatic and wildlife ephemeral waters of navigable waters. Another designated use, fish consumption, was established to protect human health.

2. There was a substantial increase in the number of navigable waters that would be addressed under the water quality standards.

3. Numeric water quality standards for fecal coliform, pH, temperature, dissolved oxygen, turbidity, nutrient criteria for total phosphorus and nitrogen, and radiochemicals were revised. Numeric water quality standards for toxic priority pollutants were revised to include standards for nearly all the 126 priority pollutants, chlorine (total residual), and total ammonia.

4. The monitoring rule was reorganized. This rule stated that the State shall maintain a surface water quality monitoring program and described the analytical methods that would be used for determining compliance with water quality standards. However, the monitoring section unnecessarily repeated A.R.S. §49-225. The monitoring portion of the rule was deleted because A.R.S. §49-225.A requires the State to conduct ongoing monitoring of the waters of the State including compliance monitoring with applicable water quality standards. This rule now addresses only the analytical methods pursuant to the Arizona Department of Health Services (ADHS). Another section of this rule

was reorganized to establish a procedure to approve alternative analytical methods for compliance monitoring.

5. The rule addressing unique water classification was substantially revised to add five navigable waters to the classification, and eliminate the declassification of a unique water.

6. Exceptions to the water quality standards were substantially revised. Each exception is now addressed in separate rules. These include exclusions, mixing zones, nutrient waiver, resource management agencies, canals and municipal park lakes, dams and flood control structures, and natural background.

7. The rule addressing the effluent dominated water (EDW) classification was revised to include 27 navigable waters. Numeric water quality standards were revised for fecal coliform, temperature, turbidity, and toxic pollutants that apply to the new designated use protecting aquatic life in EDW's. Water quality standards for viruses, *Giardia lamblia*, and parasites in EDW's were eliminated.

Designated Uses - This rule (R18-11-104) states that the Director of ADEQ shall adopt or remove designated uses and subcategories of designated uses. Designated uses include A&Wc, A&Ww, aquatic and wildlife effluent dominated waters (A&Wedw), aquatic and wildlife ephemeral waters (A&We), drinking water source, fish consumption, full body contact, partial body contact, agriculture irrigation, and agriculture livestock watering. Numeric water quality criteria to protect the designated uses are proposed in Appendix A and rules R18-11-109, R18-11-110 and R18-11-112 (ADEQ 1992b). Designated uses of the navigable waters are identified in Appendix B (ADEQ 1992b). Narrative standards to protect all navigable waters are proposed in R18-11-108. A navigable water that is not listed in Appendix B but that is tributary to a listed navigable water shall be protected by the water quality standards that have been established for the nearest downstream navigable water listed in Appendix B that is not an effluent dominated water. If a navigable water has more than one designated use, the applicable water quality criterion for a pollutant is the most stringent of those prescribed to protect the designated uses of the navigable water. Several navigable waters were identified throughout Arizona. However, several waters where endangered or threatened species occur are not subject to the tributary rule because they do not flow into a tributary of a navigable water and thus were not identified as navigable waters. The conservation recommendations address the waters that should be identified as navigable waters of the United States and therefore will have a defined designated use. These waters and associated endangered and threatened fish species will be addressed in this biological opinion.

Numeric Water Quality Standards - Standards that are proposed in rule R18-11-109 and Appendix A operate as default standards that apply to all navigable waters, including unique waters (ADEQ 1992b). Additional standards are proposed for certain unique waters in R18-11-112.

Rule R18-11-109 proposed water quality standards for fecal coliform, pH, temperature, turbidity, dissolved oxygen, nutrient criteria for total phosphorus and nitrogen, and radiochemicals. Nutrient criteria (phosphate and nitrate) for several Arizona waters were promulgated by EPA on July 1, 1992. Water quality standards proposed for fecal coliform are not to exceed from 1,000 colony forming units (cfu)/100 ml at a 30-day geometric mean to 4,000 cfu/100 ml at a single-sample maximum for designated A&Wc, A&Ww and A&We areas. Standards for A&Wedw areas are not to exceed from 200 cfu/100 ml at a 30-day geometric mean to 800 cfu/100 ml at a single-sample maximum.

Standards for pH shall range from 6.5 - 9.0 and the allowable maximum change due to a discharge is 0.5 for designated A&Wc, A&Ww, A&We and A&Wedw areas.

Standards proposed for temperature would permit a maximum increase, due to a discharge, of 3 °C in A&Ww and A&Wedw and 1 °C in A&Wc designated areas.

Water quality standards for turbidity would permit a maximum concentration not to exceed 50 nephelometric turbidity units (NTU) in rivers, streams, and other flowing waters, and 25 NTU in lakes, reservoirs, tanks, and ponds in designated A&Ww and A&Wedw areas. Turbidity in A&Wc shall not exceed 10 NTU in rivers, streams and other flowing waters, and lakes, reservoirs, tanks, and ponds. Turbidity is measured as a light transvisity.

Standards proposed for dissolved oxygen would not fall below 6.0, 7.0, or 1.0 mg/l or 90 percent saturation, whichever is less, for a single-sample minimum in respective designated A&Ww, A&Wc, and A&Wedw areas.

The State proposed nutrient standards for total phosphorus and nitrogen in several navigable waters (R18-11-109.G). Standards representing the 90th percentile for total phosphorus range from no numeric standard to 0.33 mg/l, and total nitrogen ranges from no numeric standard to 2.5 mg/l. Phosphorus and nitrogen standards apply to the following waters: Verde River and tributaries from headwaters to Bartlett Lake; White and Black Rivers, Tonto Creek and tributaries; Salt River and tributaries, except Pinal Creek, from the confluence of the White and Black Rivers to Roosevelt Lake; Roosevelt, Apache, Canyon, and Saguaro Lakes; Salt River below Stewart Mountain Dam (Saguaro Lake) to the confluence with the Verde River; Little Colorado River and tributaries above River Reservoir in Greer; South Fork of Little Colorado River and Water Canyon Creek; Little Colorado River at the crossing of Apache County Road #124; Little Colorado River above Lyman Lake near the crossing of Arizona Highway 273; Colorado River at Northern International Boundary near Morelos Dam; and San Pedro River from Curtis to Benson.

The State declined to adopt nutrient standards for phosphates and nitrates on the Colorado, Gila, and Santa Cruz rivers, and portions of the San Pedro and Little Colorado Rivers. Therefore, those standards were promulgated by EPA [40 CFR §131.31(a)(1)]. Total phosphate standards representing a mean 90 percent annual value, range from 0.04 to 0.8 mg/l, and total nitrate standards range from 4 to 7 mg/l. Phosphate standards apply to the following waters and, unless otherwise specified, standards also apply to tributaries to the named waters: Colorado River from Utah border to Morelos Dam (main stem), Gila River from New Mexico border to Ashurst Hayden Dam (including San Carlos Reservoir), San Pedro River, Verde River (except Granite Creek), Salt River above Roosevelt Lake, Santa Cruz River from international boundary near Nogales to Sahuarita and Little Colorado River above Lyman Reservoir. Promulgated standards for total nitrate apply only to the main stem of the Colorado River.

Standards proposed for radiochemicals have been established to protect drinking water in navigable waters that are designated as domestic water sources and are in compliance with the mean concentration limits pursuant to 40 CFR §141.15 and §141.16.

Numeric water quality standards in Appendix A prescribe criteria for toxic pollutants, chlorine (total residual), and total ammonia. Arizona State law (A.R.S. §49-221.D) requires the adoption of numeric water quality standards for each of the 126 priority pollutants. The State adopted numeric standards for pollutants that had EPA criteria guidance for nearly all 126 priority pollutants. Proposed acute and chronic criteria for chlorine have a maximum discharge limit of 11 and 5 μg/l, respectively, for

A&Wc, A&Ww, and A&Wedw areas. The State is adopting numeric standards for total ammonia (mg-N/L or mg NH_3-N/L) only for the A&Wc and A&Ww designated areas.

Analytical Methods - This rule (R18-11-111) requires the use of analytical methods that are approved by the ADHS to determine compliance with a water quality standard (ADEQ 1992b). The test result shall be valid only if the sample has been analyzed by a laboratory that is licensed by the ADHS.

Unique Water Classification - This rule (R18-11-112) permits the classification of certain navigable waters as "unique waters" or outstanding State resource waters (ADEQ 1992b). Additional standards proposed for unique waters either supplement or supersede the default numeric water quality standards stated in R18-11-109 and Appendix A on a parameter-by-parameter basis. Any citizen or agency may nominate a water for unique water classification. After the nomination is received and reviewed by ADEQ, a public review of the nomination will occur during the triennial review rule-making process. The Director of ADEQ may then adopt site-specific water quality standards to maintain and protect the existing water quality in a unique water. Classification of a unique water is based upon one of the following criteria: (1) the navigable water is of exceptional recreational or ecological significance because of its unique attributes, including, but not limited to, attributes related the geology, flora, fauna, water quality, aesthetic values or the wilderness characteristics of the navigable water; and (2) endangered or threatened species are known to be associated with the navigable water and the existing water quality is essential to the maintenance and propagation of an endangered or threatened species or the navigable water provides critical habitat for an endangered or threatened species. After a unique water classification has been adopted, it can not be declassified. Seven navigable waters are classified as unique waters:

1. West Fork of the Little Colorado River, above Government Springs, Apache County;

2. Oak Creek, including West Fork of Oak Creek, Coconino County;

3. Peoples Canyon Creek, tributary of Santa Maria River, Yavapai County;

4. Burro Creek, above its confluence with Boulder Creek, Yavapai County;

5. Francis Creek, Mohave and Yavapai Counties;

6. Bonita Creek, tributary to the upper Gila River, Graham County;

7. Cienega Creek, from I-10 bridge to Del Lago Dam, Pima County.

Several endangered and threatened species exist in these unique waters. Little Colorado spinedace are found in the West Fork of the Little Colorado River and razorback sucker exist in Bonita Creek. Gila topminnow have been stocked in Peoples Canyon.

The following water quality standards apply to the classified unique waters and either supersede or supplement the water quality standards proposed pursuant to R18-11-109 and Appendix A. Bonita and Cienega creeks do not have any proposed criteria to supersede or supplement the default criteria.

1. West Fork of the Little Colorado River, above Government Springs:

Parameter	Standard
Fecal Coliform[a]	200 cfu/100ml (single-sample maximum)
pH[b]	no change due to discharge
Temperature[b]	no increase due to discharge
Dissolved oxygen[b]	no decrease due to discharge
Total dissolved solids[b]	no increase due to discharge
Chromium (D)[a]	10 μg/l
Zinc (D)[a]	110 μg/l

2. Oak Creek, including West Fork of Oak Creek:

Parameter	Standard
Fecal Coliform[a]	150 cfu/100ml*
pH[b]	no change due to discharge
Temperature[b]	no increase due to discharge
Nitrogen (T)[a]	1.0 mg/l (annual mean)
	1.5 mg/l (90th percentile)
	2.5 mg/l (single-sample maximum)
Phosphorus (T)[a]	0.1 mg/l (annual mean)
	0.25 mg/l (90th percentile)
	0.3 mg/l (single-sample maximum)
Chromium (D)[a]	5 μg/l
Zinc (D)[a]	50 μg/l
Turbidity change due to discharge[b]	3 NTU

* Geometric mean of a random set of a minimum of 10 samples in any calendar month.

3. Peoples Canyon Creek, tributary to Santa Maria River:

Parameter	Standard
Temperature[b]	no increase due to discharge
Dissolved oxygen[b]	no decrease due to discharge
Turbidity change due to discharge[b]	5 NTU
Arsenic (T)[b]	20 μg/l
Manganese (T)[a]	500 μg/l

4. Burro Creek, above its confluence with Boulder Creek:

Parameter	Standard
Fecal Coliform[a]	500 cfu/100ml (single-sample maximum)
Manganese (T)[a]	500 μg/l

5. Francis Creek, Mohave, and Yavapai Counties:

Parameter	Standard
Fecal Coliform[a]	500 cfu/100ml (single-sample maximum)
Manganese (T)[a]	500 μg/l

D - dissolved fraction
T - total recoverable
[a] - the numeric water quality standard supersedes a water quality standard prescribed in R18-11-109 or Appendix A.
[b] - the numeric water quality standard supplements a water quality standard prescribed in R18-11-109 or Appendix A.

Exclusions - This rule (R18-11-103) provides for an exception from water quality standards for waste treatment systems (ADEQ 1992b). Treatment ponds and lagoons are not excluded from water quality standards if they are created in navigable waters or are the result of the impoundment of navigable waters. This exclusion for waste treatment systems is consistent with the waste treatment system exclusion pursuant to 40 CFR §122.2 - waters of the United States.

Mixing Zones - This rule (R18-11-114) provides for an exception from water quality standards for mixing zones (ADEQ 1992b). The designation of mixing zones are prohibited in ephemeral waters or where there is no water for dilution. The owner or operator of a point source seeking the establishment of a mixing zone shall submit an application to ADEQ. Guidelines in this rule include zone of passage requirements, size restrictions, and several prohibitions. Prohibitions generally prevent the impairment of designated uses outside the mixing zone and the establishment of mixing zones in biologically sensitive areas of navigable waters. When an application of a mixing zone is complete, ADEQ shall give public notice and conduct a public hearing on whether to establish a mixing zone. A mixing zone is currently established in Canyon Lake.

Nutrient Waiver - This rule (R18-11-115) provides for an exception from the nutrient water quality criteria for total phosphorus and nitrogen as prescribed in R18-11-109.G (ADEQ 1992b). Specifically, nutrient criteria for total phosphorus and nitrogen may be waived on a discharger-specific basis for a discharge to an ephemeral water that is tributary to a navigable water for which nutrient standards are prescribed, provided that water quality standards are not violated in downstream perennial waters. A discharger who seeks a nutrient waiver shall submit an application to ADEQ. When an application for a nutrient waiver is complete, ADEQ shall give public notice and conduct a public hearing on whether the request for a nutrient waiver should be granted.

Resource Management Agencies - This rule (R18-11-116) provides for exceptions from water quality standards for fisheries management activities by the Arizona Game and Fish Department (AGFD), and the Service (ADEQ 1992b). Fishery management activities include the use of registered aquatic herbicides and pesticides. This provision does not exempt the operation of fish hatcheries from NPDES permit requirements.

Canals and Municipal Park Lakes - This rule (R18-11-117) provides for an exception from water quality standards for the routine physical or mechanical maintenance of canals and the municipal park lakes identified in Appendix B (ADEQ 1992b). Maintenance includes dewatering, lining, dredging, and the physical, biological, or chemical control of weeds and algae. Increases in turbidity that result from these maintenance activities are permitted. Discharge of lubricating oil that is associated with the start-up of well pumps that discharge to canals shall not be considered a violation of the narrative standard.

Dams and Flood Control Structures - This rule (R18-11-118) provides for an exception from the turbidity water quality standard prescribed in R18-11-109.D for the routine physical or mechanical maintenance of dams and flood control structures (ADEQ 1992b).

Natural Background - This rule (R18-11-119) provides for an exception from water quality standards when the standards are exceeded due to natural background conditions (ADEQ 1992b).

Effluent Dominated Waters - This rule (R18-11-113) establishes the classification of a navigable water as an effluent dominated water downstream from a waste water treatment plant (WWTP) (ADEQ 1992b). The

Director of ADEQ may adopt site-specific water quality standards for an effluent dominated water. Site-specific standards are prescribed in R18-11-109 and Appendix A. The following navigable waters are classified as effluent dominated waters.

1. Colorado River main stem basin:
   a. Bright Angel Wash to confluence with Cataract Creek, Coconino County
   b. Unnamed wash, tributary to Bright Angel Creek, from Grand Canyon-North Rim WWTP to 1 km downstream
   c. Cataract Creek from Williams WWTP to 3 km downstream, Coconino County
   d. Holy Moses Wash from Kingman WWTP to 5 km downstream, Mohave County

2. Little Colorado River basin:
   a. Black Creek from Ft. Defiance WWTP to confluence with Rio Puerco, Apache County
   b. Dry Lake, Navajo County
   c. Lake Humphreys, Coconino County
   d. Lower Walnut Canyon Lake, Coconino County
   e. Ned Lake, Navajo County
   f. Pintail Lake, Navajo County
   g. Rio de Flag from Flagstaff WWTP to confluence with Little Colorado River, Coconino County
   h. Telephone Lake, Navajo County

3. Middle Gila River basin:
   a. Agua Fria River from Surprise WWTP to 5 km downstream, Maricopa County
   b. Agua Fria River from El Mirage WWTP to 8 km downstream, Maricopa County
   c. Agua Fria River from Avondale WWTP to confluence with Gila River, Maricopa County
   d. Gila River from confluence with Salt River to Gillespie Dam, Maricopa County
   e. Gila River from Florence WWTP to 5 km downstream, Pinal County

4. Rio Yaqui basin:
   a. Mule Gulch, from Bisbee WWTP to confluence with Whitewater Draw, Cochise County
   b. Unnamed wash from Bisbee-Douglas International Airport WWTP to Whitewater Draw, Cochise County

5. Salt River basin:
   a. Pinal Creek from Globe WWTP to 5 km downstream, Pinal County
   b. Salt River from 23rd Avenue WWTP to confluence with Gila River, Maricopa County

6. San Pedro River basin:
   a. Unnamed wash from Oracle WWTP to confluence with Big Wash, Pinal County
   b. Walnut Gulch from Tombstone WWTP to confluence with San Pedro River, Cochise County

7. Santa Cruz River basin:
   a. North Branch of Santa Cruz Wash from Casa Grande WWTP to confluence with Santa Cruz Wash, Pinal County
   b. Santa Cruz River from Nogales WWTP to Tubac, Santa Cruz County

c. Santa Cruz River from Roger Road WWTP to Baumgartner Road crossing, Pinal County

8. Upper Gila River basin:
   a. Bennet Wash from Arizona Department of Corrections-Safford WWTP to confluence with Gila River, Graham County
   b. Cammerman Wash from Arizona Department of Corrections-Globe WWTP to 3 km downstream, Gila County

9. Verde River basin:
   a. American Gulch from Payson WWTP to East Verde River, Gila County
   b. Bitter Creek from Jerome WWTP to 2.5 km downstream, Yavapai County
   c. Jack's Canyon Wash from Big Park WWTP to confluence with Dry Beaver Creek, Yavapai County.

Article 2 - Discharge Limitations - The ADEQ adopted Article 2, discharge limitations, without changes to the previous 1986 version. Article 2 contains three rules that establish prohibitions or limitations on discharges to certain navigable waters. The first rule establishes discharge limitations for phosphates in Show Low Creek and tributaries upstream of and including Fools Hollow Lake, the San Francisco River, and tributaries upstream of Luna Lake Dam and the White River and tributaries. The second rule establishes prohibitions of discharge of treated wastewater to Sabino Creek. The final rule establishes a discharge limitation to ephemeral waters.

Description of Action Area

The action area consists of all navigable waters and their tributaries in Arizona that have an identified designated use and associated federally endangered and threatened species and critical habitats. Endangered and threatened species and critical habitats listed by county with navigable waters and most stringent associated designated use are described as follows:

Apache County

Apache trout
- Headwater streams of the Black, White, Blue, and Little Colorado Rivers - A&Wc

Little Colorado spinedace
- Little Colorado River (headwaters to Winslow) - A&Wc/A&Ww
- Nutrioso Creek with critical habitat - A&Wc
- Rudd Creek - A&Wc

Cochise County

Beautiful Shiner
- *Critical habitat is all aquatic habitats on San Bernardino NWR
- Critical habitat in Blackdraw - A&Ww
- Not identified as navigable waters:
  - *Twin Pond
  - *Mesquite Pond
  - *Bathhouse Spring
  - *Gamma Pond
  - *Oasis Pond

Yaqui catfish
- Extirpated in United States
- *Critical habitat is all aquatic habitats on San Bernardino NWR
- Critical habitat in Blackdraw - A&Ww

Yaqui chub
*Critical habitat is all aquatic habitats on San Bernardino NWR
Critical habitat in Blackdraw - A&Ww
Leslie Creek - A&Ww
West Turkey Creek - A&Ww
Not identified as navigable waters:
*Bathhouse Spring
*House Pond
*Two PhD Ponds
*Robertson Cienega
*North Pond
*Mesquite Pond

Yaqui topminnow
Leslie Creek - A&Ww
Blackdraw - A&Ww
Not identified as navigable waters:
*Bathhouse Spring
*Cienega Spring
*Middle Spring
*House Pond
*North Pond
*Two PhD Ponds
*Gamma Pond
*Robertson Cienega
*Bunting Spring
*Cottonwood Spring
*Upland Spring
*Twin Pond
*Mesquite Pond

Coconino County

Apache trout
North Canyon Creek - A&Wc

Humpback chub
Little Colorado River from confluence with Colorado River - A&Ww
Colorado River in Grand and Marble Canyons - A&Wc

Little Colorado spinedace
Portions of East Clear Creek and tributaries with critical habitat - A&Wc
Dines Tank (Leonard Canyon) - A&Wc

Bald eagle
Colorado River - A&Wc

Gila County

Gila topminnow
Mescal Warm Springs - A&Ww
Corner Artesian - A&Ww
Kayler Spring - A&Wc
Reed Spring - A&Wc
Not identified as navigable waters:
*Artesian Well #3
*Cottonwood Artesian

Loach minnow
White River - A&Wc

Razorback sucker
Salt River upstream from Roosevelt Diversion Dam - A&Ww
Cherry Creek - A&Ww
Canyon Creek - A&Ww

Bald eagle
Salt River - A&Wc and A&Ww
Tonto Creek - A&Wc
Gila River - A&Ww

Graham County

Desert pupfish
- Roper Lake - A&Ww
- Not identified as navigable waters:
  - Cold Spring Seep
  - Howard Well

Gila topminnow
- Bylas Springs - A&Ww
- Salt Creek - A&Ww
- Big Spring - A&Ww
- North Fork Ash Creek - A&Ww
- Watson Wash - A&Ww
- Roper Lake - A&Ww
- Not identified as navigable waters:
  - Middle Spring
  - Cold Spring Seep

Loach minnow
- Aravaipa Creek - A&Ww

Razorback sucker
- Gila River upstream from Coolidge Dam to New Mexico border - A&Ww
- Bonita Creek - A&Ww and unique water
- Eagle Creek - A&Wc

Spikedace
- Aravaipa Creek - A&Ww
- Eagle Creek - A&Wc

Greenlee County

Loach minnow
- Blue River - A&Wc
- Campbell Blue Creek - A&Wc
- San Francisco River - A&Wc

Spikedace
- Eagle Creek - A&Wc

La Paz County

Desert pupfish
- Grapevine Spring (Yerba Mansa) - A&Ww

Gila topminnow
- Grapevine Spring (Yerba Mansa) - A&Ww

Bald eagle
- Bill Williams River - A&Ww
- Alamo Lake - A&Ww

California brown pelican
- Colorado River downstream from Parker Dam to Mexico - A&Ww

Yuma clapper rail
- Colorado River from Lake Havasu downstream to Mexico -A&Ww

Maricopa County

Desert pupfish
- Hassayampa Preserve - A&Ww

Gila topminnow
- Hassayampa Preserve - A&Ww
- Indian Spring - A&Wc
- Unnamed drainage #68 - A&Wc (A&Ww historically)
- Upper Horrell Spring (Campaign Creek) - A&Ww
- Hidden Water Spring - A&Ww
- Mesquite Spring Tank and stream - A&Ww
- Walnut Spring - A&Ww
- Seven Springs - A&Ww
- *Charlebois Spring - A&Wc
- Not identified as navigable waters:
  - *Mud Springs

Bald eagle
- Salt River - A&Ww and A&Wc
- Verde River - A&Ww
- Lake Pleasant - A&Ww

Yuma clapper rail
- Gila River - A&Wedw
- Salt River - A&Wedw

Mohave County

Bonytail chub
- Lake Mohave - A&Wc
- Lake Havasu - A&Ww

Razorback sucker
- Colorado River downstream from Glen Canyon Dam to Yuma
  - A&Wc (Lake Powell to Topock)
  - A&Ww (Topock to Mexico)

Virgin River chub
- Virgin River - A&Ww
- Beaver Dam Wash - A&Ww

Woundfin
- Virgin River - A&Ww

Yuma clapper rail
- Colorado River from Lake Havasu downstream to Mexico - A&Ww

Navajo County

Little Colorado spinedace
- Chevelon Creek with critical habitat - A&Wc
- Silver Creek from headwaters to White Mountain Lake and below
- White Mountain Lake to Little Colorado River - A&Wc

Loach minnow
- White River - A&Wc

Pima County

Desert pupfish
- Buehman Canyon - A&Ww
- Not identified as navigable water:
  - Quitobaquito Springs with critical habitat

Gila topminnow
Cienega Creek plus Matties Creek - A&Ww
Empire Gulch - A&We
Nogales Spring - A&Ww
Little Nogales Spring - A&Ww
Rincon - A&Ww

Pinal County

Desert pupfish
Ayer Lake at Boyce Thompson Arboretum - A&Ww

Gila topminnow
Ayer Lake at Boyce Thompson Arboretum - A&Ww

Spikedace
Aravaipa Creek - A&Ww
Gila River from Coolidge Dam downstream to Florence - A&Ww

Loach minnow
Aravaipa Creek and the confluence of Aravaipa Creek and San Pedro River - A&Ww

Yuma clapper rail
Picacho Reservoir - A&Ww

Santa Cruz County

Desert pupfish
Bog Hole - A&Ww
Finley Tank - A&Ww

Gila topminnow
Sonoita Creek - A&Ww
Cottonwood Spring - A&Ww
Monkey Spring (spring & canal) - A&Ww
Redrock Canyon - A&Ww
Santa Cruz River (San Rafael Valley) - A&Ww
Sheehy Spring - A&Ww
Sharp Spring - A&Ww
Heron Spring - A&Ww
Fresno Canyon - A&Ww
Santa Cruz River at Tumacacori - A&Wedw

Sonora chub
Sycamore Canyon - with critical habitat, A&Wc
Penasco Canyon - with critical habitat, A&Wc
Atascosa Canyon - A&Wc

Yavapai County

Desert pupfish
Peoples Canyon - A&Ww and unique water
AD Wash - A&Ww

Gila topminnow
AD Wash - A&Ww
Peoples Canyon - A&Ww and unique water
Horse Creek - A&Ww
Dutchman's Grave Spring - A&Ww
Thicket Spring - A&Ww
Red Creek - A&Ww
Mud Spring Tank - A&Ww
Tule Creek - A&Ww
Cow Creek - A&Ww

Humbug Creek - A&Ww
Lower Mine Spring - A&Ww
Government Spring - A&Ww
Bain Spring - A&Ww
Castle Creek - A&Ww

Gila trout
Gap Creek - A&Wc

Razorback sucker
Verde River above Horseshoe Dam - A&Ww

Spikedace
Upper Verde River from headwaters downstream to Packard - A&Ww

Bald eagle
Verde River - A&Ww
Lake Pleasant - A&Ww
Agua Fria River - A&Ww

Yuma County
California brown pelican
Colorado River downstream from Parker Dam to Mexico - A&Ww

Yuma clapper rail
Colorado River from Lake Havasu downstream to Mexico - A&Ww
Gila River - A&Wedw

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* Proposed action will have no effect

Description of the Species

Apache Trout - The Apache trout was added to the Secretary of Interior's list of rare and endangered species in 1967. With the passage of the Act in 1973, the species was included on that list as an endangered species. Conservation and recovery efforts enabled the Apache trout to be downlisted to threatened status on July 16, 1975, without critical habitat. Efforts to conserve the species were undertaken by the White Mountain Apache Tribe, AGFD, Apache-Sitgreaves National Forest, and Service. Under a special rule, State regulations to allow for recreational take of the Apache trout were developed.

The Apache trout is a species of interior western trout, medium in size (30 cm) with a yellow to yellowish-olive background color. Small dark spots are scattered over the dorsal and lateral surfaces (USFWS 1983a).

The Apache trout is native to the headwaters of the Black, White, and Little Colorado Rivers of the White Mountains of Arizona. Once very abundant in these watersheds, the introduction of nonnative species, such as the rainbow (*Oncorhynchus mykiss*), brown (*Salmo trutta*), and brook (*Salvelinus fontinalis*) trouts had significant adverse effects to the native trout populations. Competition for space in the streams and rivers of the montane country resulted from the heavy and continued stocking of these waters with nonnative trout for recreational fishing. Another significant impact was the hybridization between the rainbow and Apache trout that resulted in genetic swamping of the native genotypes.

Apache trout are similar to other trout in their habitat requirements. Competition with nonnative trout is considered a factor in the retreat of Apache trout to the very small headwater streams from their historically wider distribution in the drainages. These streams do not likely represent

ideal Apache trout habitats and inference of specific habitat preferences from these areas may be difficult. Measures of habitat quality in these areas can, and have, been made and contribute significantly to assessment of management needs.

Apache trout are currently found in headwater streams of the Black, White, Blue, and Little Colorado Rivers, and San Francisco River and Coleman Creek, Apache County; North Canyon Creek, Coconino County; and Grant Creek, Graham County (Figure 1).

Beautiful shiner - The beautiful shiner was listed as a threatened species on August 31, 1984, with critical habitat. Critical habitat was designated for all aquatic habitats on the San Bernardino NWR, Cochise County, Arizona. A special rule was included to allow take of this species for educational, scientific, and conservation purposes in accordance with Arizona State laws and regulations. This species is a small, shiny minnow approximately 6.4 cm long and similar to the red shiner in appearance. Males are very colorful during breeding with yellow-orange or orange on caudal and lower fins and a bluish body (Minckley 1973).

In the past, beautiful shiner were found throughout the Rio Yaqui basin, which drains western Sonora and portions of eastern Chihuahua in Mexico and the extreme southeastern corner of Arizona (Branson et al. 1960, Contreras-Balderas 1975, Hendrickson et al. 1980, Koster 1957, McNatt 1974, Miller 1977, Miller and Simon 1943, Minckley 1973). The beautiful shiner is found in a variety of habitats. The biology of the beautiful shiner is thought to be similar to that of the red shiner. This species' population and range have been significantly reduced, primarily due to habitat modifications from excessive pumping of underground aquifers, water diversion, impoundment construction, development of canal systems for agriculture irrigation, and arroyo cutting. Remaining populations today are in danger of being subjected to intense competition and genetic swamping through indiscriminate release of closely related exotic fish such as the red shiner. Beautiful shiner are now found in the artesian-fed well ponds on the San Bernardino NWR, Cochise County (Figure 2).

Bonytail chub - The bonytail chub was listed as an endangered species without critical habitat on April 23, 1980. Critical habitat was proposed on January 29, 1993, for the Colorado River from Hoover Dam downstream to Parker Dam. This large minnow grows up to 61 cm long, has a gray or olive-colored back, silver sides, and a white belly. It is characterized by a small head, large fins, and a streamlined body that becomes thin in front of the tail (Minckley 1973). Historically it inhabited warm, swift, turbid main stem rivers of the Colorado Basin. Decline of this species is due largely due to the modification of original river conditions by dam construction, flow depletion from irrigation and other uses, hybridization with other *Gila* species, and introduction of nonnative fishes. Individuals may persist in reservoirs for several years, but survival of young does not appear adequate to sustain the population. Bonytail chub are the rarest of the large endangered fish in the upper Colorado River basin and are nearly extinct in the wild. Fingerling bonytail chub from the Dexter National Fish Hatchery were stocked in Lake Mohave in 1981-1990. Recently, the bonytail chub numbers in Lake Mohave were augmented by introducing the fish in a protected cove. Similar efforts are beginning in Lake Havasu. Currently, bonytail chub occur in Lakes Mohave and Havasu, Mohave County, Arizona (Figure 3) and have been found in the Yampa River in Dinosaur National Monument, the Green River in Desolation and Gray Canyons, the Colorado River at the Colorado/Utah border and at the confluence of the Green and Colorado rivers upstream of Lake Powell, Utah.

Desert Pupfish - The desert pupfish was listed as an endangered species on March 31, 1986, with critical habitat. Critical habitat was designated at

Quitobaquito Spring, Organ Pipe Cactus National Monument, Pima County, Arizona, and at three locations in Imperial County, California. Desert pupfish is a small fish, 5 cm long, and mature breeding males exhibit an iridescent light- to sky-blue color (Minckley 1973). Historically, this species was common throughout much of the lower Gila, lower Colorado, and the Rio Sonoyta River systems in Arizona, California, and Sonora Mexico. Decline of the desert pupfish is due to human alterations of its habitat, such as water impoundment and diversion, stream downcutting, backwater draining, vegetation clearing, channelization, groundwater pumping, pesticides, and introduction of predatory and competitive nonnative fishes. Desert pupfish habitat includes springs, marshes, and flowing streams, and it also occurs in backwaters and other complex, lateral habitats of large rivers (Minckley 1973). Natural populations of desert pupfish now exist in Quitobaquito Spring, Pima County, Arizona; three Imperial County, California, locations; Rio Sonoyta, Sonora, Mexico, and scattered sites in the lower Colorado River delta in Baja California and Sonora, Mexico (Black 1980, Hendrickson and Varela-Romero 1989, Miller and Fuiman 1987, Schoenherr 1988). Introduced populations of desert pupfish are found in isolated springs and spatially intermittent streams scattered throughout the Gila River Basin in Graham, La Paz, Maricopa, Pima, Pinal, Santa Cruz and Yavapai Counties, Arizona (Figure 4), and the Salton Basin, Imperial County, California.

Gila topminnow - Gila topminnow was listed as an endangered species on March 11, 1967, without critical habitat. Gila topminnow is a small, 2.5 to 5 cm long, livebearing fish (Minckley 1973) of the family Poeciliidae. Gila topminnow in general have wide tolerances for environmental parameters. They can inhabit springs, streams, marshes, cienegas and edges of large rivers with velocities from moderate to none and depths of 2.5 cm to over 1.7 m. Topminnow naturally inhabit both constant temperature springs and streams with highly fluctuating temperatures. Meffe et al. (1983) recorded temperatures from 6 to 37 °C in natural Gila topminnow habitats and cited personal observation of topminnow surviving in near freezing water under ice cover. Topminnow also have wide tolerances in general chemical parameters, such as pH, dissolved oxygen, and salinity (Meffe et al. 1983). They are omnivorous and their major food being detritus but including small insects such as mosquito larvae.

The Gila topminnow occurs in the Gila, Sonora, and de la Concepcion River drainages in Arizona, New Mexico, and Sonora, Mexico (Minckley 1973, Vrijenhoek et al. 1985). The species was once one of the most common fishes in the Gila River and its tributaries (Hubbs and Miller 1941). Destruction of its habitat through water diversion, stream downcutting, backwater draining, vegetation clearing, channelization, water impoundment, and other human uses of natural resource; plus competition with and/or predation by nonnative fish species, most notably mosquitofish (*Gambusia affinis*), have resulted in extirpation of Gila topminnow throughout most of its range (Meffe et al. 1983, USFWS 1984a). At present, Gila topminnow is known from only 10 naturally occurring populations in Arizona and approximately 50 reintroduced populations. Natural populations of Gila topminnow exist in Salt Creek and Bylas and Middle Springs (equal one population) and North Fork of Ash Creek, Graham County; Cienega Creek, Pima County; and Cottonwood, Monkey, Sharp and Sheehy Springs, Redrock Canyon, Santa Cruz River in the San Rafael Valley, and Sonoita Creek, Santa Cruz County. Topminnow were stocked at several sites in Gila, Graham, La Paz, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai Counties as part of the recovery effort (Figure 5).

Gila Trout - The Gila trout was listed as endangered on March 11, 1967, without critical habitat. On October 6, 1987, the species was proposed for reclassification from endangered to threatened. This proposal is still pending. Its historical distribution included the headwaters of the Gila

River and a portion of the headwaters of the San Francisco River in New Mexico, and the upper Verde and Agua Fria drainages in Arizona (USFWS, 1984b). Reasons for its decline included hybridization with and competition by non-native salmonids, loss of habitat, and over-fishing. Gila trout were stocked in Gap Creek near Government Springs, Yavapai County (Figure 6), in 1974 and continue to exist (Warnecke 1987).

Humpback chub - The humpback chub was listed as an endangered species on March 11, 1967, without critical habitat. Critical habitat was proposed on January 29, 1993, for the Colorado River between Marble and Grand Canyons. This fish is a large minnow approximately 51 cm long, characterized by a pronounced hump behind its head and has a brown or olive-colored back and silver sides (Minckley 1973). It occurs in a variety of riverine habitats, especially canyon areas with fast current, deep pools, and boulder habitat. Historically, the humpback chub inhabited portions of the Colorado River and four of its tributaries: the Green, Yampa, White, and Little Colorado Rivers. Reasons for its decline include alteration of habitat by dam construction, water diversion, and channelization; competition with and predation by introduced nonnative fishes; and hybridization with other *Gila* species. Present populations occur in the Little Colorado River, from its confluence with the Colorado River to 8 miles upstream; and in the Colorado River in Marble and Grand Canyons (Figure 7).

Little Colorado spinedace - The Little Colorado spinedace was listed as a threatened species with critical habitat on September 16, 1987. A special rule is included to allow take of the threatened species for educational, scientific, and conservation purposes in accordance with Arizona State laws and regulations. This fish is a small, silvery minnow less than 10 centimeters long and is darker on the back than the belly (Minckley 1973). Historically, this species occurred throughout the upper portions of the Little Colorado River drainage. Decline of this species resulted from habitat alteration and loss due to impoundment, dewatering, riparian destruction, and other watershed disturbances; urbanization; use of ichthyotoxins; and the introduction and spread of exotic predatory and competitive fish species. Currently, spinedace are now found in Little Colorado River (headwaters to Winslow), West Fork of the Little Colorado River, Rudd and Nutrioso Creeks, Apache County; portions of East Clear Creek and its tributaries including Dines Tank, Coconino County; and Chevelon and Silver Creeks, Navajo County, Arizona (Figure 8) (Miller 1961, Miller 1963, Miller and Hubbs 1960, Minckley 1973, Minckley and Carufel 1967, Minckley and McCall 1977). Critical habitat includes Nutrioso, East Clear, and Chevelon creeks.

Loach minnow - The loach minnow was listed as a threatened species on October 28, 1986. A special rule was included to allow take for certain purposes in accordance with New Mexico and Arizona State laws and regulations. Critical habitat was proposed on June 18, 1985, for portions of the upper Gila, San Francisco, and Tularosa Rivers and Dry Blue Creek in New Mexico; and the Blue and San Francisco Rivers, Aravaipa and Campbell Blue Creeks in Arizona. That proposal is still pending.

Loach minnow are slender, elongate fish about 6 cm long (Minckley 1973). They are bottom-dwelling inhabitants of shallow, swift water over sand, gravel, cobble, and rubble substrates (Propst and Bestgen 1991, Rinne 1989). Loach minnow use the spaces between, and in the lee of, larger substrate for resting and spawning (Propst et al. 1988, Rinne 1989). They are 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). Spawning occurs in March through May (Britt 1982, Propst et al. 1988); however, recent reports have confirmed that 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). Loach minnow are opportunistic, benthic insectivores and feed exclusively on aquatic insects (Abarca 1987, Britt 1982, Propst et al. 1988, Propst and Bestgen 1991). Chironomids are relatively more important among the few food items utilized by larval and juvenile fishes (Schreiber and Minckley 1981).

Loach minnow are endemic to the Gila River basin of Arizona and New Mexico, U.S., and Sonora, Mexico. Historical range in Arizona included the Salt River mainstream above Phoenix, White and Black Rivers, East Fork of the White River, Verde, Gila, San Pedro, San Francisco, Tularosa, and Blue Rivers, plus major tributaries (Minckley 1973, 1980). Competition and predation by nonnative fish and habitat destruction by man's uses of rivers, streams and landscapes have reduced the range of the species by more than 85 percent. Populations of loach minnow in Arizona are found in limited portions of the Blue and San Francisco Rivers and Campbell Blue Creek, Greenlee County (Figure 9); White River, Gila County; North and East Forks of White River, Navajo County; and Aravaipa Creek, Graham and Pinal Counties (USFWS 1991a).

Razorback sucker - The razorback sucker was listed as an endangered species without critical habitat on October 23, 1991. Critical habitat was proposed on January 29, 1993, for the following locations: Colorado River from its confluence with the Paria River downstream to Davis Dam; from Parker Dam downstream to Imperial Dam; the Verde River above Horseshoe Dam including portions of Sycamore, Oak, and West Clear Creeks; the Salt River above Roosevelt Diversion Dam to its confluence with Canyon Creek, including portions of Cherry and Canyon Creeks; and the Gila River above Coolidge Dam to the New Mexico State line, including portions of Bonita and Eagle Creeks. A final rule is expected in March 1994. The razorback sucker can grow to over 1 meter in length and has a distinctive abrupt, sharp-edged, dorsal ridge behind the head (Minckley 1973). It was once one of the most abundant and widespread fish in the mainstream rivers throughout most of the Colorado River Basin from Wyoming to Mexico. Habitat alteration and destruction, along with competition and predation from introduced nonnative fish species, are responsible for the species' decline (Bestgen 1990, Marsh and Brooks 1989). In the Little Colorado River basin, it is found in Lakes Mead and Mohave and the Colorado River, Mohave County (USFWS 1991b). Razorback suckers have been stocked into numerous locations in the Gila River basin, including Bonita Creek, Eagle Creek, and Gila River from Coolidge Dam to the New Mexico State line, Salt River basin including Cherry Creek, Canyon Creek and Salt River upstream from Roosevelt diversion dam, and Verde River above Horseshoe Dam in a attempt to recover the species (Figure 10).

Sonora chub - The Sonora chub was listed as a threatened species with critical habitat on April 30, 1986. A special rule was included to allow take of the threatened species for educational, scientific, and conservation purposes in accordance with Arizona State laws and regulations. Critical habitat includes Sycamore Creek, from Yank's Spring downstream approximately 8 stream kms to the International Border with Mexico, Penasco Creek from its confluence with Sycamore Creek upstream approximately 2 km, and an unnamed tributary to Sycamore Creek, from its confluence with Sycamore Creek upstream approximately 0.4 km. This fish is a member of the minnow family and is less than 13 cm long. It is a moderately chubby, dark colored fish, with two prominent black lateral bands on the sides and a dark oval spot at the base of the tail. Sonora chub are primarily pool dwellers, but little is known of their behavior and habitat preferences (Minckley 1973).

Current threats to the Sonora chub include the stocking of exotic fishes and their associated parasites, and possible uranium mining activities. It is particularly vulnerable to these threats because of its very limited range, and because of the intermittent nature of the stream. Sonora chub occur in Sycamore Canyon in Sycamore Creek proper, in three of its tributaries, and Yank's Spring located on the Coronado National Forest northwest of Nogales, Santa Cruz County, Arizona (Figure 11). Tributaries include Penasco and Atascosa Canyons and the lower 0.4 stream kms of an unnamed stream in an unnamed canyon that enters Sycamore Canyon. Yank's Spring is a perennial spring which has been impounded in a concrete tank for many years. Sycamore Creek starts perennial flow about 0.8 km below Yank's Spring and flows downstream 4.3 kms in a series of pools and small riffles over a bedrock and rubble substrate. Penasco Canyon is a west-flowing tributary to Sycamore Creek with intermittent flow. Atascosa Canyon is a tributary of Penasco Canyon. The chub is found in the lower 2 stream kms of the creek in pools in bedrock or pools maintained by underground flow (Bell 1984). The unnamed stream channel supports three perennial bedrock pools in the 0.4 stream kms just above its confluence with Sycamore Creek. The lower two pools support large numbers of Sonora chubs (Bell 1984).

Spikedace - The spikedace was listed as a threatened species on July 1, 1986. Critical habitat was proposed on June 18, 1985, for portions of the Verde River and Aravaipa Creek in Arizona and the upper Gila River in New Mexico. The proposal has not yet been finalized. The spikedace is a small, silvery minnow reaching a maximum size of about 6 cm (Minckley 1973) that inhabits the interface of fast and slow waters in shallow, flowing streams (Propst et al. 1986). Spikedace originally existed throughout much of the Gila River drainage northeast of Phoenix, but only five inhabited areas are currently known: Aravaipa Creek, Graham and Pinal Counties, Arizona; the upper Gila River, Grant and Catron Counties, New Mexico; the upper Verde River, Yavapai County, Arizona; Eagle Creek, Greenlee County, Arizona; and the Gila River from Coolidge dam to Florence, Gila and Pinal Counties, Arizona (Figure 12). Habitat destruction and competition and predation from introduced nonnative fish species are the primary causes of the species' decline (Propst et al. 1986).

Virgin River chub - The Virgin River chub was listed as an endangered species on August 24, 1989. Critical habitat was proposed for this fish on June 24, 1986, but has not yet been finalized. In Arizona, proposed critical habitat is the Virgin River beginning from the Arizona-Nevada border, Mohave County, Arizona, continuing upstream to the mouth of the Virgin River "Narrows." The Virgin River chub is a silvery medium-sized minnow, 20-45 cm long (Minckley 1973). It is endemic to the Virgin River (Figure 13), however within that river, the range of the species has become more restricted due to habitat alteration. This species' decline is attributed to alteration of habitat by dam construction, water diversions, dewatered streams, channelization, and competition with and predation by introduced nonnative fishes. It is most common in deeper waters that are swift, but not turbulent, and most often associated with boulders or other types of cover (Minckley 1973).

Woundfin - The woundfin was listed as an endangered species without critical habitat on October 13, 1970. It is a small (7.5 cm), silver minnow which inhabits shallow runs and riffles (Minckley 1973). It was originally distributed throughout basins of the Virgin, lower Colorado, and lower Gila Rivers. This species decline is a result of habitat alteration by dam construction, water diversions, dewatering of streams, channelization, and competition with and predation by introduced nonnative fishes. It is now found only in the Virgin River in Utah, Arizona, and Nevada (Figure 14). The species lives in swift parts of silty streams and very seldom found in quieter pools (Minckley 1973).

Yaqui catfish - The Yaqui catfish was listed as a threatened species with critical habitat on August 31, 1984. Critical habitat designated for this species includes all aquatic habitats on the San Bernardino NWR, Cochise County. This species is similar to the channel catfish (*Ictalurus punctatus*) in appearance except the anal fin base is shorter and the distal margin of the anal fin is broadly rounded. The body is usually profusely speckled. Historically, it occurred in the Rio Yaqui Drainage in Sonora, Mexico, including San Bernardino Creek (Blackwater Draw), Cochise County, Arizona (Branson et al. 1960, Hendrickson et al. 1980, Koster 1957, McNatt 1974, Miller and Simon 1943, Minckley 1973). Yaqui catfish are usually found in large streams in areas of medium to slow current. This species' population is threatened by habitat modifications including arroyo cutting, water diversion, impoundment construction, development of canal systems for irrigated agriculture, excessive pumping of underground aquifers, and hybridization with channel catfish. It is now found in the Rio Yaqui Drainage, Sonora, Mexico, and is extirpated from the United States (Figure 15).

Yaqui chub - The Yaqui chub was listed as an endangered species with critical habitat on August 31, 1984. Critical habitat designated for this species includes all aquatic habitats on the San Bernardino NWR, Cochise County. The Yaqui chub is a dark colored fish over-all, but usually lighter below and approximately 15 cm long (Minckley 1973). It was historically found throughout the Rio Yaqui and adjacent drainages in Arizona and Sonora, Mexico. Decline of the Yaqui chub is a result of significant reduction of its range, primarily due to habitat modifications from excessive pumping of underground aquifers, water diversion, impoundment construction, development of canal systems for agriculture irrigation, and arroyo cutting. In Arizona, it is now restricted to the artesian-fed waters and Leslie Creek on the San Bernardino NWR, with an introduced population in West Turkey Creek on the west slope of the Chiricahua Mountains, Cochise County (Figure 16).

Yaqui topminnow - The Yaqui topminnow was listed as an endangered species without critical habitat on March 11, 1967. The Yaqui topminnow is a small, 7.5 cm long, livebearing fish (Minckley 1973). It was found throughout the Rio Yaqui and adjacent drainages in Arizona and in Sonora, Mexico (Vrijenhoek et al. 1985). The decline of this fish species is a result of significant reduction of its range, primarily due to habitat modifications from excessive pumping of underground aquifers, water diversion, impoundment construction, development of canal systems for agriculture irrigation, and arroyo cutting. Currently, it persists in small artesian-fed waters, Blackdraw and Leslie Creek on the San Bernardino NWR, Cochise County, Arizona (Figure 17).

California brown pelican - The California brown pelican was listed as endangered without critical habitat in 1970. This pelican is a large, dark gray-brown water bird with a pouch underneath a long bill (USFWS 1991c). Adults have a white head and neck, a brownish black breast and belly, and silver grayish upper parts. Historically, this subspecies occurred on the Pacific coast from Canada through Mexico. It was found on the Little Colorado River as a transient. It breeds only as far north as central California. Decline of this subspecies was a result of reproductive failure primarily due to the widespread use of DDT. Current populations exist along the California and Mexico coasts. It is still found as a transient in Arizona along the Colorado River and it is occasionally blown into central Arizona by storms (Figure 18).

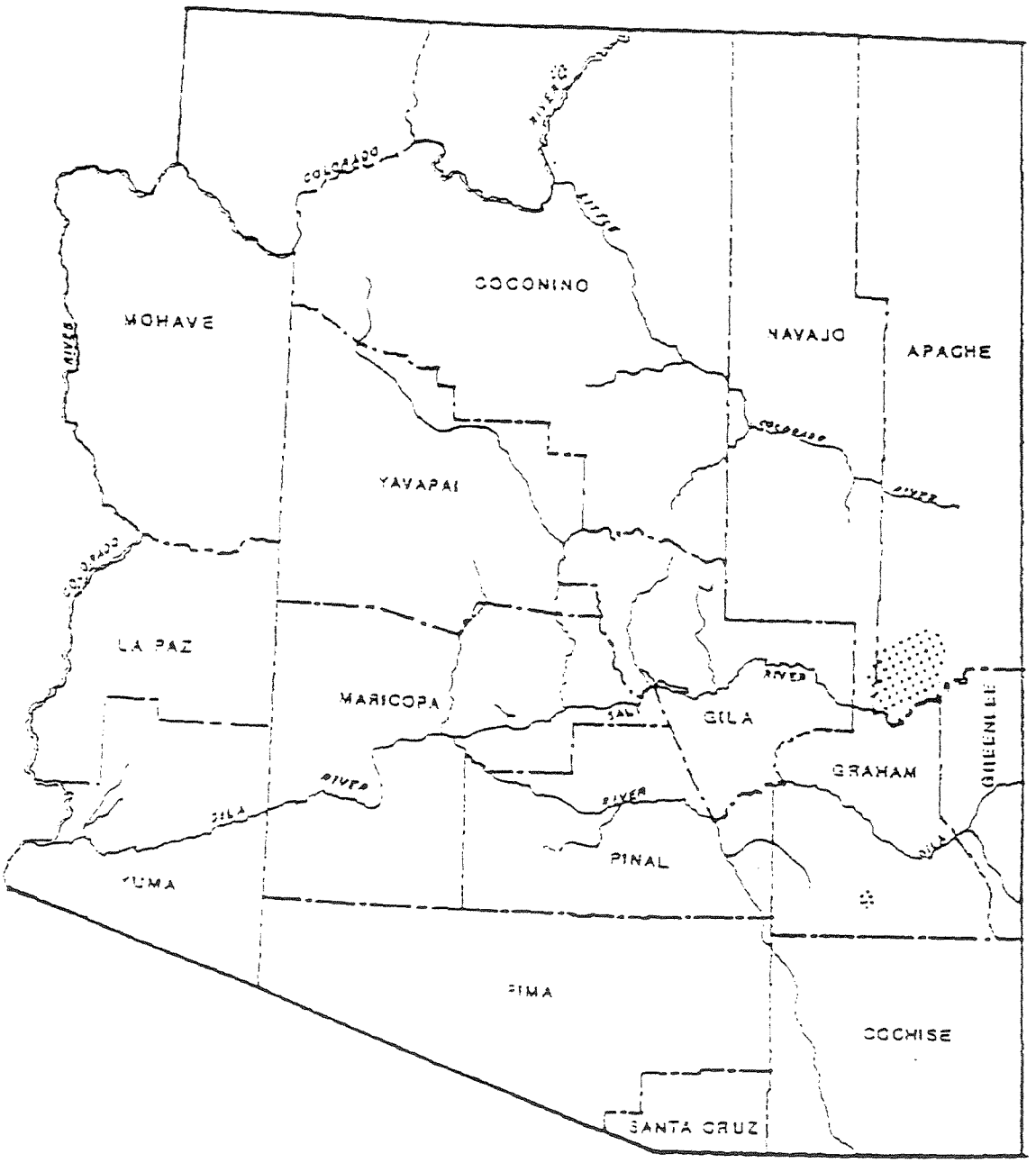
Bald eagle - Southwest Population - The bald eagle was listed as endangered without critical habitat in 1967. The widespread use of DDT was primarily responsible for the decline of this species. Cancellation of registration of DDT by EPA has had a positive effect upon this bird though habitat loss

is now a greater threat since its preferred habitat of rivers, lakes, coastal shorelines, and other riparian areas is receiving increased human pressures. The geographic area of the southwest bald eagle population includes Oklahoma and Texas west of the 100th meridian, all of New Mexico and Arizona, and that area of California bordering the lower Colorado River (USFWS 1982). As of 1990, approximately 28 active bald eagle breeding areas existed in Arizona. Currently, eagle nesting areas occur along the Salt, Verde, Gila, Aqua Fria, and Bill Williams Rivers and several major tributaries (Figure 19).

Yuma clapper rail - The Yuma clapper rail was listed as endangered on March 11, 1967, without critical habitat. The decline of this species is attributed to habitat destruction through stream and river channelization and dredging and flooding of marshes and wetlands. This rail is one of the smaller subspecies and, unlike other clapper rails, prefers fresh water marshes. The Yuma clapper rail is found along the California-Arizona segment of the Colorado River from Topock Marsh to the Mexican border, La Paz and Yuma Counties; along portions of the lower Gila River and Picacho Reservoir, Maricopa County (Figure 20); and in the Colorado River delta area in Mexico. Occupied habitat is an ecotone between emergent vegetation, usually cattail stands in shallow water, and higher ground (USFWS 1983b). This rail breeds from mid-April to mid-September. Its diet consists of crayfish, small fish, clams, and beetles (Wilbur and Tomlinson 1976).

Arizona's native fish fauna are in serious peril. Thirty-three species of fish are native to the State. Of these, 18 (54 percent) are listed as endangered or threatened by the Federal Government; an additional 6 (18percent) species are candidates for listing. In addition to the 18 species listed by the Federal Government that occur in Arizona, the State lists 4 (12 percent) additional species as endangered or threatened. The Colorado Squawfish was extirpated from Arizona waters prior to 1980. Reintroduction of this species into sections of the Salt and Verde Rivers system have occurred since 1985. These introductions were made under Section 101 of the Act. Fish surviving from these introductions are designated experimental nonessential and, thus, not afforded full protection under the Act. Other areas in the lower basin are potential reintroduction sites, and if stocked, could be provided full protection under the Act. The State also lists one species as a candidate for listing, one species as sensitive, and one species extinct. Of Arizona's 32 surviving fish species, 26 are listed as endangered, threatened, or candidates by the State, and Federal Government, or both. Of the six species believed to be common or abundant, three are primarily salt water species that enter fresh water on an intermittent basis; only three (10 percent) of Arizona's native freshwater fish fauna are believed to be relatively secure. Arizona fish habitats have been severely altered by human activities resulting in, but not limited to, stream and river desiccation, changes in water chemistry, flow patterns, food and cover conditions, and the introduction of nonnative fish. As a result, endangered and threatened fish populations are on the brink of extinction in the wild because their populations are small, fragmented, and isolated such that recolonization between populations is highly unlikely for most of these species. Genetic variation has and continues to be reduced in these populations. Because of their condition, these fish are highly vulnerable and susceptible to environmental hazards of any magnitude. The presence and addition of toxic pollutants to their environment can easily become part of, or the fulcrum of, the synergistic process that facilitates the species' extinction in the near future.

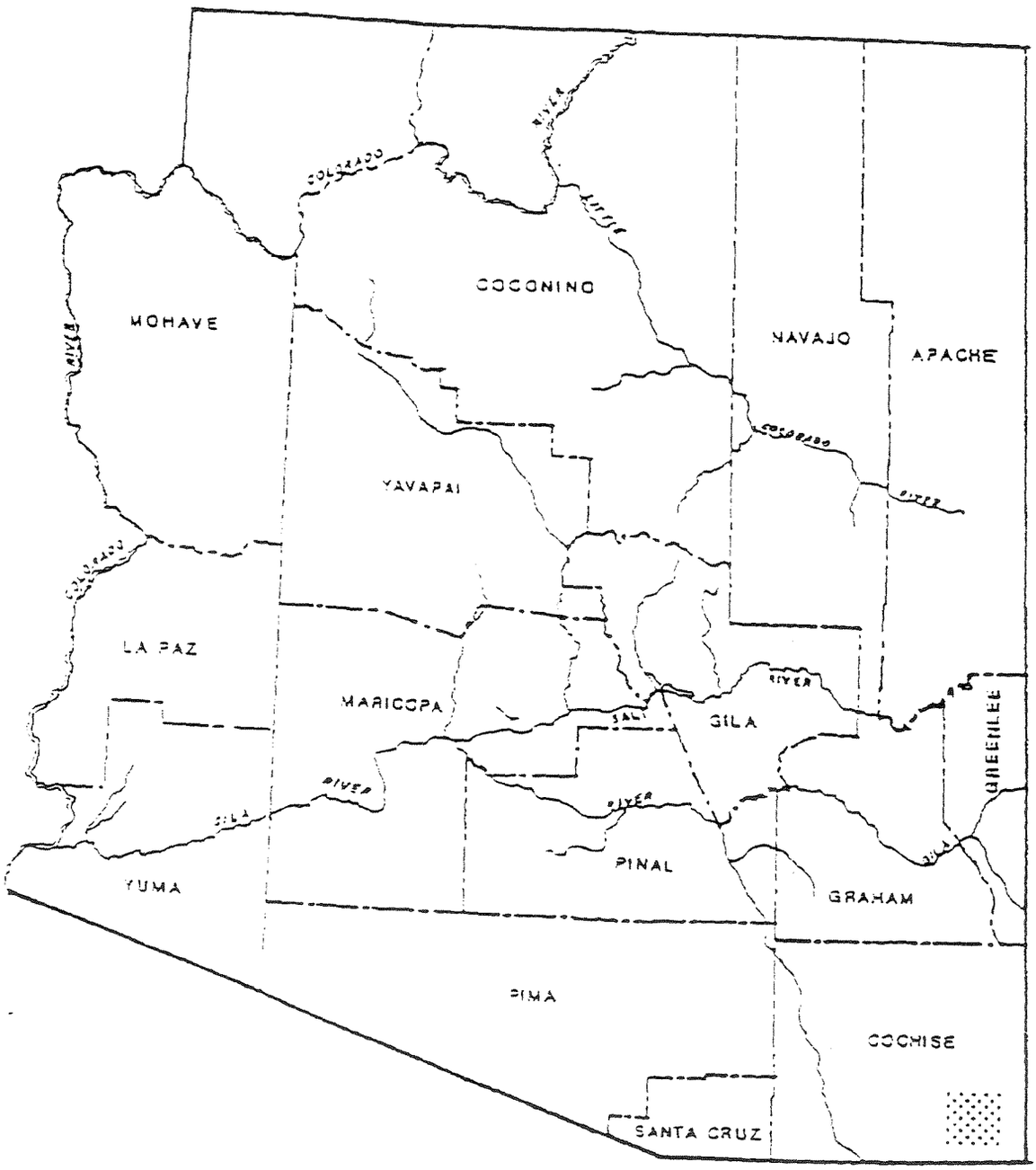
FIGURES 1-20



LEGEND

Current Range

Figure 1 Current range of Apache trout.



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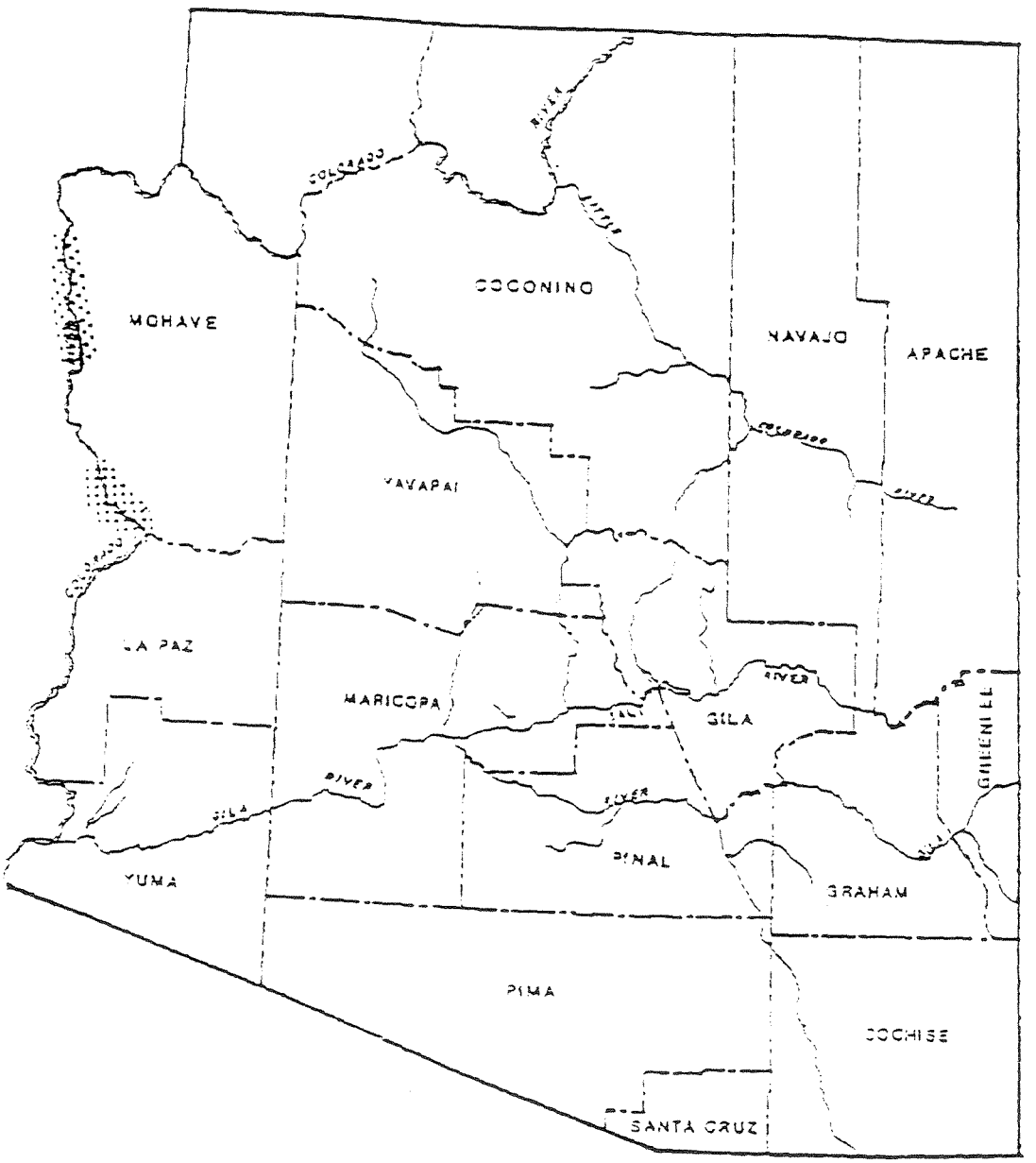
Current Range

Figure 2 Current range of beautiful shiner.



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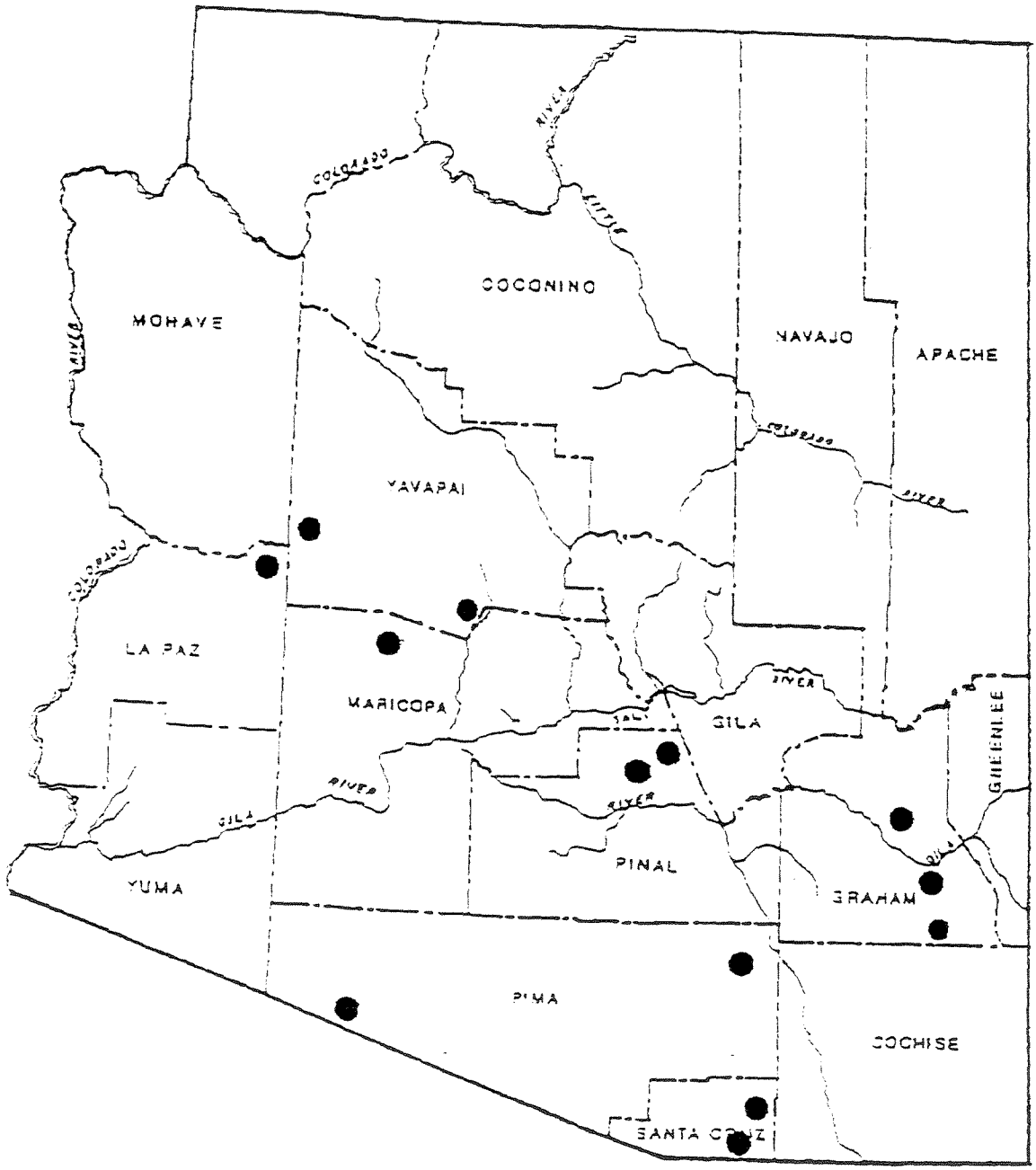
Current Range

Figure 3 Current range of bonytail chub.



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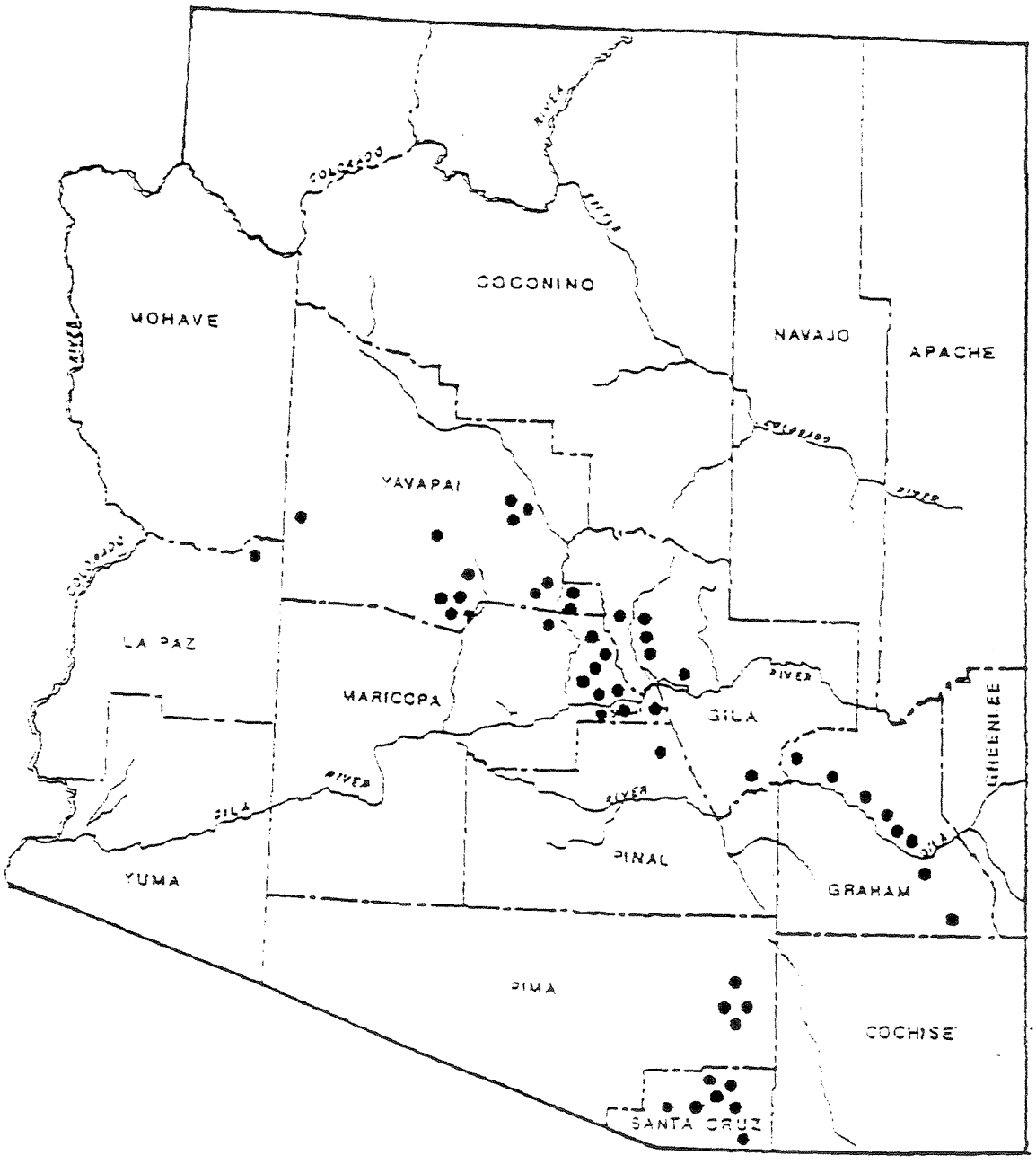
Current Range ●

Figure 4 Current range of desert pupfish.



LEGEND

Current Range ●

Figure 5 Current range of Gila topminnow.

LEGEND

Current Range ●

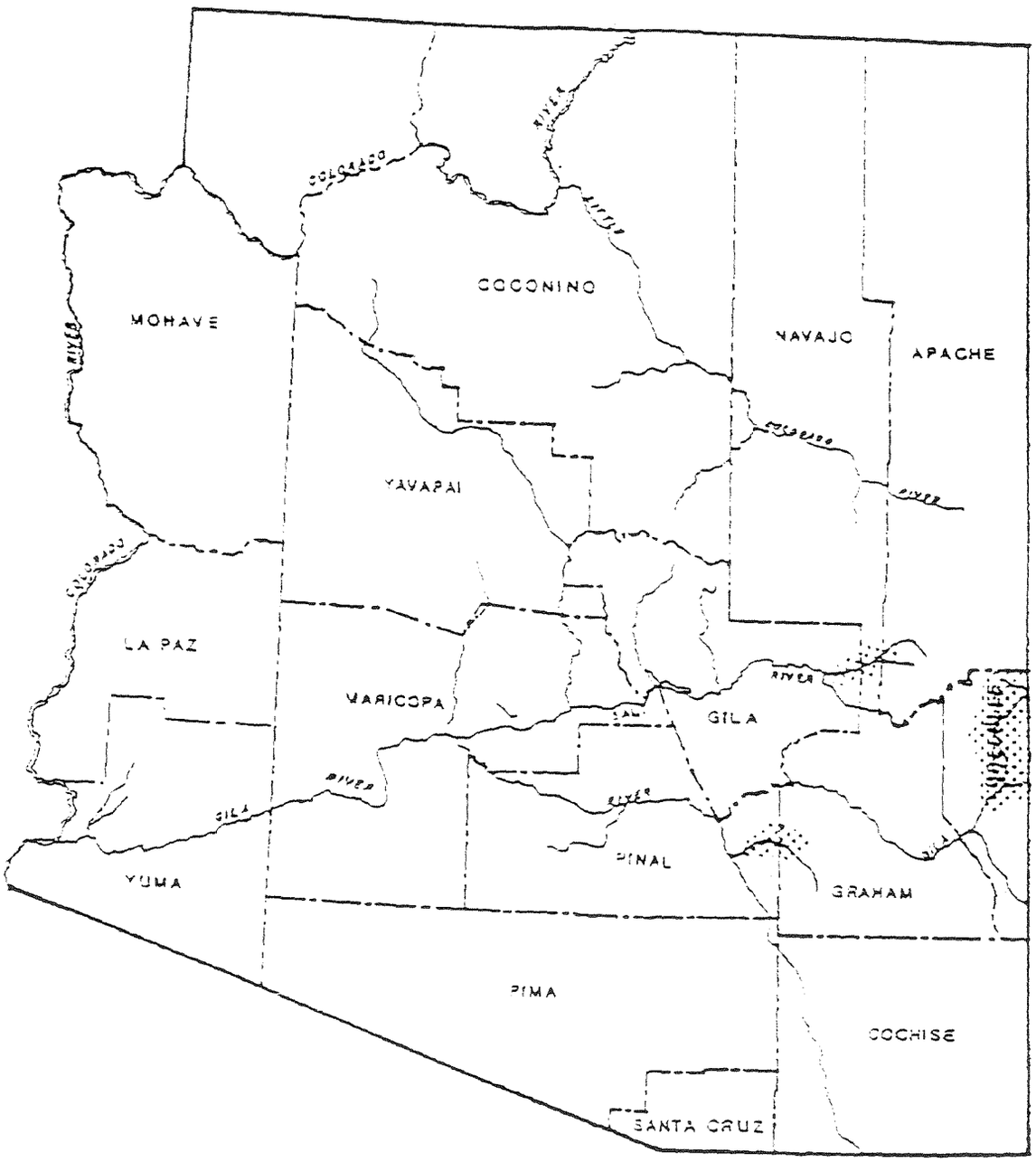
Figure 6 Current range of Gila trout.

Figure 7 Current range of humpback chub.

LEGEND

Current Range

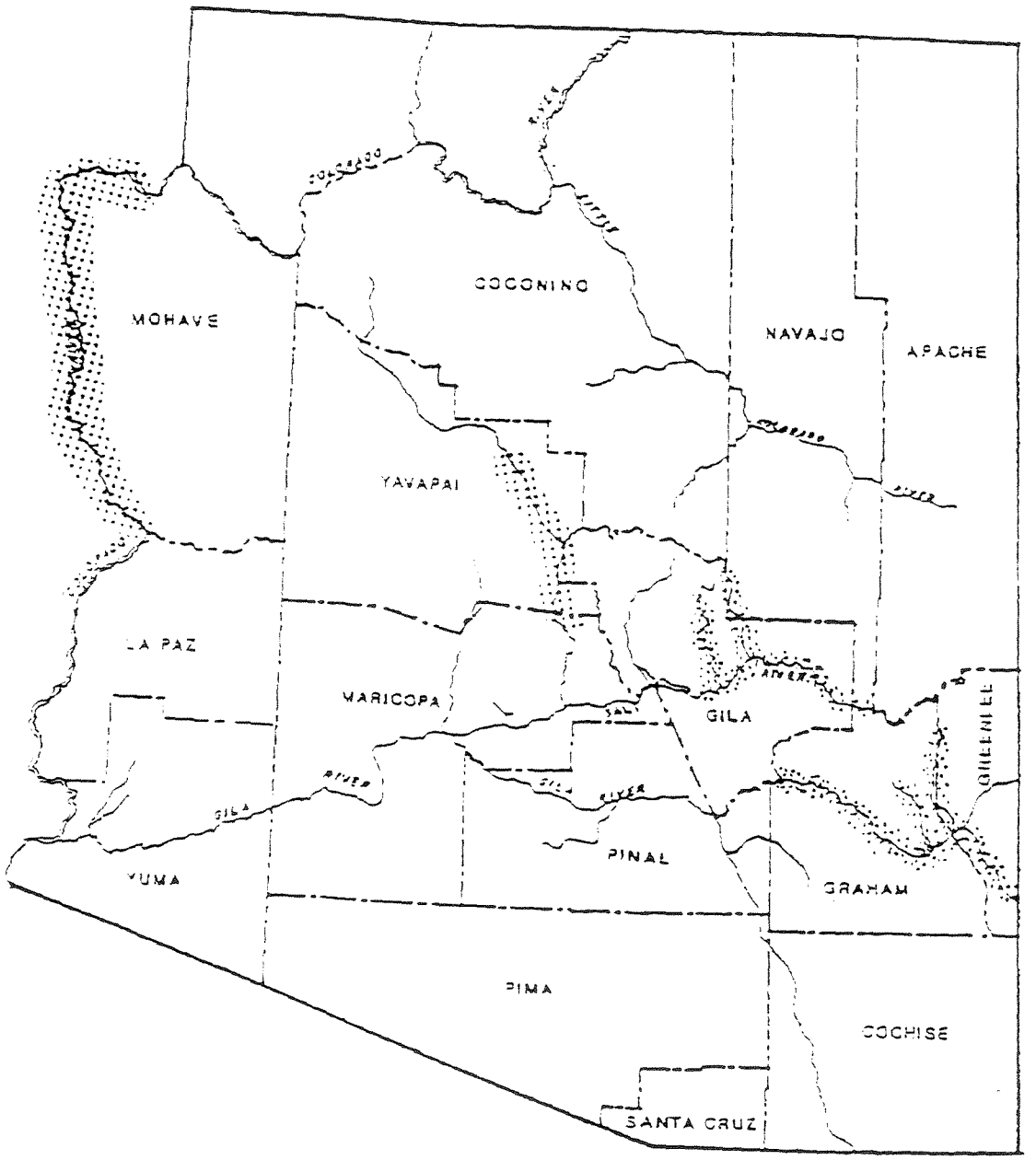
Figure 8 Current range of Little Colorado spinedace.



LEGEND

Current Range

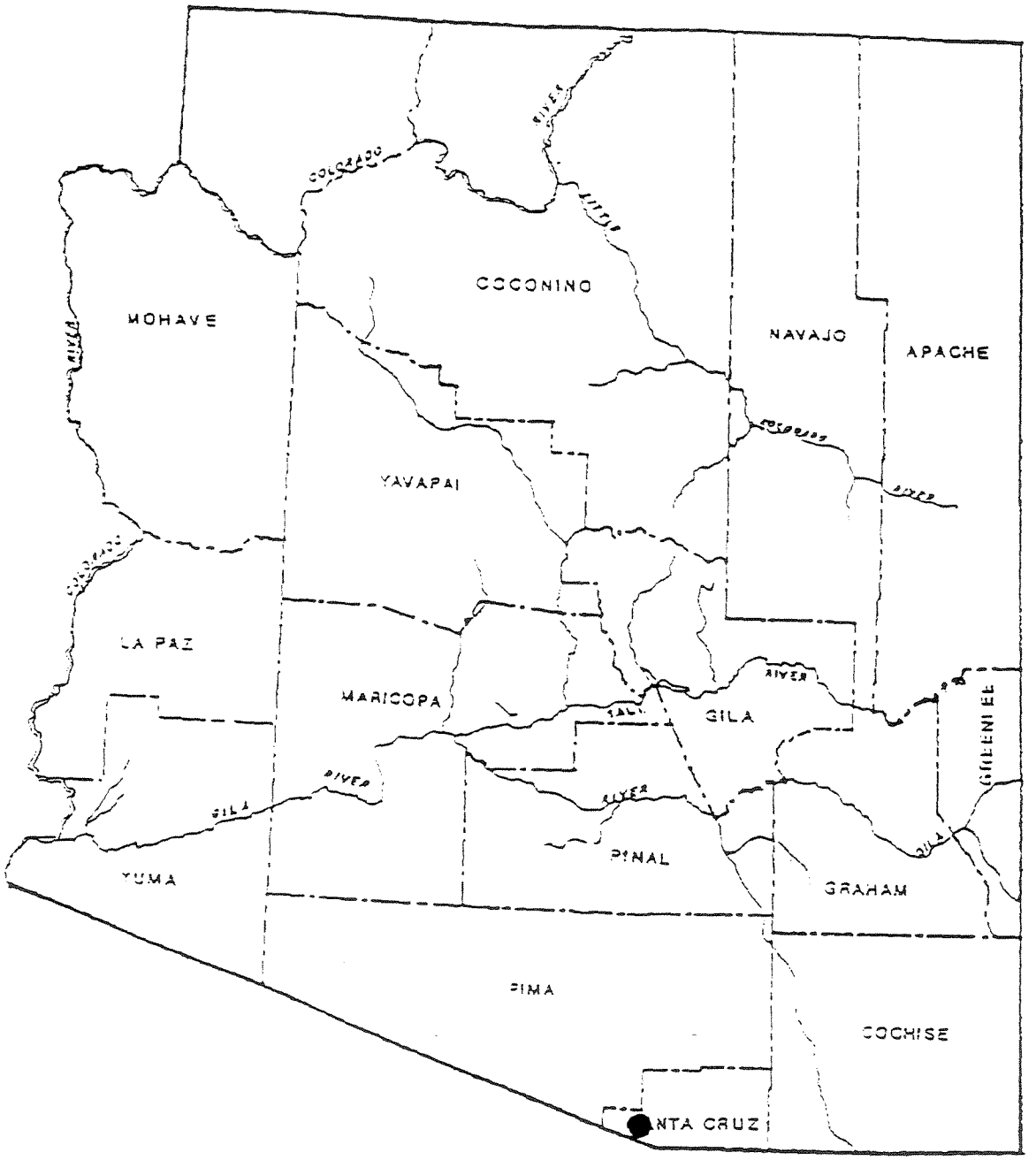
Figure 9 Current range of loach minnow.



LEGEND

Current Range

Figure 10 Current range of razorback sucker.



LEGEND

Current Range ●

Figure 11 Current range of Sonora chub.

LEGEND

Current Range

Figure 12 Current range of spikedace.

LEGEND

Current Range

Figure 13 Current range of Virgin River chub.

LEGEND

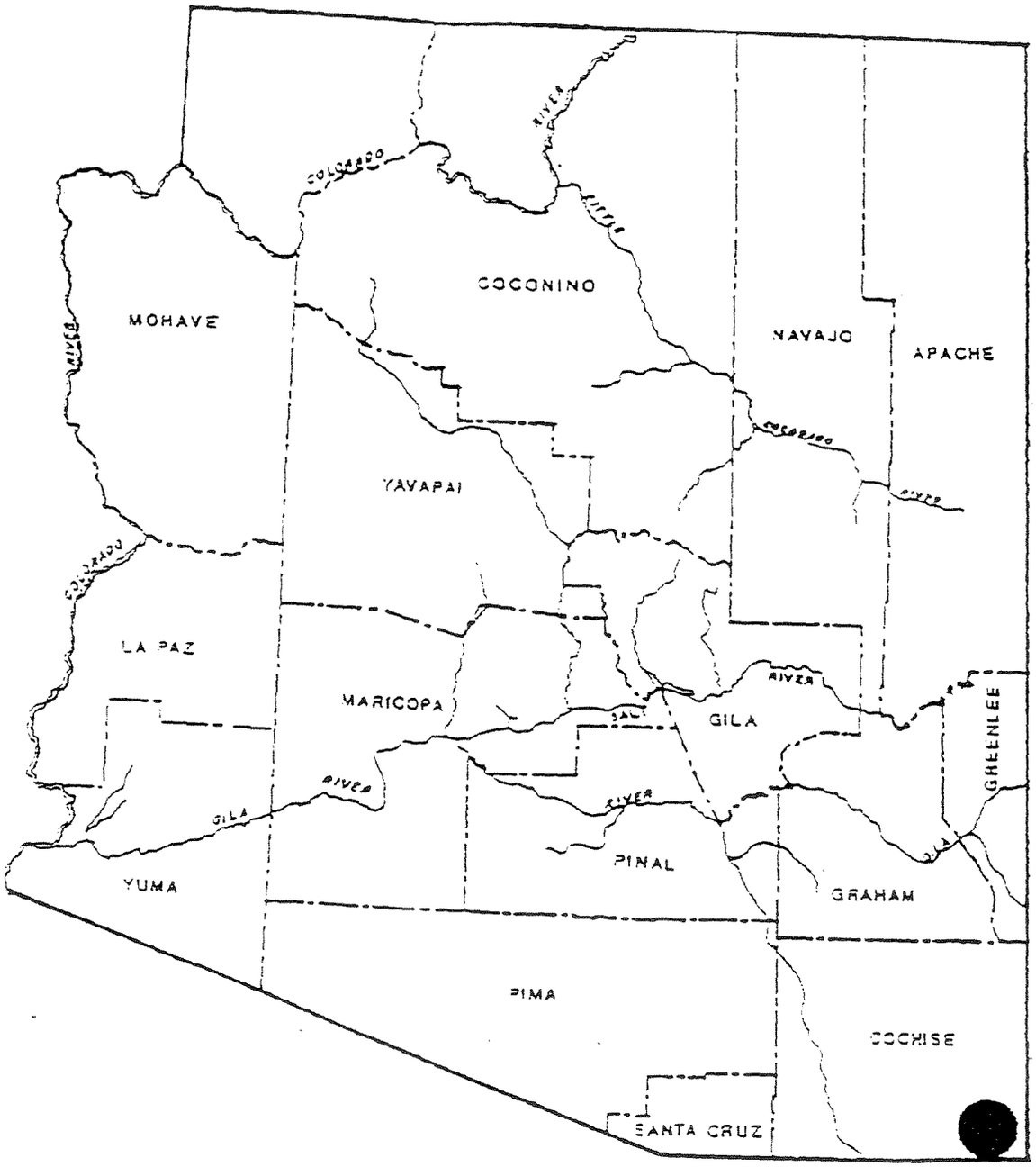
Current Range

Figure 14 Current range of woundfin.

LEGEND

Historic Range

Figure 15 Historic range of Yaqui catfish.



LEGEND

Current Range

Figure 16 Current range of Yaqui chub.

LEGEND

Current Range

Figure 17 Current range of Yaqui topminnow.

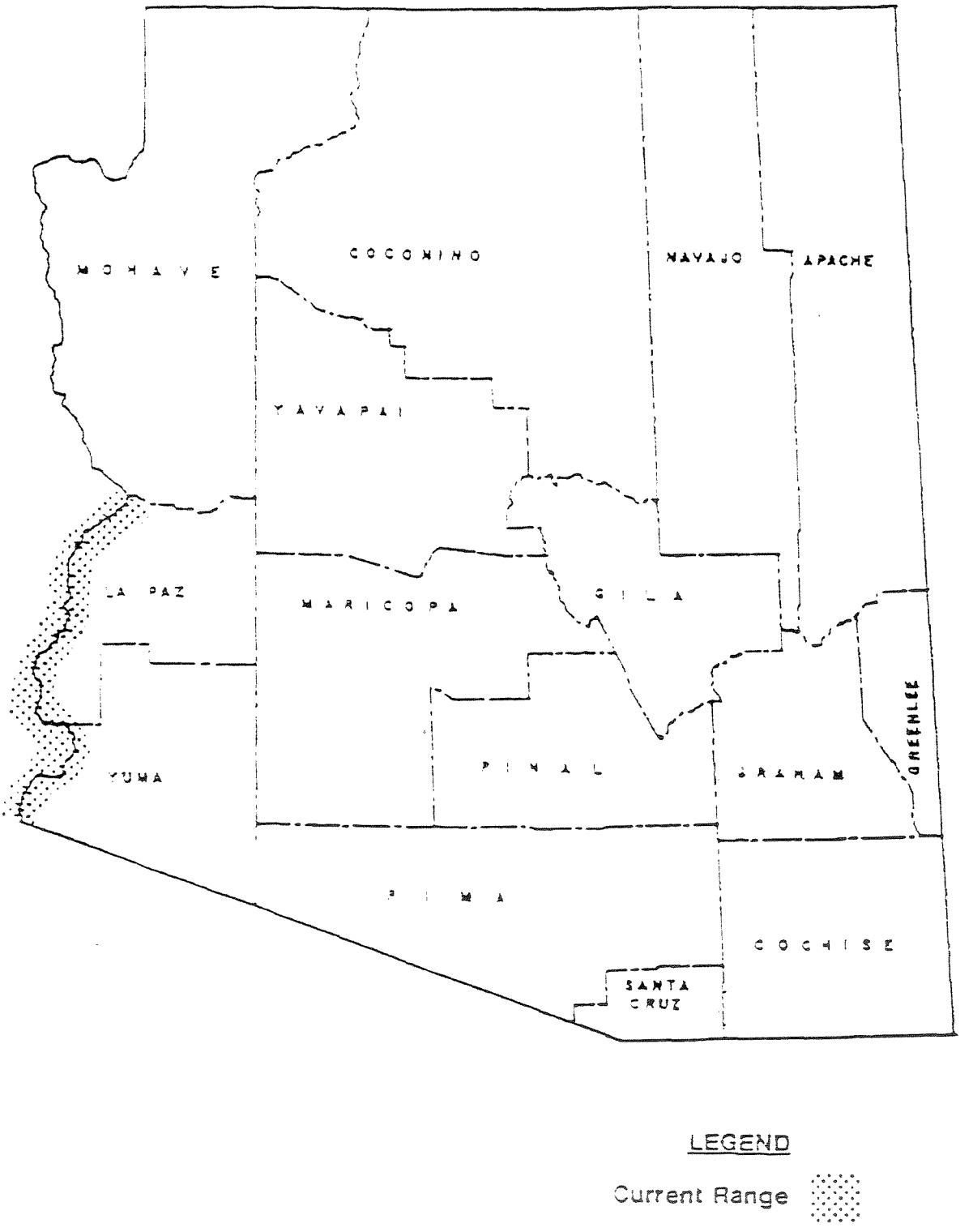
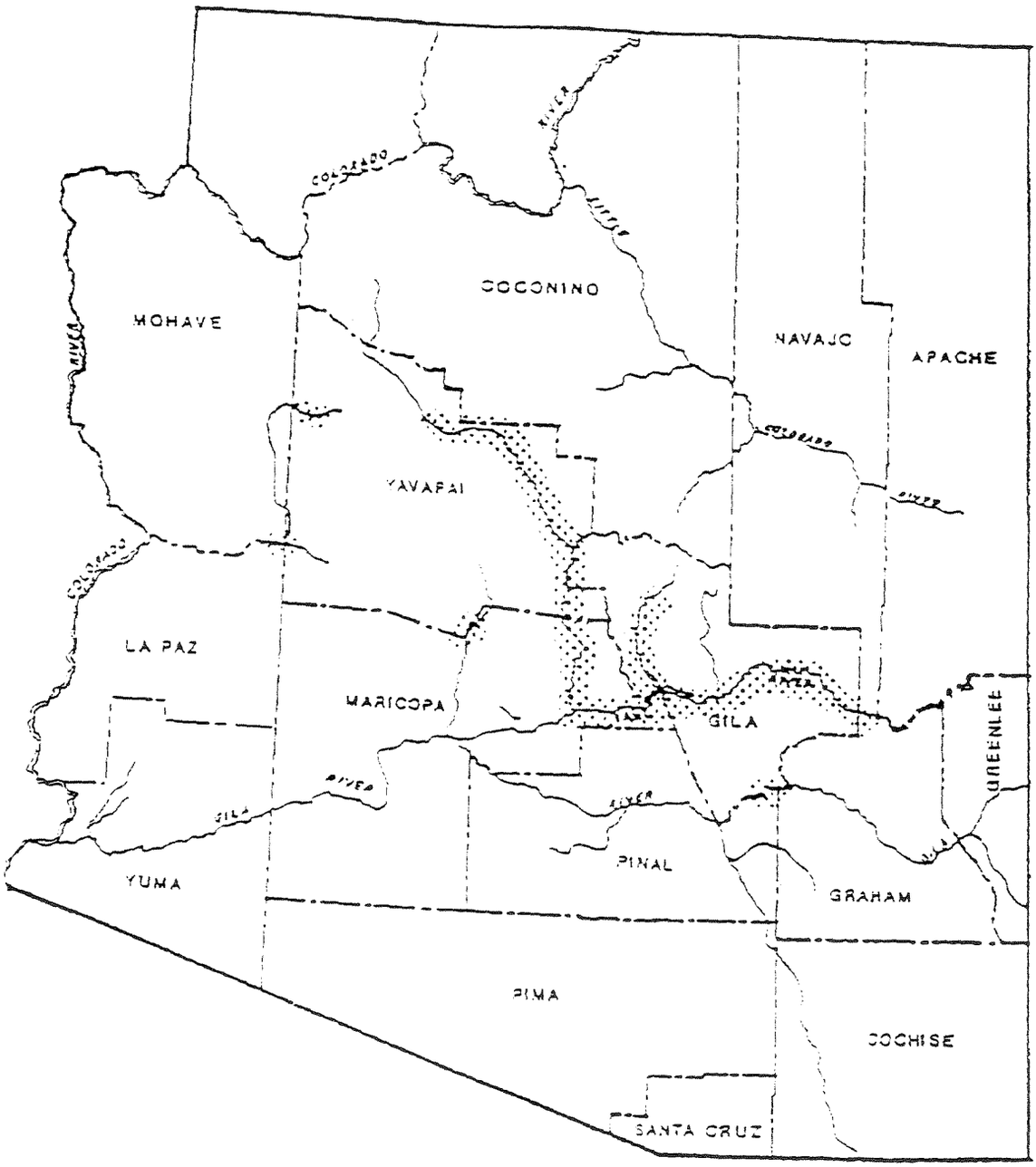


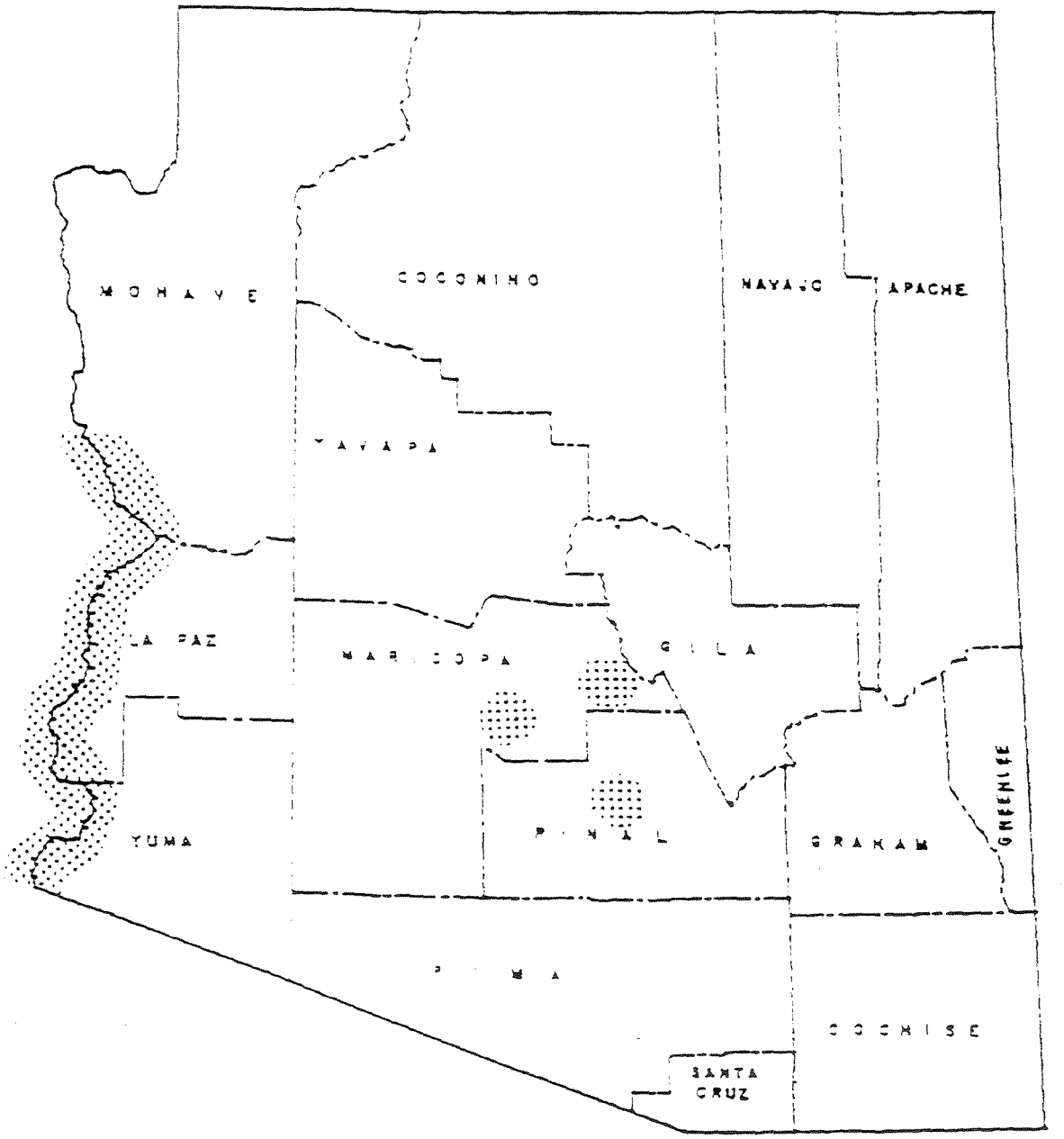
Figure 18 Current range of California brown pelican.



LEGEND

Breeding Range

Figure 19 Breeding range of bald eagle.



LEGEND

Current Range

Figure 20 Current range of Yuma clapper rail.

DIRECT AND INDIRECT EFFECTS OF THE ACTION

Antidegradation (R18-11-107) - The antidegradation rule without implementation procedures may affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, Yuma clapper rail or the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw).

The State has not identified antidegradation implementation procedures as required under 40 CFR 131.12(a). Without implementation procedures, the antidegradation rule would not be entirely effective in preventing further degradation of Arizona navigable waters and result in degraded water quality. Degraded water quality would cause decreases in dissolved oxygen, increases or decreases in pH, increases in turbidity, temperature, nutrients (phosphorus and nitrogen), toxic pollutants and the bioconcentration of some toxic pollutants. The impacts of poor water quality, including turbidity, alter useable habitat for resting, spawning, and foraging. Loss of useable habitat would result in reduced fecundity, reproduction, growth, and may cause direct mortalities of fish species and reduce prey for avian species. A reduction in prey for the listed avian species would result in general nutritional loss, reduced reproduction, increased foraging time, and decreased fitness because of food stress. These effects are not significant to result in jeopardy to the species or adverse modification of critical habitat.

Salinity of the Colorado River (R18-11-110) - This rule will have no effect on the Apache trout, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, Little Colorado spinedace, loach minnow, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), and Yaqui topminnow (populations in Blackdraw and Leslie Creek), or the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). This rule does not apply to navigable waters that provide habitat for these species.

This rule is not likely to adversely affect the bonytail chub, humpback chub, razorback sucker, California brown pelican, bald eagle, and Yuma clapper rail. The proposed criteria would not cause a change in habitat from freshwater to saltwater for the bonytail chub and razorback sucker. Prey base of the avian species would not decrease due to the proposed salinity limits. The implementation plan to maintain salinity at or below the criteria ensure that salinities would not be elevated to levels that could significantly alter freshwater habitats of these fish species or decrease the avian species prey. No substantial adverse effect to these species is anticipated due to the proposed rule for salinity standards of the Colorado River.

Enforcement (R18-11-120) - This rule is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish and Yaqui chub (Blackdraw). Enforcement action at the State level would curb violations to water

quality standards and maintain and protect navigable waters of the State. No substantial adverse effect on endangered and threatened species is anticipated.

Schedules of Compliance (R18-11-121) - This rule is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). The establishment of compliance schedules would result in lower water quality standards for these species downstream from point source discharges. No substantial adverse effect to listed species is anticipated. However, schedules of compliance established under an NPDES permit may require an additional Section 7 consultation in the future.

Numeric Water Quality Standards: R18-11-109 and EPA promulgated phosphate criteria - This rule prescribing numeric criteria for fecal coliform, pH, temperature, turbidity, dissolved oxygen, nutrient criteria for total phosphorus and nitrogen, including EPA promulgated phosphate criteria, and radiochemicals in designated A&Wc, A&Ww, and A&Wedw areas is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw).

Fecal coliform - Coliform levels proposed for A&Wc, A&Ww, and A&Wedw waters would reduce the potential for listed fish species and the prey base of the avian species to contract fish diseases. No significant adverse effects from this standard to endangered and threatened species are expected.

pH - This proposed pH range for A&Wc, A&Ww, and A&Wedw waters represents the current ambient pH levels in navigable waters of Arizona, and the proposed change in pH due to a discharge would prohibit wide fluctuations of pH. These proposed standards would not result in substantial adverse effects to endangered and threatened species.

Temperature - The proposed standard would prohibit wide fluctuations in water temperature downstream from point source discharges in A&Wc, A&Ww, and A&Wedw waters. The proposed standards would not result in significant adverse effects to endangered and threatened species.

Turbidity - The proposed turbidity standard and NTU unit used to measure turbidity do not provide an accurate representation of total suspended solids. The goal of the turbidity standard is to measure an effect of total suspended solids and as an indirect indicator of sedimentation. However, this standard often represents a measurement of algae, organic matter, air bubbles, or suspended solids in rivers or streams.

At the time of this consultation, it is difficult to evaluate how the turbidity standards in A&Wc, A&Ww, A&Wedw, and Peoples Canyon (unique water) may affect listed fish and avian species because these desert fish and birds have evolved with turbidity. Therefore, it is difficult to

determine how the criteria would affect habitats of listed fish and the ability for listed birds to forage in navigable waters.

Dissolved Oxygen - The standards for A&Ww and A&Wc waters are within the oxygen levels for the survival of listed fish species. Dissolved oxygen limits would not result in reduced prey for the listed avian species. Gila topminnow in the Santa Cruz River near Tumacacori are approximately 20 km downstream from the Nogales WWTP, and Yuma clapper rail are located 16-48 km downstream from the 91st Avenue WWTP in Phoenix. The allowable minimum dissolved oxygen limit for A&Wedw areas is not expected to occur within these species' locations. The proposed standards in A&Wc, A&Ww, and A&Wedw waters would not result in significant adverse effects to endangered and threatened species.

Nutrient criteria - Waters in Arizona are not phosphorus limited, thus, the proposed State total phosphorus and the EPA promulgated phosphate standards would not result in increased productivity in Arizona waters. In addition, the proposed State total nitrogen standards would not result in increased productivity of State waters. Therefore, no significant adverse effects to endangered and threatened species are expected.

Radiochemicals - Numeric criteria prescribed for radiochemicals applies only to navigable waters designated as domestic water sources to address human health concerns. Permitted discharges of radiochemicals into navigable waters of Arizona do not exist. Therefore, the proposed standards are not expected to affect endangered and threatened species.

<u>Numeric Water Quality Standards: EPA promulgated nitrate criteria</u> - The promulgated nitrate standards for the Colorado River will have no effect on the Apache trout, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, Little Colorado spinedace, loach minnow, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), and Yaqui topminnow (populations in Blackdraw and Leslie Creek), or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). The promulgated nitrate criteria do not apply to navigable waters that provide habitat for these species.

EPA promulgated nitrate criteria are not likely to adversely affect the bonytail chub, humpback chub, razorback sucker, California brown pelican, bald eagle, and Yuma clapper rail. The EPA's promulgated criteria are based on meeting their antidegradation criteria and ambient water quality. Therefore, the nitrate criteria would not violate the State's antidegradation rule, increase algal bloom productivity, reduce suitable foraging and spawning habitats for the fish species, and result in the loss of prey for the bird species. No significant adverse effects to these species are expected.

<u>Numeric Water Quality Standards - Toxic Pollutants - bioaccumulation</u> - **Fish, bald eagle, and Yuma clapper rail** - Numeric criteria for pollutants have been developed without consideration of bioaccumulative effects to predacious fish and fish-eating birds. Bioaccumulation refers to both the uptake of dissolved chemicals from water (bioconcentration) and the uptake from ingested food and sediment residues. The rule prescribing numeric water quality criteria for toxic pollutants, primarily mercury and selenium, in designated A&Wc, A&Ww, and A&Wedw areas is likely to jeopardize the continued existence of the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui

topminnow (populations in Blackdraw and Leslie Creek), bald eagle, and Yuma clapper rail, and result in the destruction or adverse modification of the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw).

Bioaccumulative chemicals of concern (BCC's) as stated in the proposed Federal Regulations (40 CFR sec 132.2), define BCC's as pollutants with a bioaccumulation factor, for health criteria, greater than 1,000. The following list includes 15 BCC's, most of which are complex hydrocarbons, that occur in Arizona waters downstream from NPDES discharge permits. The list is compiled from the EPA 304(l) and 303(d) lists and the 305(b) report (ADEQ 1992c).

Arsenic	4,4'-DDD; p,p'-DDD; 4,4'-TDE, p,p'-TDE
Dieldrin	4,4'-DDE, p,p'-DDE
Heptachlor epoxide	4,4'-DDT; p,p'-DDT
Hexachlorobenzene	2,3,7,8-TCDD; dioxin
Mercury	Hexachlorobutadiene; hexachloro-1,3-butadiene
Selenium	beta-Hexachlorocyclohexane; beta-BHC
Toxaphene	delta-Hexachlorocyclohexane; delta-BHC
	PCBs; polychlorinated biphenyls

Criteria developed for the fish consumption designated use, for 13 of the 15 BCC chemicals, provide protection for the above endangered and threatened species. However, A&Wc and A&Ww designated use criteria for mercury and selenium not provide protection for the above species.

Results of an irrigation drainage water study in Yuma Valley, Arizona (Baker et al. 1992) show there is a potential to cause harmful effects on fish and wildlife resources. Selenium appears to bioconcentrate in the Yuma Valley aquatic system, from water (1-2 ppb (μg/l)) to sediments (200-800 ppb dry weight), to aquatic vegetation (640-1,300 ppb dry weight) and to fish (1,100-3,400 ppb dry weight). Fish collected near eight bald eagle breeding territories in Arizona, including Lake Pleasant, Alamo Lake, Verde River near Chasm Creek and below Horseshoe Dam, San Carlos Reservoir, Roosevelt Lake, Salt River near Redmond Flat and Pinal Creek, and Tonto Creek near Sheep's crossing, contained selenium (King et al. 1991), but not at levels associated with selenium-induced reproductive failure in fish nor at the hazardous levels found in food chain organisms at Kesterson (Gillespie and Baumann 1986, Ohlendorf et al. 1989). Bioconcentration and accumulation of waterborne selenium by numerous species of algae, fish, and invertebrates are documented between 0.015 and 3.3 ppb range (Eisler 1985, Saiki 1990, Skorupa and Ohlendorf 1991). Waterborne selenium concentrations in the range of 2-5 μg/l can be fully protective of avian embryo viability (Ohlendorf et al. 1993, Skorupa 1993, Skorupa and Ohlendorf 1991). Similarly, fisheries literature suggests that adverse effects for fish are induced at threshold waterborne selenium concentrations between 2-5 μg/l (Lemly 1985, 1993, Skorupa 1993). In summary, selenium concentrations in water (1-3 μg/l, total recoverable) rarely appear to be related to any discernable adverse effects on fish and wildlife (Bureau of Reclamation (USBR) 1993). Waterborne selenium concentrations greater than 3 μg/l can be bioconcentrated in aquatic food chains and through dietary exposure that would result in toxicity and reproductive failure in fish and wildlife species (Lemly and Smith 1987, Skorupa and Ohlendorf 1991).

Concentrations of mercury in striped mullet (*Mugil cephalus*) from the Colorado River in the Yuma Valley were above the level reported (0.1 ppm) to affect fish-eating birds (Eisler 1987). Fish collected near eight bald eagle breeding territories, including Lake Pleasant, Alamo Lake, Verde River near Chasm Creek and below Horseshoe Dam, San Carlos Reservoir, Roosevelt Lake, Salt River near Redmond Flat, Pinal Creek, and Tonto Creek near Sheep's

crossing contained concentrations of mercury at or exceeding the level (0.1-97 ppm) of protection for fish-eating birds (Eisler 1987, King et al. 1991). This datum suggests that mercury is bioaccumulating above the level of protection for fish-eating birds.

Approval of the numeric water quality criteria primarily for mercury and selenium would result in bioconcentration in the food chain of endangered and threatened fish and contaminated prey base for the bald eagle and Yuma clapper rail. Bioconcentration of these chemicals in the aquatic food chain and prey base would be related to adverse effects on listed fish and birds. Contaminated prey would increase the risk of embryo defects and mortality. To protect endangered and threatened avian species that regularly consume fish and other aquatic organisms, dietary total mercury concentrations should not exceed 100 ug/kg wet weight (Eisler 1987) and selenium concentrations should not exceed 6 ug/g dry weight (USBR 1993).

The data support that mercury and selenium can bioconcentrate and bioaccumulate to levels that adversely affect these endangered and threatened fish and birds. Mercury and selenium require regulation as highly toxic, bioaccumulative chemicals.

California brown pelican - The rule prescribing numeric water quality criteria for toxic pollutants, primarily mercury and selenium, in designated A&Wc, A&Ww, and A&Wedw areas may affect the California brown pelican.

Data previously presented in this section support that mercury and selenium can bioaccumulate in prey to levels of concern for the fish-eating pelican. The pelican is a transient species along the Colorado River and is occasionally blown into the lower Gila River from winter storms. The amount of time spent foraging in these Arizona waters is short. However, the possibility remains, when foraging in Arizona waters, the pelican may consume bioaccumulated levels of mercury and/or selenium from its prey. Approval of the numeric water quality criteria for mercury and selenium would result in contaminated prey base for the pelican. Contaminated prey would increase the risk of embryo defects and mortality for the pelican. These effects are not significant to result in jeopardy.

<u>Numeric Water Quality Standards - Toxic Pollutants - adequacy of A&Ww criteria</u> - The rule prescribing numeric water quality criteria for toxic pollutants, excluding cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, toxaphene, and 1, 2, 4-trichlorobenzene in designated A&Wc and A&Ww areas is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect and Santa Cruz River), Gila trout, humpback chub, Little Colorado spinedace (populations other than those in the Little Colorado River downstream from Holbrook, Arizona), loach minnow, razorback sucker (populations other than those in the Colorado River from Parker to Yuma), Sonora chub, spikedace (populations other than those in the Gila River from Coolidge Dam to Florence), Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), bald eagle, California brown pelican, and Yuma clapper rail, or the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, or Yaqui chub (Blackdraw). The Service believes the proposed criteria for A&Wc areas can be protective of endangered and threatened species. In addition, where proposed A&Ww criteria are as stringent as the A&Wc criteria, we believe these criteria can be protective of listed species. No significant adverse effects to these species are expected.

The rule prescribing numeric water quality criteria for toxic pollutants: cyanide and phenol in designated A&Ww areas is likely to jeopardize the continued existence of the Little Colorado spinedace (populations in the

Little Colorado River downstream from Holbrook), razorback sucker (populations in the Colorado River below Parker), and spikedace (populations in the Gila River from Coolidge Dam to Florence). The rule prescribing numeric water quality criteria for the toxic pollutant cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and toxaphene in designated A&Wedw areas is likely to jeopardize the continued existence of the Gila topminnow (Santa Cruz River population).

Where the proposed A&Ww criteria are less stringent than A&Wc criteria, we believe these criteria are not protective of Gila topminnow, Little Colorado spinedace, razorback sucker, and spikedace. Acute toxicity tests have been conducted comparing endangered and threatened salmonids and warmwater fishes to standard surrogate species (EPA/600/x-92/139; Dwyer et al. 1993). Test fish included: three threatened salmonids - Apache trout, Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) and greenback cutthroat trout (*O. c. stomias*); three endangered warmwater species - bonytail chub, Colorado squawfish, and razorback sucker; and standard surrogate species - rainbow trout and fathead minnow (*Pimephales promelas*). Chemicals used in these toxicity assessments were selected to represent different chemical classes and toxic modes of action. Test results showed that for some chemicals, listed species were somewhat more sensitive during early exposure time periods. For some chemicals the warmwater fishes were more sensitive than the warmwater surrogate, but no more sensitive than the rainbow trout.

Beyers et al. (1994) conducted toxicity tests on carbaryl and malathion with the endangered Colorado squawfish and bonytail chub. They determined that for carbaryl exposures, the endangered species were similar to the responses of salmonids. However, for malathion exposures, the response of endangered species was similar to the fathead minnow and channel catfish.

Findings from these studies indicate that for regulatory purposes, results from tests conducted with the more sensitive standard species may be protective of listed species. Therefore, we believe the A&Wc criteria would be more protective of endangered and threatened species than the A&Ww criteria.

<u>Numeric Water Quality Standards - Toxic Pollutants - criteria development</u> - The rule prescribing numeric water quality criteria for toxic pollutants is likely to jeopardize the continued existence of the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), and Yaqui topminnow (populations in Blackdraw and Leslie Creek), and adversely modify critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw).

Numeric criteria developed for priority pollutants have been derived for single compounds without consideration of synergistic, additive or antagonistic effects to aquatic life. A synergistic effect is the situation in which the combined effect of two chemicals is much greater than expected by the addition of their individual responses (i.e. 2 + 2 = 20). An additive effect situation occurs when the combined effect to two chemicals is equal to the sum of the effect of each agent given alone (i.e. 2 + 3 = 5). Antagonism is the situation in which two chemicals, administered together, interfere with each other's actions and exhibit a less than additive total toxic effect (i.e. 4 + 6 = 8). Most effluents consist of complex mixtures of different chemicals.

The NPDES program requires effluent toxicity testing to assure that discharges pass both the water quality criteria and standard effluent

toxicity testing. The Service questions if the toxicity tests using EPA surrogate fathead minnow and cladoceran (*Daphnia magna*) are protective of endangered and threatened species in Arizona. At the time of this formal consultation, there were limited data to determine this. Therefore, the jeopardy and adverse modification of critical habitat biological opinion are based on worst-case analyses.

For example, results of acute toxicity tests indicated that copper-zinc and copper-manganese exhibited a respective synergistic and additive toxicity to juvenile longfin dace (*Agosia chrysogaster*) (Lewis 1978). Symptoms of the copper-zinc synergism were primarily altered fish behavior. Other subacute effects included loss of equilibrium and air gulping. Synergistic or additive impacts to aquatic life may result in reduced fecundity, reproduction or failure to reproduce, growth deficiencies, and death of listed fish species.

Numeric Water Quality Standards - Chlorine (total residual) - This rule proposing criteria for total residual chlorine is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). The State's proposed standards for chlorine are more stringent than the EPA criteria, therefore it is anticipated that no significant adverse effects to endangered and threatened species would occur.

Numeric Water Quality Standards - Ammonia - This rule proposing criteria for ammonia is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or result in the destruction or adverse modification of critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). Ammonia discharged into water quickly changes to nitrate (Sam Rector, Pers. com. ADEQ), and therefore is not expected to result in significant adverse effects to endangered and threatened species.

Unique Water Classification (R18-11-112) - This rule and waters classified as unique are not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila trout, Gila topminnow (populations other than discussed under no effect, excluding population at Peoples Canyon), humpback chub, Little Colorado spinedace (excluding populations on West Fork of the Little Colorado River), loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). At the time of this consultation, navigable waters classified as unique do not provide habitat for these species. The rule establishes that the classification of a unique water may provide for the essential maintenance and propagation of an endangered or threatened species and/or critical habitats. Approval of this rule that may provide better water quality standards for endangered and threatened species or critical habitats is

anticipated to not produce significant adverse effects to the endangered or threatened species.

Waters classified as unique on the West Fork of the Little Colorado River, Peoples Canyon and Bonita Creek are not likely to adversely affect the Little Colorado spinedace, Gila topminnow, and razorback sucker in respective waters. Criteria for arsenic, chromium, manganese and zinc should supersede numeric criteria for toxic pollutants in Appendix A. Approval of this rule, as it applies to the classification of unique waters, anticipates no significant adverse effects to Little Colorado spinedace, Gila topminnow, and razorback sucker would occur.

Analytical Methods (R18-11-111) - This rule is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish and Yaqui chub (Blackdraw). The requirement for approved analytical methods and licensed laboratories would ensure that accurate and valid analysis of water quality standards is achieved. Accurate analysis would result in determining if point source discharges are in compliance with State water quality standards. Correct diagnosis of compliance with water quality standards is an important step in maintaining and protecting the navigable waters of the State. No significant adverse effects from this proposed rule to endangered or threatened species are expected.

Mixing Zones (R18-11-114) - This rule, where established, will have no effect on the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish and Yaqui chub (Blackdraw). This rule does not apply to navigable waters that provide habitat and critical habitat for these species.

At the time of this consultation, Canyon Lake is the only navigable water with an established mixing zone. This rule is not likely to affect the bald eagle where it is known to forage. However, the application for a mixing zone is established under NPDES permits and may require an additional Section 7 consultation in the future.

Nutrient Waiver (R18-11-115) - This rule is not likely to adversely affect the Apache trout, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). A nutrient waiver that is granted must not violate the nutrient standards (R18-11-109) in downstream waters. The proposed nutrient waiver rule, as it relates to the State's total phosphorus and nitrogen standards and the EPA promulgated nitrate and phosphate criteria for downstream navigable waters,

is anticipated to have no significant adverse effects to endangered and threatened species.

However, the application for a nutrient waiver is established under NPDES permits and may require an additional Section 7 consultation in the future.

Dams and Flood Control Structures (R18-11-118) - This rule will have no effect on Apache trout, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, Little Colorado spinedace, loach minnow, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (Leslie and West Turkey creeks), Yaqui topminnow (Blackdraw and Leslie Creek), or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). This rule does not apply to navigable waters that provide habitat and critical habitat for these species.

This rule is not likely to adversely affect the bonytail chub, humpback chub, razorback sucker, California brown pelican, bald eagle, and Yuma clapper rail. Increases in turbidity that may result from routine maintenance of dams and flood control structures would be of zero or little magnitude (Loel Flannery, Pers. com. Corps of Engineers, 9-16-93), and no substantial adverse effects to these species are expected.

Effluent Dominated Waters (R18-11-113) - This rule and waters classified as effluent dominated will have no effect to the Apache trout, bonytail chub, desert pupfish, Gila trout, Gila topminnow (populations other than discussed under no effect, excluding population in Santa Cruz River near Tumacacori), humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail (populations in the Colorado River and Picacho Reservoir), or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). Navigable waters that provide habitat and critical habitat for these species do not apply to this rule.

Waters classified as effluent dominated the Gila River from the confluence with the Salt River to Gillespie Dam are not likely to adversely affect the bald eagle and Yuma clapper rail. However, waters classified as AWedw on the Santa Cruz River from Nogales to Tubac are likely to jeopardize the continued existence of the Gila topminnow. The Service's discussion of these species is presented under the Numeric Water Quality Standards: R18-11-109... and Numeric Water Quality Standards: Toxic Pollutant - adequacy of A&Ww criteria.

Article 2 - Discharge Limitations - This Article will have no effect on the bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), California brown pelican, bald eagle, and Yuma clapper rail, or the critical habitat of beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw). This Article 2 does not apply to navigable waters that provide habitat and critical habitat for these species.

Article 2 is not likely to adversely affect the Apache trout and bald eagle. Discharge limits prescribed for phosphates in this Article are not of concern for Arizona waters. Arizona rivers and streams are not phosphorus limited (Sam Rector, Pers. com. ADEQ) and discharge limits are not likely to cause

increases of productivity. No substantial adverse effects on Apache trout or bald eagle are anticipated.

CUMULATIVE EFFECTS OF PROPOSED ACTION

Cumulative effects include the effects of future State, local government, or private actions on endangered or threatened species or critical habitat that are reasonably certain to occur in the area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this biological opinion.

Future anticipated non-Federal actions that may occur in or near navigable waters in Arizona include grazing, off-road vehicle use, fishing, hiking, camping, road building, timber harvest, mining, oil and gas exploration and development, sand and gravel operations, agriculture, introduction of nonnative fishes by private parties, and urbanization which may contribute to continued degradation and loss of river and stream habitats. These non-Federal actions are likely to continue having adverse effects on the endangered and threatened species.

The anticipated actions stated above are not expected to cause additional adverse effects to the beautiful shiner, Yaqui topminnow, and Yaqui chub because these species occur on the San Bernardino NWR and will not be subject to these future actions.

The use of pesticides in agricultural practices, NPDES permits regulated by EPA, sand and gravel operations regulated by section 404 of the CWA, grazing and timber permits, and mining, oil and gas activities regulated by Federal agencies on public lands are not considered as cumulative effects because they may require Section 7 consultation.

REASONABLE AND PRUDENT ALTERNATIVES

The Section 7 regulations (50 CFR §402.02) define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction of adverse modification of critical habitat.

1. Reasonable and Prudent Alternative - The reasonable and prudent alternative to remove jeopardy to the Apache trout, beautiful shiner, bonytail chub, desert pupfish, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui catfish, Yaqui chub (populations in Leslie and West Turkey creeks), Yaqui topminnow (populations in Blackdraw and Leslie Creek), bald eagle, and Yuma clapper rail, and adverse modification of critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw) for the **Numeric water quality standards for toxic pollutants - bioaccumulation** shall include the following:

    a. Pursuant to 40 CFR 131.1&.4, adopt selenium (2 μg/l (ppb) total recoverable; Skorupa 1993) wildlife criteria that are protective of endangered and threatened species during the current triennial review rule-making process from 1994 to 1995.

b. Pursuant to 40 CFR 131.1&.4, adopt mercury wildlife criteria that are protective of endangered and threatened species during the current triennial review rule-making process from 1994 to 1995.

c. By 1998, finalize the development of mercury and selenium 304(a) criteria for wildlife.

d. By 1998, Develop a methodology to evaluate highly lipophilic compounds in a consistent way. This methodology will be the basis for developing wildlife criteria.

2. Reasonable and Prudent Alternative - The reasonable and prudent alternative to remove jeopardy to the Gila topminnow (Santa Cruz River population), Little Colorado spinedace (populations in the Little Colorado River downstream from Holbrook, Arizona), razorback sucker (populations in the Colorado River below Parker, Arizona) and spikedace (populations in the Gila River from Coolidge Dam to Florence, Arizona) for the **Numeric water quality standards for toxic pollutants - adequacy of A&Ww criteria** shall include the following:

a. Pursuant to 40 CFR 131.1&.4, adopt A&Wc criteria for cyanide and phenol for the following waterbodies where these chemicals are discharged and endangered and threatened species exist:
   i. Little Colorado River downstream from Holbrook to its confluence with East Clear Creek
   ii. Colorado River downstream from Parker to Yuma
   iii. Gila River downstream from Coolidge Dam to Florence.

b. Pursuant to 40 CFR 131.1&.4, adopt A&Wc criteria for cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and toxaphene for the waterbody Santa Cruz River downstream from Nogales to Tubac, where these chemicals are discharged and the Gila topminnow exist:

3. Reasonable and Prudent Alternative - The reasonable and prudent alternative to remove jeopardy to the Apache trout, desert pupfish, bonytail chub, Gila topminnow (populations other than discussed under no effect), Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub (populations in Leslie and West Turkey creeks), and Yaqui topminnow (populations in Blackdraw and Leslie Creek), and the adverse modification of critical habitat of the beautiful shiner (Blackdraw), desert pupfish, Little Colorado spinedace, Sonora chub, Yaqui catfish, and Yaqui chub (Blackdraw) for **Numeric water quality standards for toxic pollutants - criteria development** shall include the following to determine if the proposed aquatic criteria are protective of endangered and threatened species:

a. Conduct side-by-side standard effluent toxicity tests using EPA standard procedures and the Service's identified target endangered and threatened species or their surrogates (Table 1). The Service prefers the actual endangered and threatened species be used for the toxicity testing; however, we will accept the use of our identified surrogate species.

b. By 1997, conduct toxicity tests with effluents discharged into areas only where the endangered and threatened species exist.

c. Evaluate results conducted with standard surrogates and endangered and threatened species. If the results indicate that endangered and threatened species are more sensitive than surrogate species, by 1997, form a workgroup with EPA, Service, and ADEQ to identify

the toxicity problems and develop appropriate actions to remove the toxic effects. The development of identifying and removing the toxic effects will be consistent with adopting site-specific criteria protective of endangered and threatened species.

d. Develop narrative biocriteria standards for the following six reference sites during the next triennial review from 1996 through 1999.

   i. West fork of the Little Colorado River

   ii. Little Colorado River eight 8 upstream from confluence with the Colorado River. The Service will develop a cooperative agreement with ADEQ to assist with the development of biocriteria.

   iii. Headwaters of the White, Blue, and Campbell Blue Rivers. Headwaters of the White River are not subject to State jurisdiction, therefore they cannot collect the data required to develop biocriteria. However, the Service may develop a cooperative agreement to assist with data collection and development.

   iv. Quitobaquito Springs

   v. Aravaipa Creek

   vi. Sycamore Creek

e. By 1999, adopt narrative biocriteria standards for the above reference sites.

Table 1. Suitable water quality test species available to represent endangered and threatened species; including target and surrogate species.

THREATENED AND ENDANGERED SPECIES	TARGET SPECIES	SURROGATE SPECIES
Yaqui catfish (*Ictalurus pricei*)		Channel catfish (*Ictalurus punctatus*
Bonytail chub (*Gila elegans*)	Captive stock, Dexter NFH&TC, NM	
Humpback chub (*Gila cypha*)		Bonytail chub
Sonora chub (*Gila ditaenia*)		Bonytail chub
Virgin River chub (*Gila robusta seminuda*)		Bonytail chub
Yaqui chub (*Gila purpurea*)		Bonytail chub
Loach minnow (*Tiaroga cobitis*)		Woundfin
Desert pupfish (*Cyprinodon macularius*)	Captive stock, Dexter NFH&TC, NM	Leon Springs pupfish
Beautiful shiner (*Cyprinella formosa*)		Red shiner (*Cyprinella lutrensis*)
Spikedace (*Meda fulgida*)		Woundfin
Little Colorado spinedace (*Lepidomeda vittata*)		Woundfin
Razorback sucker (*Xyrauchen texanus*)	Captive stock, Dexter NFH&TC, NM	
Gila topminnow (*Poeciliopsis occidentalis occidentalis*)	Captive stock, Dexter NFH&TC, NM	
Yaqui topminnow (*Poeciliopsis o. sonorensis*)		Gila topminnow
Apache trout (*Oncorhynchus apache*)	Captive stock, Williams-Creek NFH&TC, AZ	
Gila trout (*Oncorhynchus gilae*)		Rainbow Trout (*Oncorhynchus mykiss*)
Woundfin (*Plagopterus argentissimus*)	Captive stock, Dexter NFH&TC, NM	

NFH&TC - National Fish Hatchery and Technical Center

INCIDENTAL TAKE

Section 9 of the Act, as amended, prohibits taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any 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 result in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as an action that creates 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. 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 taking within the bounds of the Act 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 applicant, as appropriate, in order for the exemption in Section 7(o)(2) to apply.

The EPA has a continuing duty to regulate the activity that is covered by this incidental take statement. If the agency fails to require the applicant 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.

Incidental Take - The Service anticipates that the incidental take of California brown pelican as a result of the **numeric water quality criteria for toxic pollutants - bioaccumulation** will occur, but will be difficult to quantify in terms of loss of or harm to individuals because of the limited information identifying where and how mercury and selenium actually bioaccumulate in its prey. However, if the monitoring of its prey base shows that these chemicals exceed the protection limits for fish-eating endangered birds, then the anticipated level of take is exceeded.

Reasonable and Prudent Measure - minimize incidental take.

Terms and Conditions - In order to be exempt from the prohibitions of Section 9 of the Act, EPA is responsible for compliance with the following terms and conditions, which implements the reasonable and prudent measure described above.

1. Monitor the prey base of the California brown pelican for mercury and selenium concentrations. Monitoring would occur under the EPA priority pollutant program from 1994 through 1997 and include one composite sample of five fish per year collected from the Colorado River between Parker and the International Border.

2. Identify probable pollutant sources along the Colorado River that may result in the bioaccumulation of mercury and selenium above the protection limit (100 ug/kg and 6 ug/g, respectively) for fish-eating birds.

3. Report the monitoring results to the Service annually.

Incidental Take - The Service anticipates that the incidental take of endangered and threatened fish and bird species as a result of the **antidegradation rule without the implementation procedures** may occur but will be difficult to quantify in terms of loss of or harm to individuals because of the limited data available on fish populations, because reliable estimates of fish populations are not obtainable due to sampling limitations and to the rapid population changes inherent in a short-lived

species with high fecundity and structure; and due to the inadequacy of fish population sampling and prediction techniques for detecting small changes in populations, including fish and invertebrate population sampling and detecting small changes in numbers of the prey base for avian species.

Reasonable and Prudent Measure - minimize incidental take.

Terms and Conditions - In order to be exempt from the prohibitions of Section 9 of the Act, EPA is responsible for compliance with the following terms and conditions, which implement the reasonable and prudent measure described above.

1. Pursuant to 40 CFR 131.12, adopt implementation methods for the antidegradation rule by 1995.

2. Progress and development of the implementation methods shall be made available to the Service during the public review process by mid-1994 and subsequent public reviews.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The term conservation recommendations has been defined as suggestions of the Service regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, or regarding the development of information.

1. Pursuant to 40 CFR 131.10, the following 13 waters should be identified as navigable, thus have a defined designated use during the current triennial review rule-making process from 1994 to 1995.

    a. Gamma, House, Mesquite, North, Twin and Two PhD Ponds, Robertson Cienega in Cochise County

    b. Corner Artesian in Gila County

    c. Cold Spring Seep, Howard Well, Middle Spring in Graham County

    d. Quitobaquito Springs in Pima County

    e. Johnson Wash Spring in Yavapai County.

2. Pursuant to 40 CFR 131.12(3), reevaluate numeric criteria for heavy metals in waters classified as unique.

3. Clarify the unique waters designation in terms of endangered and threatened species and their critical habitat.

4. Incorporate Geographic Information System to overlay the 305(b) report, 304(l) list, and 303(d) list with endangered and threatened species.

5. Evaluate the validity of the turbidity criteria rule as a measure of suspended solids relative to the protection of endangered and threatened species.

6. Pursuant to Section 7 of the Act, consultation with the Service should occur for NPDES permits.

SUMMARY
Section 7 Biological Opinion for
EPA Proposed Approval of
the Arizona Water Quality Standards for Navigable Waters

Consulting agency: EPA

Proposed project: The EPA approval of Arizona Water Quality Standards for Navigable Waters (Title 18, Chapter 11, Articles 1 and 2).

Species involved: Apache trout (*Oncorhynchus apache*), beautiful shiner (*Cyprinella formosa*), bonytail chub (*Gila elegans*), desert pupfish (*Cyprinodon macularius*), Gila topminnow (*Poeciliopsis occidentalis occidentalis*), Gila trout (*Oncorhynchus gilae*), humpback chub (*Gila cypha*), Little Colorado spinedace (*Lepidomeda vittata*), loach minnow (*Tiaroga cobitis*), razorback sucker (*Xyrauchen texanus*), Sonora chub (*Gila ditaenia*), spikedace (*Meda fulgida*), Virgin River chub (*Gila robusta seminuda*), woundfin (*Plagopterus argentissimus*), Yaqui catfish (*Ictalurus pricei*), Yaqui chub (*Gila purpurea*), Yaqui topminnow (*Poeciliopsis occidentalis sonoriensis*), Kanab ambersnail (*Oxyloma haydeni kanabensis*), American peregrine falcon (*Falco peregrinus*), California brown pelican (*Pelecanus occidentalis californicus*), bald eagle (*Haliaeetus leucocephalus*), whooping crane (*Grus americana*), and Yuma clapper rail (*Rallus longirostris yumanensis*).

The proposed Arizona willow (*Salix arizonica*) and southwestern willow flycatcher (*Empidonax traillii extimus*) and their proposed critical habitat, proposed critical habitat for the bonytail chub, humpback chub, loach minnow, razorback sucker, spikedace and Virgin River chub, and the experimental, non-essential population of the Colorado squawfish (*Ptychocheilus lucius*). If EPA concludes that this action may result in jeopardizing these proposed species or result in the destruction or adverse modification of proposed critical habitats, then EPA is required to initiate a conference with the Service.

Project location: Navigable waters in Arizona.

Biological opinion: No effect on the beautiful shiner, Yaqui chub, Yaqui topminnow, Yaqui catfish, Gila topminnow, Kanab ambersnail, American peregrine falcon, or whooping crane.

No effect on any listed species or critical habitat for the following rules in Article 1: exclusions, resource management agencies, canals and municipal park lakes, and natural background.

Not likely to jeopardize any listed species or adversely modify critical habitat for Article 2 and the following rules in Article 1: antidegradation; salinity of the Colorado River; enforcement; schedules of compliance; numeric water quality standards for fecal coliform, pH, temperature, turbidity, dissolved oxygen, nutrient criteria for total phosphorus and nitrogen including EPA promulgated phosphate and nitrate criteria, radiochemicals, chlorine (total residual) and ammonia; unique water classification; analytical methods; mixing zones; nutrient waivers; dams and flood control structures and effluent dominated water classification.

Not likely to jeopardize the California brown pelican for the numeric water quality standards rule for toxic pollutants because of bioaccumulation.

Not likely to jeopardize listed fish species excluding Gila topminnow (Santa Cruz River), Little Colorado spinedace (Little Colorado River

downstream from Holbrook), razorback sucker (Colorado River from Parker to Yuma) and spikedace (Gila River from Coolidge Dam to Phoenix) and bald eagle, California brown pelican, and Yuma clapper rail for the numeric water quality standards rule for toxic pollutants - adequacy of A&Ww criteria.

Is likely to jeopardize all listed fish species, bald eagle, Yuma clapper rail, and adversely modify critical habitat for the following rule: Numeric water quality standards for toxic pollutants because of bioaccumulation, adequacy of A&Ww criteria, and criteria development. Three reasonable and prudent alternatives are identified.

Basis for jeopardy:

1. Numeric criteria for toxic pollutants have been developed without the consideration of bioaccumulative effects on fish and wildlife.

2. Where A&Ww criteria are less stringent than (A&Wc) criteria, the A&Ww criteria are not protective of endangered and threatened species.

3. Numeric criteria for toxic pollutants have been derived for single compounds without consideration of synergistic, additive, or antagonistic effects to aquatic life.

Reasonable and prudent alternatives: Implementation of these three alternatives is **mandatory**.

1. **Numeric water quality standards for toxic pollutants - bioaccumulation**

   a. Pursuant to 40 CFR 131.1&.4, adopt selenium (2 μg/l, total recoverable) wildlife criteria that are protective of endangered and threatened species during the current triennial review rule-making process from 1994 to 1995.

   b. Pursuant to 40 CFR 131.1&.4, adopt mercury wildlife criteria that are protective of endangered and threatened species during the current triennial review rule-making process from 1994 to 1995.

   c. Finalize the development of mercury and selenium 304(a) criteria for wildlife by 1998.

   d. Develop a methodology to evaluate highly lipophilic compounds in a consistent way. This methodology will be the basis for development of wildlife criteria by 1998.

2. **Numeric water quality standards for toxic pollutants - adequacy of A&Ww criteria** - Gila topminnow, Little Colorado spinedace, razorback sucker and spikedace.

   a. Pursuant to 40 CFR 131.1&.4, adopt A&Wc criteria for cyanide and phenol for the following waterbodies where these chemicals are discharged and endangered and threatened species exist:

      i. Little Colorado River downstream from Holbrook to its confluence with East Clear Creek
      ii. Colorado River downstream from Parker to Yuma
      iii. Gila River downstream from Coolidge Dam to Florence.

   b. Pursuant to 40 CFR 131.1&.4, adopt A&Wc criteria for cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-

dichlorobenzene, toxaphene, and 1, 2, 4-trichlorobenzene, for the following waterbody where these chemicals are discharged and the Gila topminnow exist:

i. Santa Cruz River downstream from Nogales to Tubac.

3. **Numeric water quality standards for toxic pollutants - criteria development**

a. Conduct side-by-side standard effluent toxicity tests using EPA standard procedures and the Service's identified target endangered and threatened species or their surrogates (Table 1).

b. Conduct toxicity tests with effluents discharged into areas only where the endangered and threatened species exist by 1997.

c. Evaluate results conducted with standard surrogates and endangered and threatened species. If the results indicate that endangered and threatened species are more sensitive than surrogate species, then form a workgroup with EPA, Service, and Arizona Department of Environmental Quality to identify the toxicity problems and develop appropriate actions to remove the toxic effects by 1997. The development of identifying and removing the toxic effects will be consistent with adopting site-specific criteria protective of endangered and threatened species by 1997.

d. Develop narrative biocriteria standards for the six reference sites during the next triennial review from 1996 through 1999.

e. Adopt narrative biocriteria standards by 1999.

Incidental take:
Numeric water quality standards for toxic pollutants - Bioaccumulation - California brown pelican

Anticipated incidental take will occur but will be difficult to quantify in terms of loss of or harm to individuals. However, if the monitoring of its prey base shows that mercury and selenium exceed the protection limits for consumption by endangered birds, then the anticipated level of take is exceeded.

Reasonable and prudent measure: Implementation of this measure, through terms and conditions, is **mandatory**. The reasonable and prudent measure is to minimize the incidental take.

Terms and conditions: Implementation of the term and condition is **mandatory**.

1. Monitor the prey base of the pelican for mercury and selenium concentrations. Monitoring would occur under the EPA priority pollutant program from 1994 through 1997 and include one composite sample of five fish per year, collected from the Colorado River between Parker and the International Border.

2. Identify probable pollutant sources along the Colorado River that may result in the bioaccumulation of mercury and selenium above the protection limit (100 ug/kg and 6 ug/g, respectively) for fish-eating birds.

3. Report the monitoring results to the Service annually.

Antidegradation rule without the implementation procedures - fish and bird species

Anticipated incidental take will occur but will be difficult to quantify in terms of loss of or harm to individuals.

Reasonable and prudent measure: Implementation of this measure, through terms and conditions, is mandatory. Minimize the incidental take.

Terms and conditions: Implementation of the terms and conditions is mandatory.

1. Pursuant to 40 CFR 131.12, adopt implementation methods for the antidegradation rule by 1995.

2. Progress and development of the implementation methods shall be made available to the Service during the public review process by mid-1994 and subsequent public reviews.

Conservation recommendations: Implementation of conservation actions is **discretionary**. Recommendations are:

1. Pursuant to 40 CFR 131.10, thirteen water areas should be identified as navigable, thus have a defined designated use during the current triennial review rule-making process from 1994 to 1995.

2. Pursuant to 40 CFR 131.12(3), reevaluate numeric criteria for heavy metals in waters classified as unique.

3. Clarify the unique waters designation in terms of endangered and threatened species and their critical habitats.

4. Incorporate Geographic Information Systems to overlay the 305(b) report, 304(l) list, and 303(d) list with endangered and threatened species distribution.

5. Evaluate the validity of the turbidity criteria rule as a measure of suspended solids relative to the protection of endangered and threatened species.

6. Pursuant to Section 7 of the Endangered Species Act, consultation with the Service should occur for National Pollutant Discharge Elimination System permits.

CONCLUSION

This concludes formal consultation on the approval of the Arizona Water Quality Standards for Navigable Waters. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action (approval or disapproval of new rules or the modification of existing rules to the AWQS) that may impact listed species or critical habitat in a manner or to an extent not considered in this biological 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 biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

Because this biological opinion has found jeopardy/destruction or adverse modification of critical habitat, the EPA is required to notify the Service of its final decision on their implementation of the action under consultation.

Also occurring in the project area are the proposed Arizona willow (*Salix arizonica*) and southwestern willow flycatcher (*Empidonax traillii extimus*) and their proposed critical habitat, proposed critical habitat for the bonytail chub, humpback chub, loach minnow, razorback sucker, spikedace and Virgin River chub, and the experimental, non-essential population of the Colorado squawfish (*Ptychocheilus lucius*). If EPA concludes that this action may result in jeopardizing these proposed species or result in the destruction or adverse modification of proposed critical habitats, then EPA is required to initiate a conference with the Service.

We appreciate your cooperation in this consultation. If we can be of further assistance, contact Sam Spiller or Tom Gatz, at Arizona Ecological Services Field Office, at (602) 379-4720.

Sincerely,

Regional Director

cc:
Director, FWS, Washington, D.C. (AES/TE)
Director, Arizona Game and Fish Department, Phoenix, Arizona
Supervisor, Ecological Services Field Office, Arizona
Regional Directors, FWS, Regions 1, 3, 4, 5, 6, and 7 (ES)

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APPENDIX A

Appendix A - Numeric Water Quality Standards

PARAMETERS		DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	AgI[1] (µg/L)	AgL[1] (µg/L)
Acenaphthene		420	2600	8400	8400	850	550	850	550	850	550	NNS	NNS	NNS	NNS
Acenaphthylene		0.003	0.002	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Acrolein		110	750	1300	1300	34	30	34	30	34	30	NNS	NNS	NNS	NNS
Acrylonitrile	c	0.06	0.64	2.6	1400	3800	250	3800	250	3800	250	NNS	NNS	NNS	NNS
Alachlor	c1	2	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Aldrin	c	0.002	0.0003	0.08	4.2	2.0	NNS	2.0	NNS	2.0	NNS	4.5	NNS	l	l
Ammonia		NNS	NNS	NNS	NNS	b	b	b	b	NNS	NNS	NNS	NNS	NNS	NNS
Anthracene		2100	6300	420000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Antimony (as Sb)		2.8 T	140 T	56 T	56 T	88 D	30 D	88 D	30 D	1000 D	600 D	NNS	NNS	NNS	NNS
Arsenic (as As)	c2	50 T	3.1 T	50 T	2800 T	360 D	190 D	360 D	190 D	360 D	190 D	440 D	230 D	2000 T	200 T
Asbestos	c	a	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Atrazine		3	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Barium (as Ba)		1000 D	NNS	1000 D	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzene	c1	5	120	48	470	2700	180	2700	180	11000	700	NNS	NNS	NNS	NNS
Benzidine	c	0.0002	0.0007	0.006	420	1300	89	1300	89	1300	89	10000	640	0.01	0.01
Benzo (a) anthracene	c	0.003	0.00008	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzo (a) pyrene	c	0.003	0.002	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzo (ghi) perylene		0.003	0.00001	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzo (k) fluoranthene	c	0.003	0.00001	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
3,4-Benzofluoranthene	c	0.003	0.00004	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Beryllium (as Be)	c	0.008 T	0.21 T	0.33 T	700 T	65 D	5.3 D	65 D	5.3 D	65 D	5.3 D	NNS	NNS	NNS	NNS
BHC-alpha	c	0.006	0.03	0.22	NNS	1600	130	1600	130	1600	130	1600	130	NNS	NNS
BHC-beta	c	0.02	0.02	0.78	NNS	1600	130	1600	130	1600	130	1600	130	NNS	NNS
BHC-delta	c	NNS	NNS	NNS	NNS	1600	130	1600	130	1600	130	1600	130	NNS	NNS
BHC-gamma (lindane)	c	0.20	0.02	1	2500	2.0	0.08	3.4	0.28	7.6	0.61	11	0.9	NNS	NNS
Bis(2-chloroethoxy) methane		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Bis(2-chloroethyl) ether	c	0.03	1.4	1.3	NNS	120000	6700	120000	6700	120000	6700	NNS	NNS	NNS	NNS
Bis(2-chloroisopropyl) ether		280	15000	5600	5600	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Bis-(2-ethylhexyl) phthalate	c	2.5	7.4	100	280000	400	360	400	360	400	360	3100	360	NNS	NNS
Boron (as B)		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	1000 T	NNS
Bromoform		TTHM	80	180	2800	15000	10000	15000	10000	15000	10000	NNS	NNS	NNS	NNS
4-Bromophenyl phenyl ether		NNS	NNS	NNS	NNS	180	14	180	14	180	14	NNS	NNS	NNS	NNS
Butyl benzyl phthalate		1400	5000	28000	28000	1700	130	1700	130	1700	130	NNS	NNS	NNS	NNS
Cadmium (as Cd)		5 T	83 T	70 T	70 T	d D	d D	d D	d D	d D	d D	d D	d D	50 T	50 T
Carbofuran		40	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Carbon tetrachloride	c2	5	5.5	11	8000	18000	1100	18000	1100	18000	1100	NNS	NNS	NNS	NNS
Chlordane	c3	2	0.001	2	110	2.4	0.004	2.4	0.21	2.4	0.21	3.2	0.45	NNS	NNS
Chlorine (Total residual)		NNS	NNS	NNS	NNS	11	5.0	11	5.0	11	5.0	NNS	NNS	NNS	NNS
Chlorobenzene		100	500	2800	2800	9800	620	9800	620	NNS	NNS	NNS	NNS	NNS	NNS
Chlorodibromomethane		TTHM	12	17	2800	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Chloroethane		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
2-Chloroethyl vinyl ether		NNS	NNS	NNS	NNS	180000	9800	180000	9800	180000	9800	NNS	NNS	NNS	NNS
Chloroform		TTHM	590	230	1400	14000	900	14000	900	14000	900	NNS	NNS	NNS	NNS
2-Chloronapthalene		560	13000	11000	11000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
2-Chlorophenol		35	2100	700	700	2200	150	2200	150	2200	150	NNS	NNS	NNS	NNS

PARAMETERS		DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	Agl[1] (µg/L)	AgL[1] (µg/L)
3-methyl-4-Chlorophenol		NNS	NNS	NNS	NNS	15	4.7	15	4.7	15	4.7	48000	15000	NNS	NNS
4-Chlorophenyl phenyl ether		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Chromium (as Cr)		100 T	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	1000 T	1000 T
Chromium (as Cr III)		NNS	67000 T	140000 T	140000 T	e D	e D	e D	e D	e D	e D	e D	e D	NNS	NNS
Chromium (as Cr VI)		NNS	3400 T	700 T	700 T	16 D	11 D	16 D	11 D	16 D	11 D	34 D	23 D	NNS	NNS
Chrysene	c	0.003	0.0001	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Copper (as Cu)		1000 D	NNS	5200 D	5200 D	f D	f D	f D	f D	f D	f D	f D	f D	5000 T	500 T
Cyanide		140 T	210000 T	3100 T	3100 T	22 T	5.2 T	41 T	9.7 T	41 T	9.7 T	84 T	19 T	NNS	200 T
DDD	c	0.15	0.0009	5.8	NNS	1.1	0.001	1.1	0.02	1.1	0.02	1.1	0.02	0.001	0.001
DDE	c	0.1	0.0006	4.1	NNS	1.1	0.001	1.1	0.02	1.1	0.02	1.1	0.03	0.001	0.001
DDT	c	0.1	0.0005	4.1	700	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.006	0.001	0.001
Dibenzo (ah) anthracene	c	0.003	0.00003	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-Dichlorobenzene		600	2800	13000	13000	790	300	1200	470	1200	470	5900	2300	NNS	NNS
1,3-Dichlorobenzene		94	1200	13000	13000	2500	970	2500	970	2500	970	NNS	NNS	NNS	NNS
1,4-Dichlorobenzene		75	1200	13000	13000	560	210	2000	780	2000	780	6500	2500	NNS	NNS
3,3-Dichlorobenzidine	c	0.08	0.09	3.1	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Dichlorobromomethane		TTHM	10	11	2800	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Dichlorobromopropane	c3	0.2	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,1-Dichloroethane		NNS	NNS	14000	14000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-Dichloroethane	c4	5	120	15	10000	59000	41000	59000	41000	59000	41000	NNS	NNS	NNS	NNS
1,1-Dichloroethylene	c5	7	4.5	7	1300	15000	950	15000	950	15000	950	NNS	NNS	NNS	NNS
1,2-cis-Dichloroethylene		70	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-trans-Dichloroethylene		100	13000	2800	2800	68000	3900	68000	3900	68000	3900	NNS	NNS	NNS	NNS
2,4-Dichlorophenol		21	810	420	420	1000	88	1000	88	1000	88	NNS	NNS	NNS	NNS
Dichlorophenoxyacetic acid		70	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-Dichloropropane	c6	5	NNS	200	200	26000	9200	26000	9200	26000	9200	NNS	NNS	NNS	NNS
1,3-Dichloropropene		2.1	360	60	60	3000	1100	3000	1100	3000	1100	NNS	NNS	NNS	NNS
Dieldrin	c	0.002	0.0002	0.09	7	2.5	0.002	2.5	0.002	2.5	0.005	4.0	0.9	l	l
Diethyl phthalate		5600	110000	110000	110000	26000	1600	26000	1600	26000	1600	NNS	NNS	NNS	NNS
Dimethyl phthalate		70000	2800000	14000000	NNS	17000	1000	17000	1000	17000	1000	NNS	NNS	NNS	NNS
2,4-Dimethylphenol		140	2200	28000	NNS	1000	310	1000	310	1100	310	150000	43000	NNS	NNS
2,4-Dinitrophenol		14	5400	280	280	110	9.2	110	9.2	110	9.2	NNS	NNS	NNS	NNS
2-methyl-4,6-Dinitrophenol		2.7	120	550	NNS	310	24	310	24	310	24	NNS	NNS	NNS	NNS
2,4-Dinitrotoluene	c	0.009	0.02	0.38	NNS	15000	970	15000	970	15000	970	NNS	NNS	NNS	NNS
2,6-Dinitrotoluene		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
2,3,7,8-TCDD (Dioxin)	c	0.0000002	0.000000004	0.000009	NNS	0.01	0.005	0.01	0.005	0.12	0.01	0.1	0.01	NNS	NNS
1,2-Diphenylhydrazine	c	0.04	0.25	1.8	NNS	130	11	130	11	130	11	NNS	NNS	NNS	NNS
Di-n-butyl phthalate		700	2300	14000	14000	470	35	470	35	470	35	1100	84	NNS	NNS
Di-n-octyl phthalate		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Endosulfan sulfate		0.35	0.78	70	NNS	0.22	0.06	0.22	0.06	0.22	0.06	3.0	1.5	NNS	NNS
Endosulfan-alpha		0.35	0.92	70	NNS	0.22	0.06	0.22	0.06	0.22	0.06	3.0	1.5	NNS	NNS
Endosulfan-beta		0.35	0.92	70	NNS	0.22	0.06	0.22	0.06	0.22	0.06	3.0	1.5	NNS	NNS
Endrin		0.2	1.1	40	40	0.18	0.002	0.2	0.08	0.2	0.08	0.7	0.3	0.004	0.004
Endrin aldehyde		2.1	0.81	420	NNS	0.18	0.002	0.2	0.08	0.2	0.08	0.7	0.3	NNS	NNS
Ethlybenzene		700	110000	64000	64000	23000	1400	23000	1400	23000	1400	NNS	NNS	NNS	NNS
Ethylene dibromide	c7	0.05	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Fluoranthene		280	130	5600	5600	2000	1600	2000	1600	2000	1600	NNS	NNS	NNS	NNS

PARAMETERS		DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	AgI[1] (µg/L)	AgL[1] (µg/L)
Fluorene		280	580	5600	5600	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Fluoride		4000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Heptachlor	c8	0.400	0.0002	0.31	20	0.52	0.004	0.52	0.004	0.58	0.013	0.9	0.1	NNS	NNS
Heptachlor epoxide	c8	0.200	0.0001	0.15	2	0.52	0.004	0.52	0.004	0.58	0.013	0.9	0.1	NNS	NNS
Hexachlorobenzene	c	0.02	0.002	0.83	100	6.0	3.7	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Hexachlorobutadiene	c	0.45	0.52	18	280	45	8.2	45	8.2	45	8.2	NNS	NNS	NNS	NNS
Hexachlorocyclopentadiene		49	550	1000	1000	3.5	0.3	3.5	0.3	3.5	0.3	NNS	NNS	NNS	NNS
Hexachloroethane	c	2.5	4.8	100	140	490	350	490	350	490	350	850	610	NNS	NNS
Indeno (1,2,3-cd) pyrene	c	0.003	0.000003	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Isophorone	c	8.5	520	340	28000	59000	43000	59000	43000	59000	43000	NNS	NNS	NNS	NNS
Lead (as Pb)		50 I	NNS	NNS	NNS	g D	g D	g D	g D	g D	g D	g D	g D	10000 I	100 I
Manganese (as Mn)		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	10000	NNS
Mercury (as Hg)		2.1 I	0.6 I	42 I	42 I	2.4 D	0.01 D	2.4 D	0.01 D	2.6 D	0.2 D	5.0 D	.2.7 D	NNS	10 I
Methoxychlor		40	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Methyl bromide		9.8	7500	200	200	5500	360	5500	360	5500	360	NNS	NNS	NNS	NNS
Methyl chloride	c	5.7	1800	230	2800	270000	15000	270000	15000	270000	15000	NNS	NNS	NNS	NNS
Methylene chloride	c	4.7	480	190	27000	97000	5500	97000	5500	97000	5500	NNS	NNS	NNS	NNS
Naphthalene		NNS	NNS	560	560	1100	210	3300	600	3300	600	NNS	NNS	NNS	NNS
Nickel (as Ni)		140 I	400 I	2800 I	2800 I	h D	h D	h D	h D	h D	h D	h D	h D	NNS	NNS
Nitrate (as N)		10000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Nitrate/nitrite (Total as N)		10000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Nitrite (as N)		1000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Nitrobenzene		3.5	600	70	70	13000	850	13000	850	13000	850	NNS	NNS	NNS	NNS
2-Nitrophenol		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
4-Nitrophenol		NNS	NNS	NNS	NNS	4100	3000	4100	3000	4100	3000	NNS	NNS	NNS	NNS
N-nitrosodimethylamine	c	0.0007	2.1	0.03	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
N-nitrosodiphenylamine	c	7.1	12	290	NNS	2900	200	2900	200	2900	200	NNS	NNS	NNS	NNS
N-nitrosodi-n-propylamine	c	0.005	0.51	0.2	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
PCBs	c9	0.5	0.00009	0.18	NNS	2.0	0.01	2.0	0.02	2.0	0.02	11	2.5	0.001	0.001
Pentachlorophenol		210	29000	2000	2000	i	i	i	i	i	i	i	i	NNS	NNS
Phenanthrene		0.003	0.0005	0.12	NNS	30	6.3	30	6.3	54	6.3	NNS	NNS	NNS	NNS
Phenol		4200	6500000	84000	84000	5100	730	7000	1000	7000	1000	180000	26000	NNS	NNS
Pyrene		210	1100	4200	4200	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Selenium (as Se)		50 I	9000	420	420 I	20 I	2.0 I	20 I	2.0 I	50 I	2 I	33 I	2.0 I	20 I	50 I
Silver (as Ag)		NNS	NNS	NNS	NNS	j D	NNS	j D	NNS	j D	NNS D	j D	NNS D	NNS	NNS
Styrene	c9	100	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Sulfides		NNS	NNS	NNS	NNS	100	NNS	100	NNS	100	NNS	100	NNS	NNS	NNS
1,1,2,2-Tetrachloroethane	c	0.17	11	7	450	4700	3200	4700	3200	4700	3200	NNS	NNS	NNS	NNS
Tetrachloroethylene	c10	5.00	11	35	4000	2600	280	6500	680	6500	680	15000	1600	NNS	NNS
Thallium (as Tl)		0.63 I	44 I	3700 I	3700 I	700 D	150 D	700 D	150 D	700 D	150 D	NNS	NNS	NNS	NNS
Toluene		1000	90000	42000	42000	8700	180	8700	180	8700	180	NNS	NNS	NNS	NNS
Toxaphene	c9	3.0	0.0008	3.0	1000	0.73	0.0002	0.73	0.02	0.73	0.02	11	1.5	0.005	0.005
2,4,5-TP (m)		50	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2,4-Trichlorobenzene		NNS	NNS	2800	2800	750	130	1700	300	NNS	NNS	NNS	NNS	NNS	NNS
1,1,1-Trichloroethane		200	160000	13000	13000	2600	1600	2600	1600	2600	1600	NNS	NNS	NNS	NNS
1,1,2-Trichloroethane	c11	0.61	31	25	560	18000	12000	18000	12000	18000	12000	NNS	NNS	NNS	NNS
Trichloroethylene	c12	5.0	78	110	NNS	20000	1300	20000	1300	20000	1300	NNS	NNS	NNS	NNS

PARAMETERS		DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	AgI[1] (µg/L)	AgL[1] (µg/L)
2,4,6-Trichlorophenol	c	3.2	4.9	130	NNS	160	25	160	25	160	25	3000	460	NNS	NNS
Trihalomethanes, Total	c	100	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Uranium (as Ur)		35 D	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Vinyl chloride	c13	2.0	620	80	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Xylenes (Total)		10000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Zinc (as Zn)		5000 T	NNS	28000	28000	k D	k D	k D	k D	k D	k D	k D	k D	10000 T	25000 T

µg/L - micrograms per liter

a - The standard to protect this use is 7 million fibers (longer than 10 micrometers) per liter.

b - Values for ammonia are contained in separate tables located at the end of Appendix A.

c - Indicates that the parameter is a known, probable or possible human carcinogen and that the standards to protect DWS, FC and FBC are based on carcinogenicity. A "c" by itself indicates that the excess cancer risk level for the DWS designated use is 1×10^{-6}. A "c" followed by a number indicates that the excess cancer risk level for the DWS designated use only is greater than 1×10^{-6}. These excess cancer risk levels, multiplied by 10^{-6} are: c1=5; c2=17; c3=67; c4=13; c5=117; c6=10; c7=125; c8=50; c9=100; c10=7; c11=8; c12=2; and c13=133. The excess cancer risk level for the FC and FBC designated uses is 1×10^{-6}.

d - Cadmium - A&Wc acute standard: $e^{(1.128\,[\ln(\text{Hardness})] - 3.828)}$

A&Wc chronic standard: $e^{(0.7852\,[\ln(\text{Hardness})] - 3.490)}$

A&Ww acute standard: $e^{(1.128\,[\ln(\text{Hardness})] - 2.0149)}$

A&Ww chronic standard: $e^{(0.7852\,[\ln(\text{Hardness})] - 3.490)}$

A&Wedw acute standard: $e^{(1.128\,[\ln(\text{Hardness})] - 2.0149)}$

A&Wedw chronic standard: $e^{(0.7852\,[\ln(\text{Hardness})] - 3.490)}$

A&We acute standard: $e^{(1.128\,[\ln(\text{Hardness})] - 0.9691)}$

A&We chronic standard: $e^{(0.7852\,[\ln(\text{Hardness})] - 3.490)}$

(See Footnote 4)

e - Chromium III - A&Wc acute standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 3.688)}$

A&Wc chronic standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 1.561)}$

A&Ww acute standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 3.688)}$

A&Ww chronic standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 1.561)}$

A&Wedw acute standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 4.9381)}$

A&Wedw chronic standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 1.561)}$

A&We acute standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 3.688)}$

A&We chronic standard: $e^{(0.8190\,[\ln(\text{Hardness})] + 1.561)}$

(See Footnote 4)

f - Copper - A&Wc acute standard: $e^{(0.9422\ [\ln(\text{Hardness})] - 1.464)}$

A&Wc chronic standard: $e^{(0.8545\ [\ln(\text{Hardness})] - 1.465)}$

A&Ww acute standard: $e^{(0.9422\ [\ln(\text{Hardness})] - 1.464)}$

A&Ww chronic standard: $e^{(0.8545\ [\ln(\text{Hardness})] - 1.465)}$

A&Wedw acute standard: $e^{(0.9422\ [\ln(\text{Hardness})] - 1.464)}$

A&Wedw chronic standard: $e^{(0.8545\ [\ln(\text{Hardness})] - 1.465)}$

A&We acute standard: $e^{(0.9422\ [\ln(\text{Hardness})] - 1.1514)}$

A&We chronic standard: $e^{(0.8545\ [\ln(\text{Hardness})] - 1.1448)}$

(See Footnote 4)

g - Lead - A&Wc acute standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 1.460)}$

A&Wc chronic standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 4.705)}$

A&Ww acute standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 1.460)}$

A&Ww chronic standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 4.705)}$

A&Wedw acute standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 1.460)}$

A&Wedw chronic standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 4.705)}$

A&We acute standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 0.7131)}$

A&We chronic standard: $e^{(1.2730\ [\ln(\text{Hardness})] - 3.9518)}$

(See Footnote 4)

h - Nickel - A&Wc acute standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 3.3611)}$

A&Wc chronic standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 1.1044)}$

A&Ww acute standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 3.3611)}$

A&Ww chronic standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 1.1044)}$

A&Wedw acute standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 3.3611)}$

A&Wedw chronic standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 1.1044)}$

A&We acute standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 4.4389)}$

A&We chronic standard: $e^{(0.8460\ [\ln(\text{Hardness})] + 2.2417)}$

(See Footnote 4)

i - Pentachlorophenol - A&Wc acute standard: $e^{(1.005\ (pH) - 4.830)}$

A&Wc chronic standard: $e^{(1.005\ (pH) - 5.290)}$

A&Ww acute standard: $e^{(1.005\ (pH) - 4.830)}$

A&Ww chronic standard: $e^{(1.005\ (pH) - 5.290)}$

A&Wedw acute standard: $e^{(1.005\ (pH) - 4.830)}$

A&Wedw chronic standard: $e^{(1.005\ (pH) - 5.290)}$

A&We acute standard: $e^{(1.005\ (pH) - 3.4306)}$

A&We chronic standard: $e^{(1.005\ (pH) - 3.9008)}$

(See Footnote 5)

j - Silver - A&Wc acute standard: $e^{(1.72\ [\ln(Hardness)] - 6.52)}$

A&Ww acute standard: $e^{(1.72\ [\ln(Hardness)] - 6.52)}$

A&Wedw acute standard: $e^{(1.72\ [\ln(Hardness)] - 6.52)}$

A&We acute standard: $e^{(1.72\ [\ln(Hardness)] - 6.52)}$

(See Footnote 4)

k - Zinc - A&Wc acute standard: $e^{(0.8473\ [\ln(Hardness)] + 0.860)}$

A&Wc chronic standard: $e^{(0.8473\ [\ln(Hardness)] + 0.761)}$

A&Ww acute standard: $e^{(0.8473\ [\ln(Hardness)] + 0.860)}$

A&Ww chronic standard: $e^{(0.8473\ [\ln(Hardness)] + 0.761)}$

A&Wedw acute standard: $e^{(0.8473\ [\ln(Hardness)] + 0.860)}$

A&Wedw chronic standard: $e^{(0.8473\ [\ln(Hardness)] + 0.761)}$

A&We acute standard: $e^{(0.8473\ [\ln(Hardness)] + 3.1342)}$

A&We chronic standard: $e^{(0.8473\ [\ln(Hardness)] + 3.0484)}$

(See Footnote 4)

l - The standard to protect this use is 0.003 ug/l aldrin/dieldrin.
m - 2,4,5-Trichlorophenoxyacetic acid

1 - The numeric standards to protect this use shall not be exceeded.
2 - Determination of compliance with acute standards shall be as prescribed in R18-11-120.C.
3 - Determination of compliance with chronic standards shall be as prescribed in R18-11-120.C.
4 - Hardness is determined pursuant to the methods specified for the definition of hardness Section 101. Hardness is determined from a sample taken at the same time and place that the sample for the metal is taken. Hardness, expressed as mg/l $CaCO_3$, is then inserted into the equation where it says "Hardness".
5 - The pH at the time and location that the sample for pentachlorophenol was taken is inserted into the equation where it says "pH".

NNS - No numeric standard.
D - Dissolved
T - Total recoverable

THM - Indicates that the chemical is a trihalomethane. See trihalomethanes for DWS standard.

A&Wc - ACUTE

Total Ammonia mg-N/l (or mg NH3-N/liter)

pH	Temperature in Degrees Celsius 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	25	30 and above	pH
6.5	29	28	28	27	27	27	27	26	26	26	25	25	25	25	25	24	24	24	24	24	24	16.6	11.8	6.5
6.6	28	27	27	27	26	26	26	25	25	25	25	24	24	24	24	24	24	23	23	23	23	16.2	11.4	6.6
6.7	27	27	26	26	26	25	25	25	24	24	24	24	23	23	23	23	23	23	23	22	22	15.6	11.1	6.7
6.8	26	25	25	25	24	24	24	24	23	23	23	23	23	22	22	22	22	22	22	22	21	15.0	10.6	6.8
6.9	25	24	24	24	23	23	23	22	22	22	22	22	21	21	21	21	21	21	21	21	20	14.3	10.1	6.9
7.0	23	23	22	22	22	22	21	21	21	21	20	20	20	20.0	19.9	19.7	19.6	19.5	19.4	19.3	19.2	13.4	9.5	7.0
7.1	22	21	21	21	20	20	19.9	19.6	19.5	19.3	19.1	18.9	18.8	18.6	18.5	18.4	18.3	18.2	18.1	18.0	17.9	12.5	8.9	7.1
7.2	19.8	19.6	19.2	19.0	18.8	18.5	18.4	18.1	17.9	17.8	17.6	17.5	17.3	17.2	17.0	16.9	16.8	16.7	16.7	16.6	16.5	11.6	8.2	7.2
7.3	18.0	17.8	17.5	17.3	17.1	16.9	16.7	16.5	16.3	16.2	16.0	15.9	15.8	15.6	15.5	15.4	15.3	15.2	15.2	15.1	15.0	10.6	7.5	7.3
7.4	16.2	16.0	15.7	15.5	15.3	15.1	15.0	14.8	14.6	14.5	14.4	14.3	14.1	14.0	13.9	13.8	13.8	13.7	13.6	13.6	13.5	9.5	6.7	7.4
7.5	14.3	14.1	13.9	13.7	13.6	13.4	13.3	13.1	13.0	12.8	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.1	12.1	12.1	12.0	8.4	6.0	7.5
7.6	12.5	12.3	12.2	12.0	11.9	11.7	11.6	11.5	11.4	11.2	11.2	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.6	10.5	10.5	7.4	5.3	7.6
7.7	10.8	10.7	10.5	10.4	10.3	10.1	10.0	9.9	9.8	9.7	9.6	9.6	9.5	9.5	9.3	9.3	9.2	9.2	9.2	9.1	9.1	6.4	4.6	7.7
7.8	9.2	9.1	9.0	8.9	8.8	8.7	8.6	8.5	8.4	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.9	7.8	7.8	5.5	4.0	7.8
7.9	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.7	6.7	6.6	6.6	4.7	3.4	7.9
8.0	6.5	6.4	6.4	6.3	6.2	6.1	6.1	6.0	5.9	5.9	5.8	5.8	5.8	5.7	5.7	5.7	5.6	5.6	5.6	5.6	5.6	4.0	2.9	8.0
8.1	5.2	5.1	5.1	5.0	4.9	4.9	4.8	4.8	4.8	4.7	4.7	4.6	4.6	4.6	4.6	4.5	4.5	4.9	4.5	4.5	4.5	3.2	2.3	8.1
8.2	4.2	4.1	4.0	4.0	4.0	3.9	3.9	3.8	3.8	3.8	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.6	2.6	1.89	8.2
8.3	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.1	1.55	8.3
8.4	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.4	2.4	1.71	1.27	8.4
8.5	2.1	2.1	2.1	2.0	2.0	2.0	1.98	1.96	1.95	1.94	1.93	1.92	1.91	1.90	1.90	1.90	1.90	1.90	1.90	1.91	1.92	1.41	1.05	8.5
8.6	1.68	1.66	1.65	1.63	1.61	1.60	1.59	1.58	1.57	1.56	1.55	1.55	1.54	1.54	1.54	1.54	1.54	1.55	1.55	1.56	1.57	1.16	0.88	8.6
8.7	1.35	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.26	1.25	1.25	1.25	1.25	1.25	1.25	1.26	1.26	1.27	1.28	1.29	0.96	0.74	8.7
8.8	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.03	1.03	1.04	1.05	1.06	1.07	0.81	0.63	8.8
8.9	0.87	0.86	0.86	0.85	0.84	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.84	0.84	0.84	0.85	0.85	0.86	0.87	0.88	0.89	0.69	0.55	8.9
9.0	0.70	0.70	0.69	0.69	0.69	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.69	0.69	0.70	0.70	0.71	0.72	0.73	0.74	0.75	0.59	0.48	9.0

NOTES:

1. pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia.
2. If field measured pH and/or temperature values fall between the A&Wc Acute Total Ammonia tabular values, round field measured values according to standard rounding procedures to nearest tabular value to determine ammonia standard.

A&Ww - ACUTE

Total Ammonia mg-N/liter (or mg NH3-N/liter)

pH	Temperature in Degrees Celsius 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	pH
6.5	29	28	28	27	27	27	27	26	26	26	25	25	25	25	25	6.5
6.6	28	27	27	27	26	26	26	25	25	25	25	25	24	24	24	6.6
6.7	27	27	26	26	26	25	25	25	24	24	24	24	23	23	23	6.7
6.8	26	25	25	25	24	24	24	24	23	23	23	23	23	22	22	6.8
6.9	25	24	24	24	23	23	23	22	22	22	22	22	21	21	21	6.9
7.0	23	23	22	22	22	22	21	21	21	21	20	20	20	20	20	7.0
7.1	22	21	21	21	20	20	20	20	19.5	19.3	19.1	18.9	18.8	18.6	18.5	7.1
7.2	20	20	19.2	19.0	18.8	18.5	18.4	18.1	17.9	17.8	17.6	17.5	17.3	17.2	17.0	7.2
7.3	18.0	17.8	17.5	17.3	17.1	16.9	16.7	16.5	16.3	16.2	16.0	15.9	15.8	15.6	15.5	7.3
7.4	16.2	16.0	15.7	15.5	15.3	15.1	15.0	14.8	14.7	14.5	14.4	14.3	14.1	14.0	13.9	7.4
7.5	14.3	14.1	13.9	13.7	13.6	13.4	13.3	13.1	13.0	12.8	12.7	12.6	12.5	12.4	12.4	7.5
7.6	12.5	12.3	12.2	12.0	11.9	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8	7.6
7.7	10.8	10.7	10.5	10.4	10.3	10.1	10.0	9.9	9.8	9.7	9.6	9.6	9.5	9.5	9.3	7.7
7.8	9.2	9.1	9.0	8.9	8.8	8.7	8.6	8.5	8.4	8.3	8.2	8.2	8.1	8.1	8.0	7.8
7.9	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.0	7.0	6.9	6.9	6.8	6.8	7.9
8.0	6.5	6.4	6.4	6.3	6.2	6.1	6.1	6.0	5.9	5.9	5.8	5.8	5.8	5.7	5.7	8.0
8.1	5.2	5.1	5.1	5.0	4.9	4.9	4.8	4.8	4.8	4.7	4.7	4.6	4.6	4.6	4.6	8.1
8.2	4.2	4.1	4.0	4.0	4.0	3.9	3.9	3.8	3.8	3.8	3.7	3.7	3.7	3.7	3.6	8.2
8.3	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.9	8.3
8.4	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	8.4
8.5	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	1.95	1.94	1.93	1.92	1.91	1.90	1.90	8.5
8.6	1.68	1.66	1.65	1.63	1.61	1.60	1.59	1.58	1.57	1.56	1.55	1.55	1.54	1.54	1.54	8.6
8.7	1.35	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.26	1.25	1.25	1.25	1.25	1.25	8.7
8.8	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	8.8
8.9	0.87	0.86	0.86	0.85	0.84	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.84	0.84	0.84	8.9
9.0	0.70	0.70	0.69	0.69	0.69	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.69	0.69	0.70	9.0

NOTES:

1. pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia.
2. If field measured pH and/or temperature values fall between the A&Ww Acute Total Ammonia tabular values, round field measured values according to standard scientific rounding procedures to nearest tabular value to determine the ammonia standard.

A&Ww - ACUTE

Total Ammonia mg-N/liter (or mg NH3-N/liter) (cont.)

pH	Temperature in Degrees Celsius 15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30 and above	pH
6.5	24	24	24	24	24	24	24	24	24	24	23	22	20	19.1	17.8	16.6	6.5
6.6	24	24	23	23	23	23	23	23	23	23	23	21	20	18.5	17.3	16.1	6.6
6.7	23	23	23	23	22	22	22	22	22	22	22	21	19.2	17.9	16.7	15.6	6.7
6.8	22	22	22	22	22	21	21	21	21	21	21	20	18.4	17.2	16.1	15.0	6.8
6.9	21	21	21	21	21	20	20	20	20	20	20	18.8	17.5	16.4	15.3	14.3	6.9
7.0	20	20	20	19.4	19.3	19.2	19.2	19.1	19.1	19.0	19.0	17.7	16.5	15.4	14.4	13.4	7.0
7.1	18.4	18.3	18.2	18.1	18.0	17.9	17.9	17.8	17.8	17.7	17.7	16.5	15.4	14.4	13.4	12.6	7.1
7.2	16.9	16.8	16.7	16.7	16.6	16.5	16.5	16.4	16.4	16.4	16.3	15.2	14.2	13.3	12.4	11.6	7.2
7.3	15.4	15.3	15.2	15.2	15.1	15.0	15.0	15.0	14.9	14.9	14.9	13.9	12.9	12.0	11.3	10.6	7.3
7.4	13.8	13.8	13.7	13.6	13.6	13.5	13.5	13.5	13.4	13.4	13.4	12.5	11.6	10.9	10.2	9.5	7.4
7.5	12.3	12.2	12.2	12.1	12.1	12.0	12.0	12.0	11.9	11.9	11.9	11.1	10.4	9.7	9.1	8.5	7.5
7.6	10.8	10.7	10.6	10.6	10.5	10.5	10.5	10.4	10.4	10.4	10.5	9.8	9.1	8.5	8.0	7.4	7.6
7.7	9.3	9.2	9.2	9.2	9.1	9.1	9.1	9.1	9.1	9.1	9.1	8.5	7.9	7.4	6.9	6.5	7.7
7.8	8.0	7.9	7.9	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.3	6.8	6.4	6.0	5.6	7.8
7.9	6.7	6.7	6.7	6.7	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.2	5.8	5.4	5.1	4.8	7.9
8.0	5.7	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.2	4.9	4.6	4.3	4.0	8.0
8.1	4.5	4.5	4.9	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.2	4.0	3.7	3.5	3.3	8.1
8.2	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.4	3.2	3.0	2.8	2.7	8.2
8.3	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	3.0	2.8	2.6	2.5	2.3	2.2	8.3
8.4	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.1	2.0	1.90	1.80	8.4
8.5	1.90	1.90	1.90	1.90	1.91	1.92	1.92	1.93	1.95	1.96	1.99	1.86	1.77	1.66	1.57	1.49	8.5
8.6	1.54	1.54	1.55	1.55	1.56	1.57	1.58	1.58	1.60	1.62	1.63	1.55	1.46	1.38	1.31	1.24	8.6
8.7	1.25	1.26	1.26	1.27	1.28	1.29	1.30	1.31	1.33	1.34	1.36	1.29	1.22	1.16	1.10	1.05	8.7
8.8	1.03	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.11	1.12	1.14	1.09	1.03	0.98	0.94	0.90	8.8
8.9	0.85	0.85	0.86	0.87	0.88	0.89	0.91	0.92	0.93	0.95	0.97	0.93	0.88	0.84	0.81	0.77	8.9
9.0	0.70	0.71	0.72	0.73	0.74	0.75	0.77	0.78	0.80	0.81	0.83	0.80	0.76	0.73	0.70	0.68	9.0

NOTES:

1. pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia.
2. If field measured pH and/or temperature values fall between the A&Ww Acute Total Ammonia tabular values, round field measured values according to standard scientific rounding procedures to nearest tabular value to determine the ammonia standard.

APPENDIX B

Appendix B
List of Navigable Waters and Designated Uses

Navigable water	Designated Use
COLORADO MAIN STEM RIVER BASIN	
A-10 Backwater	A&Ww,FBC,FC
A-7 Backwater	A&Ww,FBC,FC
Agate Creek	A&Wc,FBC,DWS,FC
Alamo Lake	A&Ww,FBC,FC
Big Sandy River	A&Ww,FBC,FC,AgL
Big Springs Tank	A&Wc,FBC,FC,AgL
Bill Williams River	A&Ww,FBC,FC,AgL
Blue Tank	A&Ww,FBC,FC,AgL
Boucher Creek	A&Wc,FBC,DWS,FC
Boulder Creek	A&Ww,FBC,FC,AgI,AgL
Bright Angel Creek	A&Wc,FBC,DWS,FC
Bright Angel Wash[1] (Grand Canyon WWTP to Cataract Creek)	A&Wedw,PBC
Bull Rush Canyon Wash	A&We,PBC
Burro Creek[2] (above confluence with Boulder Creek)	A&Ww,FBC,FC,AgL
Cataract Creek (Headwaters to Williams WWTP)	A&Wc,FBC,DWS,FC,AgI,AgL
Cataract Creek[1] (Williams WWTP to 3 km downstream)	A&Wedw,PBC
Cataract Creek (Below 3 km downstream of Williams WWTP)	A&Wc,FBC,FC,AgI,AgL
Cataract Lake	A&Wc,FBC,DWS,FC,AgL
Chuar Creek	A&Wc,FBC,DWS,FC
Cibola Lake	A&Ww,FBC,FC
City Reservoir	A&Ww,FBC,DWS,FC
Clear Creek	A&Wc,FBC,DWS,FC
Colorado River (Lake Powell to Topock)	A&Wc,FBC,DWS,FC,AgI,AgL
Colorado River (Topock to Mexico)	A&Ww,FBC,DWS,FC,AgI,AgL
Coors Lake	A&Ww,FBC,FC
Cottonwood Creek	A&Ww,FBC,DWS
Crystal Creek	A&Wc,FBC,DWS,FC
Deer Creek	A&Wc,FBC,DWS,FC
Detrital Wash	A&We,PBC
Diamond Creek	A&Wc,FBC,FC,AgL
Dogtown Reservoir	A&Wc,FBC,DWS,FC,AgI,AgL
Dragon Creek	A&Ww,FBC,DWS,FC
Francis Creek[2]	A&Ww,FBC,DWS,FC,AgL
Garden Creek	A&Wc,FBC,DWS,FC
Gila River (See listing in Middle Gila River Basin)	
Grand Wash	A&We,PBC
Granite Park Canyon Creek	A&Wc,FBC,FC
Grapevine Creek	A&Wc,FBC,DWS,FC
Grapevine Wash	A&We,PBC
Hakatai Creek	A&Wc,FBC,DWS,FC
Hance Creek	A&Wc,FBC,DWS,FC
Havasu Creek	A&Wc,FBC,DWS,FC,AgI,AgL

Navigable water	Designated use
COLORADO MAIN STEM RIVER BASIN (cont.)	
Hermit Creek	A&Wc,FBC,DWS,FC
Holy Moses Wash[1] (Kingman WWTP to 5 km downstream)	A&Wedw,PBC
Horn Creek	A&Wc,FBC,DWS,FC
Hualapai Wash	A&Ww,PBC
Hunter's Hole Backwater	A&Ww,FBC,FC
Imperial Reservoir	A&Ww,FBC,DWS,FC,AgI,AgL
Jacob Lake	A&Ww,FBC
Kaibab Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Kaibito Creek	A&Ww,FBC,FC,AgL
Kanab Creek	A&Ww,FBC,DWS,FC,AgL
Kirkland Creek	A&Ww,FBC,FC,AgI,AgL
Kwagunt Creek	A&Wc,FBC,DWS,FC
Laguna Reservoir	A&Ww,FBC,DWS,FC,AgI,AgL
Lake Havasu	A&Ww,FBC,DWS,FC,AgI,AgL
Lake Mead	A&Wc,FBC,DWS,FC,AgI,AgL
Lake Mohave	A&Wc,FBC,DWS,FC,AgI,AgL
Lake Powell	A&Wc,FBC,DWS,FC,AgI,AgL
Lonetree Canyon Creek	A&Ww,PBC,DWS
Martinez Lake	A&Ww,FBC,FC,AgI,AgL
Matkatamiba Creek	A&Wc,FBC,DWS,FC
Mittry Lake	A&Ww,FBC,FC
Mohave Wash	A&We,PBC
Monument Creek	A&Ww,FBC,DWS,FC
Nankoweap Creek	A&Wc,FBC,DWS,FC
National Canyon Creek	A&Wc,FBC,DWS,FC
Navajo Creek	A&Ww,FBC,FC,AgL
North Canyon Creek	A&Wc,FBC,DWS,FC
Olo Creek	A&Ww,FBC,DWS,FC
Paria River	A&Wc,FBC,DWS,FC
Peeple's Canyon Creek[2]	A&Ww,FBC,AgL
Phantom Creek	A&Wc,FBC,DWS,FC
Pipe Creek	A&Wc,FBC,DWS,FC
Pretty Water Lake	A&Ww,FBC,FC
Quigley Ponds	A&Ww,FBC,FC
Red Canyon Creek	A&Ww,FBC,DWS
Redondo Lake	A&Ww,FBC,FC
Roaring Springs Creek	A&Wc,FBC,DWS,FC
Royal Arch Creek	A&Wc,FBC,DWS,FC
Ruby Creek	A&Wc,FBC,DWS,FC
Sacramento Wash	A&We,PBC
Saddle Canyon Creek	A&Wc,FBC,FC
Santa Fe Reservoir	A&Wc,FBC,DWS,FC
Santa Maria River	A&Ww,FBC,FC,AgI,AgL
Sapphire Creek	A&Wc,FBC,DWS,FC
Sawmill Wash	A&Ww,PBC,AgL
Serpentine Creek	A&Wc,PBC,DWS,FC
Shinumo Creek	A&Wc,FBC,DWS,FC
Short Creek	A&We,PBC
Slate Creek	A&Wc,FBC,DWS,FC
Spencer Canyon Creek	A&Wc,FBC,FC
Spring Canyon Creek	A&Wc,FBC,DWS,FC

Navigable water	Designated use
COLORADO MAIN STEM RIVER BASIN (cont.)	
Stone Creek	A&Wc,FBC,DWS,FC
Tapeats Creek	A&Wc,FBC,DWS,FC
Three Springs Creek	A&Wc,FBC,DWS,FC
Thunder River	A&Wc,FBC,DWS,FC,AgL
Topock Marsh	A&Ww,FBC,DWS,FC,AgI,AgL
Trail Canyon Creek	A&Wc,FBC,DWS,FC
Travertine Falls Creek	A&Wc,FBC,DWS,FC
Trout Creek	A&Ww,FBC,FC,AgL
Turquoise Creek	A&Wc,FBC,DWS,FC
Unkar Creek	A&Wc,FBC,DWS,FC
Unnamed Wash[1] (Grand Canyon,North Rim WWTP to 1 km downstream)	A&Wedw,PBC
Upper City Reservoir	A&Ww,FBC,FC
Vasey's Paradise	A&Wc,FBC,DWS,FC
Virgin River	A&Ww,FBC,FC,AgI,AgL
Vishnu Creek	A&Wc,FBC,DWS,FC
Warm Springs Creek	A&Ww,FBC,DWS
Wellton Canal	DWS, AgI,AgL
Wellton Ponds	A&Ww,FBC,FC
White Creek	A&Ww,FBC,DWS,FC
Wia Manua Park Lake	A&Ww,FBC,FC
YPG Pond	A&Ww,FBC,FC
Yuma Area Canals above municipal water treatment plant intakes	DWS, AgI,AgL
Yuma Area Canals below water treatment plant intakes and all drains	AgI,AgL
LITTLE COLORADO RIVER BASIN	
Antelope Lake	A&Ww,FBC,FC,AgI,AgL
Ashurst Lake	A&Wc,FBC,FC,AgI,AgL
Barbershop Canyon Creek	A&Wc,FBC,FC,AgL
Bear Canyon Creek (Tributary to Blue Ridge Reservoir)	A&Wc,FBC,FC,AgL
Bear Canyon Creek (Tributary to Willow Creek)	A&Wc,FBC,FC,AgL
Bear Canyon Lake	A&Wc,FBC,FC,AgI,AgL
Becker Lake	A&Wc,FBC,FC,AgL
Billy Creek	A&Wc,FBC,FC,AgL
Black Canyon Creek	A&Wc,FBC,FC,AgI,AgL
Black Canyon Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Black Creek (New Mexico Border to Fort Defiance WWTP)	A&Ww,FBC,AgI,AgL
Black Creek[1] (Fort Defiance WWTP to the Puerco River)	A&Wedw,PBC
Blue Ridge Reservoir	A&Wc,FBC,,FC,AgI,AgL
Boot Lake	A&Ww,FBC,,AgL
Buck Springs Canyon Creek	A&Wc,FBC,FC,AgL
Bunch Reservoir	A&Wc,FBC,FC,AgI,AgL
Camillo Tank	A&Ww,FBC,,AgL
Carnero Lake	A&Wc,FBC,FC,AgL

Navigable water	Designated use
LITTLE COLORADO RIVER BASIN (cont.)	
Chevelon Canyon Lake	A&Wc,FBC,FC,AgI,AgL
Chevelon Creek	A&Wc,FBC,FC,AgI,AgL
Chevelon Creek, West Fork	A&Wc,FBC,FC,AgL
Chilson Tank	A&Ww,FBC,,AgL
Cholla Lake	A&Ww,FBC,FC,AgL
Clear Creek	A&Wc,FBC,DWS,FC,AgL
Clear Creek Reservoir	A&Wc,FBC,FC,AgI,AgL
Coconino Reservoir	A&Wc,FBC,FC,AgI,AgL
Colter Creek	A&Wc,FBC,FC,AgL
Colter Reservoir	A&Wc,FBC,FC,AgL
Concho Creek	A&Ww,FBC,FC,AgL
Concho Lake	A&Wc,FBC,FC,AgI,AgL
Cow Lake	A&Ww,FBC,,AgL
Coyote Creek	A&Wc,FBC,FC,AgI,AgL
Crisis Lake (Snake Tank #2)	A&Ww,FBC,,AgL
Dane Canyon Creek	A&Wc,FBC,FC,AgL
Daves Tank	A&Ww,FBC,,AgL
Deep Lake	A&Ww,FBC,,AgL
Dry Lake[1]	A&Wedw
East Clear Creek	A&Wc,FBC,FC,AgI,AgL
Fish Creek	A&Wc,FBC,FC
Fool's Hollow Lake	A&Wc,FBC,FC,AgL
Ganado Lake	A&Ww,FBC,FC,AgI
General Springs Creek	A&Wc,FBC,FC,AgL
Hall Creek	A&Wc,FBC,FC,AgI,AgL
Hart Canyon Creek	A&Wc,FBC,FC,AgL
Hidden Lake	A&Ww,FBC,FC,AgI,AgL
Horse Lake	A&Ww,FBC,,AgL
Huffer Tank	A&Ww,FBC,FC,AgL
Hulsey Creek	A&Wc,FBC,FC
Hulsey Lake	A&Wc,FBC,FC
Jack's Canyon Creek	A&Ww,FBC,FC,AgI,AgL
Kinnikinick Lake	A&Wc,FBC,FC,AgL
Knoll Lake	A&Wc,FBC,FC,AgL
Lake Humphreys[1]	A&Wedw,PBC
Lake Mary, lower	A&Wc,FBC,FC,AgL
Lake Mary, upper	A&Wc,FBC,DWS,FC,AgL
Lake of the Woods	A&Wc,FBC,FC,AgI,AgL
Lee Valley Creek	A&Wc,FBC,FC,AgL
Lee Valley Reservoir	A&Wc,FBC,FC,AgI,AgL
Leonard Canyon Creek	A&Wc,FBC,FC,AgL
Leonard Canyon Creek, East Fork	A&Wc,FBC,FC,AgL
Leonard Canyon Creek, Middle Fork	A&Wc,FBC,FC,AgL
Leonard Canyon Creek, West Fork	A&Wc,FBC,FC,AgL
Little Colorado River (Below Lyman Reservoir)	A&Ww,FBC,DWS,FC,AgI,AgL
Little Colorado River (West Fork below Government Springs)	A&Wc,FBC,FC,AgI,AgL
Little Colorado River[2] (West Fork above Government Springs)	A&Wc,FBC,FC
Little Colorado River, East Fork	A&Wc,FBC,FC,AgI,AgL
Little Colorado River, South Fork	A&Wc,FBC,FC,AgI,AgL

Navigable water	Designated use
LITTLE COLORADO RIVER BASIN (cont.)	
Little George Reservoir	A&Ww,FBC,FC,AgI
Little Mormon Lake	A&Ww,FBC,FC,AgI,AgL
Little Ortega Lake	A&Ww,FBC,FC
Long Lake, lower	A&Wc,FBC,FC,AgI,AgL
Long Lake, upper	A&Ww,FBC,,AgL
Long Tom Tank	A&Wc,FBC,FC,AgL
Lower Walnut Canyon Lake[1]	A&Wedw,PBC
Lyman Reservoir	A&Wc,FBC,FC,AgI,AgL
Mamie Creek	A&Wc,FBC,FC,AgI,AgL
Marshall Lake	A&Wc,FBC,FC,AgL
Merritt Draw Creek	A&Wc,FBC,FC,AgL
Mexican Hay Lake	A&Wc,FBC,FC,AgI,AgL
Milk Creek	A&Wc,FBC,FC
Miller Canyon Creek	A&Wc,FBC,FC,AgL
Miller Canyon Creek, East Fork	A&Wc,FBC,FC,AgL
Mineral Creek	A&Wc,FBC,FC,AgI,AgL
Mormon Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Morton Lake	A&Wc,FBC,FC,,AgL
Mud Lake	A&Ww,FBC,,AgL
Ned Lake[1]	A&Wedw,PBC,
Nelson Reservoir	A&Wc,FBC,FC,AgI,AgL
Nutrioso Creek	A&Wc,FBC,FC,AgI,AgL
Paddy Creek	A&Wc,FBC,FC
Pasture Canyon Lake	A&Ww,FBC,FC,AgI
Phoenix Park Wash	A&We,PBC
Pine Tank	A&Ww,FBC,,AgL
Pintail Lake[1]	A&Wedw,PBC
Porter Creek	A&Wc,FBC,FC
Potato Lake	A&Wc,FBC,,AgL
Pratt Lake	A&Wc,FBC,FC
Puerco River	A&Ww,FBC,AgI,AgL
Quarter Circle Bar Tank	A&Ww,FBC,,AgL
Rainbow Lake	A&Wc,FBC,FC,AgI,AgL
Red Lake	A&Ww,FBC,FC,AgI
Rio de Flag[1]	A&Wedw,PBC
River Reservoir	A&Wc,FBC,FC,AgI,AgL
Rogers Reservoir	A&Ww,FBC,,AgL
Russell Tank	A&Wc,FBC,FC,AgL
Sawmill Lakes	A&Ww,FBC,FC,AgI,AgL
Scott's Reservoir	A&Wc,FBC,FC,AgI,AgL
Show Low Creek	A&Wc,FBC,FC,AgI,AgL
Show Low Lake	A&Wc,FBC,FC,AgI,AgL
Silver Creek	A&Wc,FBC,FC,AgI,AgL
Soldiers Annex Lake	A&Wc,FBC,FC,AgI,AgL
Soldiers Lake	A&Wc,FBC,FC,AgI,AgL
Spaulding Tank	A&Ww,FBC,FC,AgL
Sponseller Lake	A&Ww,FBC
St Johns Reservoir (Little Reservoir)	A&Ww,FBC,FC,AgI,AgL
Telephone Lake[1]	A&Wedw,PBC,
Trout Lake	A&Ww,FBC,FC,AgL
Tunnel Lake	A&Wc,FBC,FC,AgI,AgL

Navigable water	Designated use
LITTLE COLORADO RIVER BASIN (cont.)	
Turkey Creek	A&Wc,FBC,FC,AgL
Vail Lake	A&Wc,FBC,,AgL
Walnut Creek	A&Wc,FBC,FC
Water Canyon Creek	A&Ww,FBC,FC,AgL
Whipple Lake	A&Ww,FBC,FC,AgL
White Mountain Lake	A&Wc,FBC,FC,AgI,AgL
White Mountain Reservoir	A&Wc,FBC,FC,AgI,AgL
Willow Creek	A&Wc,FBC,FC,AgL
Willow Springs Creek	A&Wc,FBC,FC,AgL
Willow Springs Lake	A&Wc,FBC,FC,AgI,AgL
Woodland Reservoir	A&Wc,FBC,FC,AgI,AgL
Woods Canyon Creek	A&Wc,FBC,FC
Woods Canyon Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Zuni River	A&Ww,FBC,AgI,AgL
MIDDLE GILA RIVER BASIN	
Agua Fria River (Above Lake Pleasant)	A&Ww,FBC,DWS,FC,AgI,AgL
Agua Fria River (Lake Pleasant to the Surprise WWTP)	A&Ww,FBC,FC,AgI,AgL
Agua Fria River[1] (Surprise WWTP to Camelback Road)	A&Wedw,PBC
Agua Fria River (Camelback Road to Avondale WWTP)	A&Ww,PBC,AgI,AgL
Agua Fria River[1] (Avondale WWTP to Gila River confluence)	A&Wedw,PBC
Antelope Creek	A&Ww,PBC,AgI,AgL
Ash Creek	A&Ww,FBC,FC,AgI,AgL
Beehive Tank	A&Ww,FBC,,AgL
Big Bug Creek	A&Ww,FBC,FC,AgI,AgL
Black Canyon Creek	A&Ww,FBC,AgI,AgL
Blind Indian Creek	A&Ww,FBC,FC,AgI,AgL
Cave Creek (Headwaters to Cave Creek Dam)	A&Ww,FBC,FC,AgL
Cave Creek (Cave Creek Dam to the Arizona Canal)	A&We,PBC
Centennial Wash	A&We,PBC
Centennial Wash Ponds	A&Ww,FBC,,AgL
Galena Gulch	A&Ww,PBC,AgL
Gila River (Ashurst-Hayden Dam to the Florence WWTP)	A&Ww,FBC,FC,AgL
Gila River[1] (Florence WWTP to Felix Road)	A&Wedw,PBC
Gila River (Felix Road to the Salt River)	A&Ww,PBC,AgL
Gila River[1] (Salt River to the Gillespie Dam)	A&Wedw,PBC,FC,AgI,AgL
Gila River (Gillespie Dam to the Painted Rock Dam)	A&Ww,FBC,FC,AgI,AgL
Gila River (Painted Rock Dam to the Colorado River)	A&Ww,PBC,AgI,AgL

Navigable water	Designated use
MIDDLE GILA RIVER BASIN (cont.)	
Groom Creek	A&Wc,FBC,DWS,FC,
Hank Raymond Lake	A&Ww,FBC,FC,AgI,AgL
Hassayampa Lake	A&Wc,FBC,DWS,
Hassayampa River (Headwaters to 8 miles south of Wickenburg)	A&Ww,FBC,FC,AgI,AgL
Hassayampa River (from 8 miles south of Wickenburg to the Buckeye Irrigation Company canal)	A&We,PBC
Hit Tank	A&Ww,FBC,,AgL
Horsethief Basin Lake	A&Wc,FBC,DWS,FC,AgL
Lake Pleasant	A&Ww,FBC,FC,AgI,AgL
Little Ash Creek	A&Ww,FBC,FC,AgL
Lynx Creek	A&Ww,PBC,AgL
Lynx Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Martinez Creek	A&Ww,FBC,FC,AgI,AgL
New River	A&Ww,FBC,FC,AgI,AgL
Painted Rock Lake	A&Ww,FBC,AgI,AgL
Painted Rock Reservoir	A&Ww,FBC,FC,AgI,AgL
Perry Mesa Tank	A&Ww,FBC,,AgL
Picacho Reservoir	A&Ww,FBC,FC,AgI,AgL
Queen Creek (Headwaters to the Superior WWTP)	A&Ww,PBC,DWS,AgL
Queen Creek[1] (Superior WWTP to Potts Canyon)	A&Wedw,PBC
Queen Creek (Below Potts Canyon)	A&Ww,PBC,AgL
Sycamore Creek	A&Wc,FBC,FC,AgL
Turkey Creek	A&Ww,FBC,AgI,AgL
Unnamed Wash[1] (Gila Bend WWTP to the Gila River)	A&Wedw,PBC
Unnamed Wash[1] (Luke Air Force Base WWTP to the Agua Fria River)	A&Wedw,PBC
Unnamed Wash[1] (Queen Valley WWTP to Queen Creek)	A&Wedw,PBC
RED LAKE BASIN	
Red Lake	A&Ww,FBC
Rock Canyon Creek	A&We,PBC
Truxton Wash	A&We,PBC
Wright Canyon Creek	A&We,PBC
RIO MAGDALENA BASIN	
Holden Canyon Creek	A&Ww,PBC
Sycamore Canyon Creek	A&Ww,FBC,AgL
RIO SONOITA BASIN	
San Simon Wash	A&We,PBC
Vamori Wash	A&We,PBC

Navigable water	Designated use
RIO YAQUI BASIN	
Abbot Canyon	A&Ww,FBC,DWS,AgI,AgL
Blackwater Draw	A&Ww,FBC,DWS,AgI,AgL
Buck Canyon	A&Ww,FBC,DWS,AgI,AgL
Dixie Canyon	A&Ww,FBC,DWS,AgI,AgL
Dry Canyon	A&Ww,FBC,DWS,AgI,AgL
Gadwell Canyon	A&Ww,FBC,DWS,AgI,AgL
Glance Creek	A&Ww,FBC,AgI,AgL
Gold Gulch	A&Ww,FBC,AgI,AgL
Johnson Canyon	A&Ww,FBC,DWS,AgI,AgL
Leslie Creek	A&Ww,FBC,DWS,FC,AgL
Mexican Canyon	A&Ww,FBC,DWS,AgI,AgL
Mule Gulch (Headwaters to Bisbee WWTP)	A&Ww,PBC,AgI,AgL
Mule Gulch[1] (Below Bisbee WWTP)	A&Wedw,PBC,AgL
Rucker Canyon Creek	A&Wc,FBC,DWS,FC,AgL
Rucker Canyon Lake	A&Wc,FBC,FC,AgL
Soto Canyon	A&Ww,FBC,DWS,AgI,AgL
Unnamed Wash[1] (Bisbee-Douglas International Airport WWTP to Whitewater Draw)	A&Wedw,PBC
Whitewater Draw	A&Ww,FBC,FC,AgI,AgL
SALT RIVER BASIN	
A-1 Lake	A&Wc,FBC,FC,AgI,AgL
Ackre (Judge) Lake	A&Wc,FBC,FC,AgI,AgL
Alvord Park Lake[3]	A&Ww,PBC,FC
Apache Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Arlington Canal(above Wilson Avenue)	AgL
B.S. Gap Tank	A&Ww,FBC,FC,AgL
Ball Tank	A&Ww,FBC,FC,AgL
Basin Creek	A&Wc,FBC,FC
Baskin Tank	A&Ww,FBC,FC,AgL
Bear Cienega Creek	A&Wc,FBC,FC
Bear Creek	A&Wc,FBC,FC,AgI,AgL
Bear Wallow Creek	A&Wc,FBC,FC,AgI,AgL
Bear Wallow Creek, North Fork	A&Wc,FBC,FC
Bear Wallow Creek, South Fork	A&Wc,FBC,FC
Beaver Creek	A&Wc,FBC,FC,AgI,AgL
Becker Creek	A&Wc,FBC,FC,AgI,AgL
Big Bonito Creek	A&Wc,FBC,FC,AgI,AgL
Big Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Black River	A&Wc,FBC,DWS,FC,AgI,AgL
Black River, East Fork	A&Wc,FBC,DWS,FC,AgI,AgL
Black River, North Fork of East Fork	A&Wc,FBC,DWS,FC,AgI,AgL
Black River, West Fork	A&Wc,FBC,DWS,FC,AgI,AgL
Bloody Tanks Wash (Headwaters to Schultze Ranch)	A&We,PBC,AgL
Bloody Tanks Wash (Schultze Ranch to Miami Wash)	A&We,PBC

Navigable water	Designated use
SALT RIVER BASIN (cont.)	
Blue Lake	A&Wc,FBC,FC,AgL
Bobcat Tank	A&Ww,FBC,FC,AgL
Bog Creek	A&Wc,FBC,FC
Bog Tank	A&Wc,FBC,FC,AgI,AgL
Boggy Creek	A&Wc,FBC,FC,AgI,AgL
Boneyard Creek	A&Wc,FBC,FC,AgI,AgL
Bonsall Park Lake[3]	A&Ww,PBC,FC
Bootleg Lake	A&Wc,FBC,FC,AgI,AgL
Canal Park Lake[3]	A&Ww,PBC,FC
Canyon Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Canyon Lake	A&Wc,FBC,FC,AgI,AgL
Carrizo Creek	A&Wc,FBC,FC,AgI,AgL
Cedar Creek	A&Ww,FBC,AgI,AgL
Centerfire Creek	A&Wc,FBC,FC,AgI,AgL
Chambers Draw Creek	A&Wc,FBC,FC
Chaparral Park Lake[3]	A&Ww,PBC,FC,AgI
Cherry Creek	A&Wc,FBC,FC,AgI,AgL
Chino Tank	A&Ww,FBC,FC,AgI,AgL
Christmas Tree Lake	A&Wc,FBC,FC,AgI,AgL
Christopher Creek	A&Wc,FBC,FC,AgI,AgL
Cibecue Creek	A&Wc,FBC,FC,AgI,AgL
Clover Tank	A&Ww,FBC,FC,AgL
Cold Springs Canyon Creek	A&Ww,FBC,FC
Conklin Creek	A&Wc,FBC,FC,AgI,AgL
Cooley Lake	A&Wc,FBC,FC,AgI,AgL
Coon Creek	A&Ww,FBC
Corduroy Creek	A&Wc,FBC,FC,AgI,AgL
Corn Tank	A&Ww,FBC,FC,AgI,AgL
Cortez Park Lake[3]	A&Ww,PBC,FC,AgI
Coyote Creek	A&Wc,FBC,FC,AgI,AgL
Crescent Lake	A&Wc,FBC,FC,AgI,AgL
Crooked Creek	A&Wc,FBC,FC,AgI,AgL
Cyclone Lake	A&Wc,FBC,FC,AgI,AgL
Deep Creek	A&Wc,FBC,FC,AgI,AgL
Deer Creek	A&Wc,FBC,FC
Deer Tank	A&Ww,FBC,FC,AgL
Desert Breeze Lake[3]	A&Ww,PBC,FC
Devil's Chasm Creek	A&Wc,FBC,FC
Diamond Creek	A&Wc,FBC,FC,AgI,AgL
Dobson Lake[3]	A&Ww,PBC,FC
Double Cienega Creek	A&Wc,FBC,FC
Drift Fence Lake	A&Wc,FBC,FC,AgI,AgL
Earl Creek	A&Wc,FBC,FC,AgI,AgL
Earl Park Lake	A&Wc,FBC,FC,AgI,AgL
East Bonito Praire Tank	A&Ww,FBC,FC,AgL
East Deer Tank	A&Ww,FBC,FC,AgL
Eldorado Park Lake[3]	A&Ww,PBC,FC
Elwood Tank	A&Ww,FBC,FC,AgL
Encanto Park Lake[3]	A&Ww,PBC,FC,AgI
Fish Creek	A&Wc,FBC,FC,AgI,AgL
Flash Creek	A&Wc,FBC,FC,AgI,AgL
George's Basin Lake	A&Ww,FBC,FC,AgI,AgL

Navigable water	Designated use
SALT RIVER BASIN (cont.)	
Glade Tank	A&Ww,FBC,FC,AgL
Gold Creek	A&Ww,FBC
Gomez Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Gooseberry Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Gordon Canyon Creek	A&Ww,FBC,FC
Granada Park Lake[3]	A&Ww,PBC,FC
Haigler Creek	A&Wc,FBC,FC,AgI,AgL
Halfway Tank	A&Ww,FBC,FC,AgL
Hannagan Creek	A&Wc,FBC,FC,AgL
Hawley Lake	A&Wc,FBC,FC,AgI,AgL
Hay Creek	A&Wc,FBC,FC
Herrington Tank	A&Ww,FBC,FC,AgL
Highway Tank	A&Ww,FBC,FC,AgL
Home Creek	A&Wc,FBC,FC
Horse Creek	A&Wc,FBC,FC
Horseshoe Cienega Lake	A&Wc,FBC,FC,AgI,AgL
Horseshoe Creek	A&Wc,FBC,FC
Horton Creek	A&Wc,FBC,FC,AgI,AgL
Houston Creek	A&Ww,FBC,FC,AgL
Hunter Creek	A&Wc,FBC,FC,AgL
Hurricane Creek	A&Wc,FBC,FC
Hurricane Lake	A&Wc,FBC,FC,AgI,AgL
Indian Bend Wash	A&Ww,PBC,FC
Indian Bend Wash Lakes[3]	A&Ww,PBC,FC
Indian School Park Lake[3]	A&Ww,PBC,FC
Kiwanis Park Lake[3]	A&Ww,PBC,FC,AgI
Lake Sierra Blanca	A&Wc,FBC,FC,AgI,AgL
Little Bonito Creek	A&Wc,FBC,FC,AgI,AgL
Little Diamond Creek	A&Wc,FBC,FC,AgI,AgL
Lofer Cienega Creek	A&Wc,FBC,FC,AgI,AgL
Lost Basin Tank	A&Ww,FBC,FC,AgL
Lost Mule Tank	A&Ww,FBC,FC,AgL
Martin Luther Tank	A&Ww,FBC,FC,AgL
McDonald Tank	A&Ww,FBC,FC,AgL
McKellips Park Lake[3]	A&Ww,PBC,FC,AgI
McNary Mill Pond	A&Wc,FBC,DWS,FC,AgI,AgL
Miami Wash	A&We,PBC
Moon Creek	A&Wc,FBC,FC,AgI,AgL
Morman Tank	A&Ww,FBC,FC,AgL
Mule Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Nash Creek Reservoir	A&Wc,FBC,FC,AgI,AgL
Navajo Pit Tank	A&Ww,FBC,FC,AgI,AgL
North Bonito Praire Tank	A&Ww,FBC,FC,AgL
Open Draw Creek	A&Wc,FBC,FC
Ord Creek	A&Wc,FBC,FC,AgI,AgL
Pacheta Creek	A&Wc,FBC,FC,AgI,AgL
Pacheta Lake	A&Wc,FBC,FC,AgI,AgL
Paddy Creek	A&Wc,FBC,FC,AgL
Papago Park Ponds[3]	A&Ww,PBC,FC
Paradise Creek	A&Wc,FBC,FC,AgI,AgL
Perry Creek	A&Wc,FBC,FC,AgL
Phillips Park Tank	A&Ww,FBC,FC,AgL

Navigable water	Designated use
SALT RIVER BASIN (cont.)	
Phoenix Area Canals (Granite Reef Dam to municipal WTP)	DWS,AgI,AgL
Phoenix Area Canals (Below WTP intakes and all other locations)	AgI,AgL
Pickett Corral Tank	A&Ww,FBC,FC,AgL
Pinal Creek (Headwaters to Globe WWTP)	A&We,PBC,AgI,AgL
Pinal Creek[1] (Globe WWTP to Radium)	A&Wedw,PBC
Pinal Creek (Radium to Setka Ranch)	A&We,PBC,AgI,AgL
Pinal Creek (Setka Ranch to the Salt River)	A&Ww,FBC,FC,AgI,AgL
Pinto Creek	A&Ww,FBC,FC,AgI,AgL
Pole Corral Tank	A&Ww,FBC,FC,AgL
Powerline Tank	A&Ww,FBC,,AgL
Pueblo Canyon Creek	A&Wc,FBC,FC,AgL
Reservation Creek	A&Wc,FBC,FC,AgI,AgL
Reservation Lake	A&Wc,FBC,FC,AgI,AgL
Reynolds Creek	A&Wc,FBC,FC,AgL
Riverview Lake[3]	A&Ww,PBC,FC
Roadrunner Park Lake[3]	A&Ww,PBC,FC
Roosevelt Lake	A&Ww,FBC,DWS,FC,AgI,AgL
Rye Creek	A&Ww,FBC,FC,AgL
Saguaro Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Salome Creek	A&Wc,FBC,FC,AgI,AgL
Salt River (Above Roosevelt Lake)	A&Ww,FBC,FC,AgI,AgL
Salt River (Stewart Mountain Dam to the Verde River)	A&Wc,FBC,DWS,FC,AgI,AgL
Salt River (Verde River to 2 km below Granite Reef Dam)	A&Ww,FBC,DWS,FC,AgI,AgL
Salt River (2 km below Granite Reef Dam to the I-10 bridge)	A&We,PBC
Salt River (I-10 bridge to the 23rd Avenue WWTP)	A&Ww,PBC
Salt River[1] (23rd Avenue WWTP to the Gila River confluence)	A&Wedw,PBC,FC,AgI,AgL
Sand Creek	A&Wc,FBC,FC,AgI,AgL
Sawmill Creek	A&Ww,FBC,AgI,AgL
Sawmill Tank	A&Ww,FBC,FC,AgL
Seneca Lake	A&Ww,FBC,FC
Shush Be Tou Lake	A&Wc,FBC,FC,AgI,AgL
Shush Bezahze Lake	A&Wc,FBC,FC,AgI,AgL
Slate Creek	A&Ww,PBC,FC,,AgL
Snake Creek	A&Wc,FBC,FC,AgI,AgL
Soldier Creek	A&Wc,FBC,FC
Spring Creek	A&Wc,FBC,FC,AgL
Spur Tank	A&Ww,FBC,FC,AgL
Squaw Creek	A&Wc,FBC,FC,AgI,AgL
Steele Tank	A&Ww,FBC,FC,AgL
Stinky Creek	A&Wc,FBC,FC
Stove Tank	A&Ww,FBC,FC,AgL
Sun Creek	A&Wc,FBC,FC,AgI,AgL

Navigable water	Designated use
SALT RIVER BASIN (cont.)	
Sunrise Lake	A&Wc,FBC,FC,AgI,AgL
Sycamore Tank	A&Ww,FBC,FC,AgL
Tanks Canyon Tank	A&Ww,FBC,FC,AgL
Thomas Creek	A&Wc,FBC,FC,AgL
Thompson Creek	A&Wc,FBC,FC
Tonto Creek	A&Wc,FBC,FC,AgI,AgL
Tonto Lake	A&Wc,FBC,FC,AgI,AgL
Trout Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Turkey Creek	A&Ww,FBC,FC
Tuttle Tank	A&Ww,FBC,FC,AgL
Upper Corn Creek Tank	A&Ww,FBC,FC,AgL
Upper Highway Tank	A&Ww,FBC,FC,AgL
Vista Del Camino Park North[3]	A&Ww,PBC,FC
Vista Del Camino Park South[3]	A&Ww,PBC,FC
Weaning Pen Tank	A&Ww,FBC,FC,AgI,AgL
White River	A&Wc,FBC,FC,AgI,AgL
White River, East Fork	A&Wc,FBC,FC,AgI,AgL
White River, North Fork	A&Wc,FBC,DWS,FC,AgI,AgL
Wild Steer Tank	A&Ww,FBC,FC,AgL
Wildcat Creek	A&Wc,FBC,FC
Williams Creek	A&Wc,FBC,FC,AgI,AgL
Willow Creek	A&Wc,FBC,FC
Workman Creek	A&Wc,FBC,DWS,FC,AgI,AgL
SAN JUAN RIVER BASIN	
Chinle Wash	A&Ww,FBC,AgL
Laguna Creek	A&Ww,FBC,FC,AgI,AgL
Many Farms Reservoir	A&Ww,FBC,FC,AgI
Round Rock Lake	A&Ww,FBC,FC,AgI
Tsaile Creek	A&Ww,FBC,FC,AgL
Tsaile Lake	A&Wc,FBC,FC,AgI
Walker Creek	A&Ww,FBC,AgI,AgL
Wheatfields Creek	A&Ww,FBC,FC,AgL
Wheatfields Lake	A&Wc,FBC,FC,AgI
Whiskey Creek	A&Ww,FBC,FC,AgL
SAN PEDRO RIVER BASIN	
Aravaipa Creek	A&Ww,FBC,DWS,FC,AgL
Babocomari Creek	A&Ww,FBC,FC,AgL
Bass Canyon Tank	A&Ww,FBC,FC,AgL
Blacktail Pond	A&Ww,FBC,FC
Buehman Canyon Creek	A&Ww,FBC,AgL
Bull Tank	A&Ww,FBC,FC,AgL
Carr Canyon Creek	A&Wc,FBC,FC,AgL
Copper Creek	A&Ww,PBC,AgI,AgL
East Gravel Pit Pond	A&Ww,FBC,FC
Fly Pond	A&Ww,FBC,FC
Garden Canyon Creek	A&Ww,FBC,DWS,AgI
Golf Course Pond	A&Ww,FBC,FC
Gravel Pit Pond	A&Ww,FBC,FC

Navigable water	Designated use
SAN PEDRO RIVER BASIN (cont.)	
Hidden Pond	A&Ww,FBC,FC
Hotsprings Canyon Creek	A&Ww,FBC,FC,AgL
Lower Garden Canyon Pond	A&Ww,FBC,FC
Miller Canyon Creek	A&Wc,FBC,FC,AgL
Officers Club Pond	A&Ww,FBC,FC
Ramsey Canyon Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Redfield Canyon Creek	A&Ww,FBC,FC,AgL
San Pedro River (Mexico border to Redington)	A&Ww,FBC,FC,AgI,AgL
San Pedro River (Redington to the Gila River)	A&Ww,FBC,AgL
Sycamore Pond I	A&Ww,FBC,FC
Sycamore Pond II	A&Ww,FBC,FC
Turkey Creek	A&Ww,FBC,AgI,AgL
Unnamed Wash[1] (Oracle WWTP to Big Wash)	A&Wedw,PBC
Walnut Gulch[1] (Tombstone WWTP to the San Pedro River)	A&Wedw,PBC
Woodcutters Pond	A&Ww,FBC,FC
SANTA CRUZ RIVER BASIN	
Agua Caliente Wash	A&Ww,FBC,AgL
Aguirre Wash	A&We,PBC
Alambre Wash	A&We,PBC
Alamo Wash	A&We,PBC
Altar Wash	A&We,PBC
Alum Gulch	A&We,PBC
Arivaca Creek	A&Ww,FBC,AgL
Arivaca Lake	A&Ww,FBC,FC,AgI,AgL
Atterbury Wash	A&We,PBC
Bear Grass Tank	A&Ww,FBC,FC,AgL
Big Wash	A&We,PBC
Bog Hole Tank	A&Ww,FBC,,AgL
Brawley Wash	A&We,PBC
Cañada del Oro (Headwaters to Highway 89)	A&Ww,FBC,DWS,FC,AgI,AgL
Cañada del Oro (Below Highway 89)	A&We,PBC,AgI,AgL
Cienega Creek (Headwaters to I-10)	A&Ww,FBC,AgL
Cienega Creek[2] (I-10 to Del Lago dam)	A&Ww,FBC,AgL
Cienega Creek (Below Del Lago dam)	A&Ww,FBC,AgL
Davidson Canyon (Headwaters to I-10)	A&We,PBC
Davidson Canyon (I-10 to Cienega Creek)	A&Ww,FBC,AgL
Empire Gulch (Headwaters to Empire Ranch Spring)	A&We,PBC
Empire Gulch (Below Empire Ranch Spring)	A&Ww,FBC,AgL
Fagen Tank	A&Ww,FBC,FC,AgL

Navigable water	Designated use
SANTA CRUZ RIVER BASIN (cont.)	
Flux Canyon	A&We,PBC
Gardner Canyon Creek	A&Ww,FBC
Greene Wash	A&We,PBC
Harshaw Wash	A&Ww,PBC,AgL
Huachuca Tank	A&Ww,FBC,,AgL
Julian Wash	A&We,PBC
Lemmon Canyon Creek	A&Wc,FBC,FC
Los Robles Wash	A&We,PBC
Madera Canyon Creek	A&Ww,FBC,FC
Nogales Wash	A&Ww,PBC,AgI,AgL
Oak Tree Canyon	A&We,PBC
Palisade Canyon Creek	A&Wc,FBC,FC
Pantano Wash	A&We,PBC
Parker Canyon Creek	A&Ww,PBC,FC
Parker Canyon Lake	A&Wc,FBC,FC,AgI,AgL
Patagonia Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Pena Blanca Lake	A&Wc,FBC,FC,AgI,AgL
Puertocito Wash	A&We,PBC
Redrock Canyon Creek	A&Ww,FBC,FC
Rillito Creek	A&We,PBC,AgL
Romero Canyon Creek	A&Wc,FBC,FC
Rose Canyon Creek	A&Ww,FBC,FC
Rose Canyon Lake	A&Wc,FBC,FC,AgI,AgL
Sabino Canyon Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Salero Ranch Tank	A&Ww,FBC,FC,AgL
Santa Cruz River (Headwaters to the International Boundary)	A&Ww,FBC,FC,AgI,AgL
Santa Cruz River (International Boundary to Nogales WWTP)	A&Ww,DWS,FBC,AgI,AgL
Santa Cruz River (Nogales WWTP to Tubac)	A&Wedw,PBC
Santa Cruz River (Tubac to the Roger Rd WWTP)	A&We,PBC,AgL
Santa Cruz River (Roger Rd WWTP to Baumgartner Rd)	A&Wedw,PBC
Santa Cruz River (Wash) (Baumgartner Rd to the Gila River Reservation)	A&We,PBC,AgL
Santa Cruz River (Wash) (Gila River Reservation to the Gila River)	A&Ww,FBC,AgI,AgL
Santa Cruz River, West Branch	A&We,PBC
Santa Cruz Wash, N Branch (Casa Grande WWTP to the Santa Cruz River)	A&Wedw,PBC
Santa Rosa Wash	A&We,PBC
Soldier Lake	A&Wc,FBC,,AgI,AgL
Sonoita Creek (Above the town of Patagonia)	A&Ww,PBC,AgI,AgL
Sonoita Creek (Below the town of Patagonia)	A&Ww,FBC,FC,AgI,AgL

Navigable water	Designated use
SANTA CRUZ RIVER BASIN (cont.)	
Split Tank	A&Ww,FBC,FC,AgL
Stock Tank	A&Ww,FBC,,AgL
Sutherland Wash	A&We,PBC
Sycamore Spring Reservoir	A&Wc,FBC,FC
Tanque Verde Creek	A&Ww,FBC,AgL
The Lake Tank	A&Ww,FBC,FC,AgL
Tinaja Wash	A&Ww,PBC,AgL
Vekol Wash	A&We,PBC
Williams Ranch Tanks	A&Ww,FBC,,AgL
UPPER GILA RIVER BASIN	
Apache Creek	A&Ww,FBC,AgL
Armstrong Tank	A&Ww,FBC,FC,AgL
Arrowhead Tank	A&Ww,FBC,FC,AgL
Arsenic Tub	A&Ww,FBC,FC
Ash Creek	A&Ww,FBC,FC,AgL
Barlow Pass Tank	A&Ww,FBC,FC,AgL
Bennet Wash[1] (Arizona Department of Correction-Safford WWTP to the Gila River)	A&Wedw,PBC
Big Bonita Tank	A&Ww,FBC,FC,AgL
Big Brushy Tank	A&Ww,FBC,FC,AgL
Bitter Creek	A&Ww,PBC
Bloody Basin Tank	A&Ww,FBC,FC,AgL
Blue River	A&Wc,FBC,FC,AgI,AgL
Boni Tank	A&Ww,FBC,FC,AgL
Bonita Creek[2]	A&Ww,FBC,DWS,FC,AgL
Brushy Basin Tank	A&Ww,FBC,FC,AgL
Buckalou Creek	A&Wc,FBC,FC
Burdette Tank	A&Ww,FBC,FC,AgL
Cammerman Wash[1] (Arizona Department of Correction-Globe WWTP to 3 km downstream)	A&Wedw,PBC
Campbell Blue Creek	A&Wc,FBC,FC
Castle Creek	A&Wc,FBC,FC
Cave Creek and Ponds	A&Wc,FBC,FC,AgI,AgL
Chapman Tank	A&Ww,FBC,FC,AgL
Chase Creek	A&Ww,PBC,AgL
Chitty Canyon Creek	A&Wc,FBC,FC
Cluff Ranch Pond #1	A&Ww,FBC,FC,AgI,AgL
Cluff Ranch Pond #2	A&Ww,FBC,FC,AgI,AgL
Cluff Ranch Pond #3	A&Ww,FBC,FC,AgI,AgL
Coleman Creek	A&Wc,FBC,FC
Cox Corral Tank	A&Ww,FBC,FC,AgL
Dankworth Lake	A&Wc,FBC,FC
Deadman Canyon Creek	A&Wc,FBC,DWS,FC,AgL
Deadman Tank	A&Ww,FBC,FC,AgL
Dry Lake	A&Ww,FBC,FC,AgL
Dry Prong Tank	A&Ww,FBC,FC,AgL
Eagle Creek	A&Wc,FBC,DWS,FC,AgI,AgL
East Eagle Creek	A&Wc,FBC,FC,AgL

Navigable water	Designated use
UPPER GILA RIVER BASIN (cont.)	
East Salt Shed Tank	A&Ww,FBC,FC,AgL
East Shortline Tank	A&Ww,FBC,FC,AgL
Evans Pond	A&Ww,FBC,
Foote Creek	A&Ww,FBC,FC
Four Mile Tank	A&Ww,FBC,FC,AgL
Frye Creek	A&Wc,FBC,FC,AgL
Frye Mesa Reservoir	A&Wc,FBC,DWS,FC
Geronimo Tank (Concrete)	A&Ww,FBC,FC,AgL
Geronimo Tank (Earth Dam)	A&Ww,FBC,FC,AgL
Gibson Creek	A&Wc,FBC,FC,AgI,AgL
Gila River (New Mexico border to San Carlos Lake)	A&Ww,FBC,FC,AgI,AgL
Gila River (San Carlos Lake to San Pedro River)	A&Ww,FBC,FC,AgL
Gila River (San Pedro River to Mineral Creek)	A&Ww,FBC,FC,AgI,AgL
Gila River (Mineral Creek to Ashurst-Hayden Dam)	A&Ww,FBC,FC,AgI,AgL
Gimme Tank	A&Ww,FBC,FC,AgL
Grant Creek	A&Wc,FBC,FC
Green Mountain Tank	A&Ww,FBC,FC,AgL
Headquarters Tank	A&Ww,FBC,FC,AgL
Homer J. Tank	A&Ww,FBC,FC,AgL
IDT Tank	A&Ww,FBC,FC,AgL
Juniper Tank	A&Ww,FBC,FC,AgL
K P Creek	A&Wc,FBC,DWS,FC,AgL
Kidde Tank	A&Ww,FBC,FC,AgL
Lasley Tank	A&Ww,FBC,FC,AgL
Little Creek	A&Wc,FBC,FC
Loafer Tank	A&Ww,FBC,FC,AgL
Lower Georges Reservoir	A&Wc,FBC,FC,AgL
Luna Lake	A&Wc,FBC,FC,AgL
Maggie Jones Tank	A&Ww,FBC,FC,AgL
Marijilda Creek	A&Wc,FBC,FC,AgI,AgL
Markham Creek	A&Ww,FBC,AgL
Mineral Creek	A&Ww,FBC,FC,AgL
Nine Mile Tank	A&Ww,FBC,FC,AgL
Pigeon Creek	A&Ww,FBC,AgL
Pima Gap Tank	A&Ww,FBC,FC,AgL
Pine Flat Tank	A&Ww,FBC,FC,AgL
Point of Pines Lake	A&Ww,FBC,FC
Point-O-Pines Charco Tank	A&Ww,FBC,FC,AgL
Prairie Tank	A&Ww,FBC,FC,AgL
Raspberry Creek	A&Ww,FBC,FC
Riggs Reservoir	A&Ww,FBC,FC
Rodeo Tank	A&Ww,FBC,FC,AgL
Roper Lake	A&Ww,FBC,FC
Salt Creek Tank	A&Ww,FBC,FC,AgL
Salt Shed Tank	A&Ww,FBC,FC,AgL
San Carlos Lake	A&Ww,FBC,FC,AgI,AgL
San Carlos River	A&Ww,FBC,FC

Navigable water	Designated use
UPPER GILA RIVER BASIN (cont.)	
San Francisco River (Headwaters to New Mexico border)	A&Wc,FBC,FC,AgI,AgL
San Francisco River (New Mexico border to the Gila River)	A&Ww,FBC,FC,AgI,AgL
San Simon River	A&Ww,PBC,AgI,AgL
Seven Mile Tank	A&Ww,FBC,FC,AgL
Sheep Tank	A&Ww,FBC,FC,AgL
Shortline Tank	A&Ww,FBC,FC,AgL
Slaughter Camp Tank	A&Ww,FBC,FC,AgL
Smith Pond	A&Ww,FBC,FC
Soldier Hole Tank	A&Ww,FBC,FC,AgL
South Headquarters Tank	A&Ww,FBC,FC,AgL
South Summit Tank	A&Ww,FBC,FC,AgL
Stone Creek	A&Wc,FBC,FC,AgI,AgL
Strayhorse Creek	A&Wc,FBC,FC
Summit Tank	A&Ww,FBC,FC,AgL
Sweetmeat Tank	A&Ww,FBC,FC,AgL
Talkali Lake	A&Ww,FBC,FC,AgI
Tarantula Tank	A&Ww,FBC,FC,AgL
Tinny Pond	A&Ww,FBC,FC,AgL
Turkey Creek	A&Wc,FBC,FC,AgI,AgL
Turkey Roost Tank	A&Ww,FBC,FC,AgL
Turtle Tank	A&Ww,FBC,FC,AgL
University Charco Tank	A&Ww,FBC,FC,AgL
Upper Cienega Tank	A&Ww,FBC,FC,AgL
Walnut Canyon Creek	A&Ww,FBC,FC
White Canyon Creek	A&Ww,FBC,FC
VERDE RIVER BASIN	
American Gulch (Headwaters to the Payson WWTP)	A&Ww,FBC,FC,AgI,AgL
American Gulch[1] (Payson WWTP to the East Verde River)	A&Wedw,PBC
Aspen Creek	A&Ww,PBC
Bar Cross Tank	A&Ww,FBC,FC,AgL
Barrata Tank	A&Ww,FBC,,AgL
Bartlett Lake	A&Ww,FBC,DWS,FC,AgI,AgL
Beaver Creek	A&Wc,FBC,FC,AgL
Bitter Creek (Headwaters to the Jerome WWTP)	A&Ww,PBC,AgL
Bitter Creek[1] (Jerome WWTP to 2.5 km downstream)	A&Wedw,PBC
Bitter Creek (Below 2.5 km downstream of the Jerome WWTP)	A&Ww,FBC,AgI,AgL
Bonita Creek	A&Wc,FBC,DWS,FC
Bray Creek	A&Ww,FBC,FC,AgL
Carter Tank	A&Ww,FBC,FC,AgL
Cement Dam Lake	A&Wc,FBC,FC,AgI,AgL
Chase Creek	A&Wc,FBC,DWS,FC
Dead Horse Lake	A&Wc,FBC,FC
Deadman Creek	A&Ww,FBC,FC,AgL

Navigable water	Designated use
VERDE RIVER BASIN (cont.)	
Del Rio Dam Lake	A&Ww,FBC,FC,AgL
Dry Beaver Creek	A&Ww,FBC,FC,AgI,AgL
Dude Creek	A&Wc,FBC,FC,AgI,AgL
East Verde River	A&Wc,FBC,DWS,FC,AgI,AgL
El Paso Tank	A&Ww,FBC,FC,AgL
Ellison Creek	A&Wc,FBC,FC,AgL
Fossil Creek	A&Ww,FBC,FC,AgI,AgL
Fossil Springs	A&Ww,FBC,DWS
Foxboro Lake	A&Ww,FBC,,AgL
Fry Lake	A&Ww,FBC,FC,AgL
Gap Creek	A&Wc,FBC,FC,AgL
Garrett Tank	A&Ww,FBC,FC,AgL
Goldwater Lake	A&Wc,FBC,DWS,FC
Granite Basin Lake	A&Ww,FBC,FC,AgI,AgL
Granite Creek	A&Ww,FBC,AgI,AgL
Heifer Tank	A&Ww,FBC,FC,AgL
Hell Canyon Tank	A&Ww,PBC,FC,AgL
Homestead Tank	A&Ww,FBC,FC,AgL
Horse Park Tank	A&Ww,FBC,,AgL
Horseshoe Lake	A&Ww,FBC,FC,AgI,AgL
Jacks Canyon Wash[1] (Big Park WWTP to Dry Beaver Creek)	A&Wedw,PBC
J.D. Dam Lake	A&Wc,FBC,FC,AgI,AgL
McLellan Reservoir	A&Ww,FBC,FC,AgI,AgL
Meath Dam Tank	A&Ww,FBC,,AgL
Mullican Tank	A&Ww,FBC,FC,AgL
Oak Creek[2]	A&Wc,FBC,DWS,FC,AgI,AgL
Oak Creek, West Fork[2]	A&Wc,FBC,FC,AgL
Peck's Lake	A&Wc,FBC,FC,AgI,AgL
Perkins Lake	A&Wc,FBC,FC,AgL
Pine Creek	A&Wc,FBC,DWS,FC,AgI,AgL
Red Lake	A&Ww,FBC,FC,AgL
Reservoir #1	A&Ww,FBC,FC
Reservoir #2	A&Ww,FBC,FC
Scholze Lake	A&Ww,FBC,FC,AgL
Spring Creek	A&Ww,FBC,FC,AgI,AgL
Steel Dam Lake	A&Ww,FBC,FC,AgL
Stehr Lake	A&Ww,FBC,FC,,AgL
Stoneman Lake	A&Wc,FBC,FC,AgI,AgL
Sullivan Lake	A&Ww,FBC,FC,AgI,AgL
Sycamore Creek (Coconino Forest)	A&Wc,FBC,FC,AgI,AgL
Sycamore Creek (Tonto Forest)	A&Ww,FBC,FC,AgI,AgL
Tangle Creek	A&Ww,FBC,FC,AgI,AgL
Trinity Tank	A&Ww,FBC,FC,AgL
Verde River (Above Bartlett Dam)	A&Ww,FBC,FC,AgI,AgL
Verde River (Below Bartlett Dam)	A&Ww,FBC,DWS,FC,AgI,AgL
Watson Lake	A&Ww,FBC,FC,AgI,AgL
Webber Creek	A&Wc,FBC,FC,AgL
West Clear Creek	A&Wc,FBC,FC,AgL
Wet Beaver Creek	A&Wc,FBC,FC,AgI,AgL
Whitehorse Lake	A&Wc,FBC,DWS,FC,AgI,AgL
Williscraft Lake	A&Ww,FBC,FC,AgL

Navigable water	Designated use
VERDE RIVER BASIN (cont.)	
Willow Creek	A&Wc,FBC,FC,,AgL
Willow Lake	A&Ww,FBC,FC,AgI,AgL
Willow Valley Lake	A&Ww,FBC,,AgL
WILLCOX PLAYA	
Ash Creek	A&Wc,FBC,FC,AgI,AgL
Big Canyon Creek	A&Ww,FBC,FC,AgL
Grant Creek	A&Wc,FBC,DWS,FC,AgL
High Creek	A&Ww,FBC
Moonshine Creek	A&Wc,FBC,FC,AgL
Pinery Creek	A&Ww,FBC,DWS,FC
Post Creek	A&Wc,FBC,FC,AgI,AgL
Riggs Flat Lake	A&Wc,FBC,FC,AgI,AgL
Rock Creek	A&Ww,FBC,FC,AgL
Snow Flat Lake	A&Wc,FBC,FC,AgI,AgL
Soldier Creek	A&Wc,FBC,FC,AgL
Willcox Playa	A&Ww,FBC,AgL

ABBREVIATIONS:

A&Wc = Aquatic and Wildlife (cold water fishery).

A&We = Aquatic and Wildlife (ephemeral).

A&Wedw = Aquatic and Wildlife (effluent dominated water).

A&Ww = Aquatic and Wildlife (warm water fishery).

AgL = Agricultural Livestock Watering.

AgI = Agricultural Irrigation.

DWS = Domestic Water Source.

FBC = Full Body Contact.

PBC = Partial Body Contact.

FC = Fish Consumption.

WTP = Water Treatment Plant.

WWTP = Wastewater Treatment Plant.

NOTES:

1 = An effluent dominated water.

2 = A unique water: Limits developed on a site-specific basis for each stream segment or lake. See R18-11-112 for applicable criteria.

3 = Municipal Park Lake.