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AESO/SE
02-21-02-F-0504 June 21, 2004

Mr. Doug Eberhardt
Clean Water Act Standards and Permits Office (WTR-5)
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, California 94105

Dear Mr. Eberhardt:

This constitutes the U.S. Fish and Wildlife Service's (FWS) biological and conference opinion (BO) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act), on the effects of the U.S. Environmental Protection Agency's (EPA) approval of the State of Arizona's proposed revisions to existing Water Quality Standards (WQS) for Surface Waters as submitted by the Arizona Department of Environmental Quality (ADEQ) on January 16, 2002. ADEQ's final rule results from the required State triennial review and revision process pursuant to 40 CFR §131.20 and the Clean Water Act. All of the proposed or listed threatened and endangered species and their designated or proposed critical habitats in, adjacent to, or dependent on, surface waters in Arizona are considered in this biological opinion and are referenced in Appendix 1. Although EPA requested consultation on the whooping crane *(Grus americana*), the whooping crane is not currently known to occur in Arizona and is not considered in this BO.

This BO is based on information provided in the September 18, 2002 biological evaluation (BE), ADEQ Final Rule dated January 16, 2002, telephone conversations between us and EPA and/or ADEQ, meetings, and other sources of information. Literature cited in this BO is not a complete bibliography of all literature available on the species of concern, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at Arizona Ecological Services Field Office in Phoenix, Arizona.

Consultation History

January 10, 1992: ADEQ completed a water-quality standard program revision.

February 18, 1992: ADEQ adopted and submitted water quality standards to EPA.

May 21, 1993: EPA initiated formal consultation with this office pursuant to Section 7 of the ESA, which was the first programmatic consultation on the Arizona WQS.

February 16, 1996: We completed the biological opinion on the first programmatic consultation on the Arizona WQS.

April 26, 1996: ADEQ submitted further revisions to the WQS to the EPA.

June 27, 1996: EPA initiated section 7 consultation on the 1996 WQS revisions.

December 11, 1998: We issued a biological opinion on the 1996 WQS revisions.

May 21, 2001: ADEQ transmitted to this office two copies of ADEQ's draft proposed revisions to the Surface WQS rules.

January 16, 2002: ADEQ issued "Notice of Final Rulemaking; Title 18. Environmental Quality; Chapter 11. Department of Environmental Quality Water Quality Standards".

March 28, 2002: ADEQ transmitted to EPA Region 9 their submission of revised water quality standards as required by 40 CFR §131.6 (triennial review process).

September 18, 2002: ADEQ transmitted to EPA a proposed schedule by which ADEQ will develop implementation procedures for antidegredation, narrative toxics standard, narrative bottom deposits/sediment standard, and narrative nutrients standard. This correspondence also expressed ADEQ's intent to revise certain standards in a supplemental rulemaking, after the current triennial review process is completed.

September 18, 2002: EPA transmitted a letter and a Biological Evaluation (BE) to us which requested concurrence under section 7 of the Act for the approval of ADEQ's Water Quality Standards for Surface Waters final rule dated January 16, 2002. EPA determined the proposed action "may affect, but is not likely to adversely affect" 31 federally-listed or proposed species (associated with aquatic habitats statewide) or their designated or proposed critical habitat.

October 22, 2002: EPA transmitted letter of approval to ADEQ regarding ADEQ's revisions to surface WQS with the exception of those revisions formally submitted for EPA review in a subsequent, supplemental rulemaking.

October 22, 2002: We transmitted a letter to EPA acknowledging their request for concurrence under section 7 of the Act but did not provide concurrence with EPA's "is not likely to adversely affect" determination and requested further information prior to initiation of formal section 7 consultation in accordance with 50 CFR §402.14(c). This correspondence also requested that EPA reinitiate section 7 consultation on potential effects of ADEQ's existing surface WQS on the newly listed threatened Chiricahua leopard frog.

December 16, 2002: EPA transmitted a letter to this office declining our request for reinitiation of section 7 consultation on potential effects of ADEQ's existing surface WQS on the Chiricahua leopard frog. EPA based their decision on conditions set forth in the *National Memorandum of Agreement between EPA, FWS, and NMFS Regarding Enhanced Coordination Under the Clean Water Act and Endangered Species Act.* This correspondence also requested initiation of formal consultation on this current proposed action.

January 14, 2003: We transmitted a letter to EPA requesting further information. Specifically, we requested that EPA analyze the effects of relaxing the numeric water quality standards for 11 chemical constituents from the reclassification in designated uses of 26 streams in 5 drainage basins from Aquatic and Wildlife cold water (A&Wc) to Aquatic and Wildlife warm water (A&Ww).

March 19, 2003: EPA transmitted a letter to this office which amended their effects determination for all species with respect to revised rules R18-11-101 (Definitions #7 and #10), R18-11-105 (Tributaries; Designated Uses #2 and #3), and Appendix B to R18-11-101 et seq. which is the "List of Surface Waters and Designated Uses". The EPA changed the determination from "may affect, not likely to adversely affect" to "no effect" citing the rationale that the applicable species listed in Appendix 1: 1) have been known to previously exist at elevations below 5000 feet; 2) have been known to occur in or around streams previously designated as A&Ww by ADEQ; 3) are classified as warm water taxa; and 4) are known to be tolerant of fluctuations in temperature or habitat types.

April 23, 2003: We transmitted a letter to EPA which acknowledges the amendment made in their effects determinations discussed above and initiated formal consultation on the remainder of the project.

September 17, 2003: A meeting was held between representatives from the EPA, ADEQ, and us regarding coordination during section 7 consultation as well as various aspects of the this BO (in draft form at the time of the meeting). In this meeting, EPA agreed to amend their BE to incorporate specific conservation measures.

October 27, 2003: ADEQ transmitted a letter to EPA pursuant to a request made for such during the September 17, 2003 meeting. The letter discussed issues pertaining to the proposed suspended sediment concentration standard replacing the turbidity standard and the actions ADEQ is willing to take to address potential adverse effects of the new standard.

November 06, 2003: EPA transmitted a letter to us which included an addendum to the September 18, 2002 BE which established conservation measures or Reasonable and Prudent Measures (depending on whether an Incidental Take Permit is issued) that ADEQ suggested in their October 27, 2003 letter.

January 02, 2004: We transmitted a draft BO opinion to EPA for review.

January 20, 2004: EPA provided comments on the draft BO.

January 20 - June 16, 2004: Negotiations were held and consensus reached between involved parties regarding the Incidental Take Statement in its draft form.

BIOLOGICAL OPINION

Description of the Proposed Action

Section 303 of the Clean Water Act (CWA) requires States to develop water quality standards which are designed to protect the public health or welfare, enhance the quality of water, and serve the purposes of the CWA. Water quality standards consist of : 1) designated uses of waterways (e.g., protection and propagation of fish, shellfish, and wildlife); 2) criteria which will ensure the protection of designated uses; and 3) an anti-degradation policy that protects existing uses and provides a mechanism for maintenance of high water quality. The CWA directs States to take into consideration, among other things, the "propagation of fish and wildlife" when revising or adopting WQS (33 U.S.C. § 1313(c)(2)(A)).

Pursuant to section 303(c)(1) of the Clean Water Act (CWA), States must review their water quality standards at least once every three years and revise them where it is appropriate to do so. Under the Arizona Revised Statutes (A.R.S.) §49-202(A), ADEQ is responsible for conducting the review of Arizona's water quality standards, holding public hearings, and, as appropriate, revising and adopting standards every three years as part of a continuing triennial review process. Results of such reviews 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 surface 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 are considered when adopting regulatory criteria. Pursuant to section 303(c)(3) of the CWA, the EPA approves and/or disapproves all or portions of Arizona'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, 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-approved and/or promulgated water quality criteria is the Arizona Pollutant Discharge Elimination System (AZPDES) permit program. The Arizona water quality standards will provide generic guidelines for the AZPDES permit writers to develop conditions and limits for inclusion in such permits. The action area consists of all surface waters and their tributaries in Arizona that have an identified designated use, as well as all surface waters on Arizona's Tribal lands which are not under the jurisdiction of ADEQ, but may be indirectly affected by the proposed action.

The action in review is EPA's proposed approval of ADEQ's January 16, 2002 revisions to Water Quality Standards for Surface Waters (also known as the "Triennial Review" and hereinafter referred to as the "proposed action"). A full description of the 2002 Arizona Water Quality Standards may be found in the Arizona Administrative Code, Title 18, Chapter 11 (ADEQ 2002b). For a pre-decisional perspective on these proposed amendments to the water quality standards, applicable excerpts from the preamble to the final notice of rulemaking has been included as Appendix 3. The specific, proposed revisions addressed in this document are outlined below with relevant text *italicized* and **bolded** for reference. Additions and modifications to the water quality standards are written as underlined, deletions to previous standards are written as ~~strikeout~~.

ARTICLE 1. WATER QUALITY STANDARDS FOR SURFACE WATERS

R18-11-101. Definitions

The terms of this Article ~~shall~~ have the following meanings:

1. "Acute toxicity" means toxicity involving a stimulus severe enough to ~~rapidly~~ induce a response rapidly. In aquatic toxicity tests, an effect observed in 96 hours or less is considered acute.
2. "AgI" means agricultural irrigation.
3. "AgL" means agricultural livestock watering.
4. "Agricultural irrigation" means the use of a surface water for the irrigation of crops.
5. "Agricultural livestock watering" means the use of a surface water as a supply of water for consumption by livestock.
6. "Annual mean" means the arithmetic mean of monthly values determined over a consecutive 12-month period, provided that monthly values are determined for at least ~~3~~ three months. The monthly value is the arithmetic mean of all values determined in a calendar month.
7. "Aquatic and wildlife (cold water ~~fishery~~)" means the use of a surface water by animals, plants, or other cold-water organisms~~, including salmonids~~, generally occurring at elevations greater than 5000 feet, for habitation, growth, or propagation.
8. "Aquatic and wildlife (~~effluent-dependent~~ effluent-dependent water)" means the use of an ~~effluent-dependent~~ effluent-dependent water by animals, plants, or other organisms for habitation, growth, or propagation.
9. "Aquatic and wildlife (ephemeral)" means the use of an ephemeral water by animals, plants, or other organisms, excluding fish, for habitation, growth, or propagation.
10. "Aquatic and wildlife (warm water ~~fishery~~)" means the use of a surface water by animals, plants , or other warm-water organisms, ~~excluding salmonids~~, generally occurring at elevations less than 5000 feet, for habitation, growth, or propagation.
11. "A&Wc" means aquatic and wildlife (cold water ~~fishery~~).
12. "A&We" means aquatic and wildlife (ephemeral).
13. "A&Wedw" means aquatic and wildlife (~~effluent-dependent~~ effluent-dependent water).

14. "A&Ww" means aquatic and wildlife (warm water ~~fishery~~).
15. "Clean Water Act" means the Federal Water Pollution Control Act~~, as amended by the Water Quality Act of 1987~~ [33 U.S.C. §§ 1251 to 1387].
16. "Criteria" means elements of water quality standards that are expressed as pollutant concentrations, levels, or narrative statements representing a water quality that supports a designated use.
17. "Designated use" means a use specified in Appendix B of this Article for a surface water.
18. "Domestic water source" means the use of a surface water as a potable water supply. Coagulation, sedimentation, filtration, disinfection, or other treatments may be necessary to yield a finished water suitable for human consumption.
19. "DWS" means domestic water source.
20. "EDW" means ~~effluent-dependent~~ effluent-dependent water.
21. ***~~"Effluent-dependent~~ Effluent-dependent water" means a surface water that consists ~~primarily~~ of discharges of treated wastewater ~~which has been~~ that is classified as an ~~effluent-dependent~~ effluent-dependent water by the Director under R18-11-113. An effluent-dependent water is a surface water that, without the discharge of treated wastewater, would be an ephemeral water.***
22. "Ephemeral water" means a surface water that has a channel that is at all times above the water table , and that flows only in direct response to precipitation~~, and that does not support a self-sustaining fish population~~).
23. "Existing use" means a use of a surface water that ~~has actually occurred~~ occurs in a surface water ~~on or after November 28, 1975~~ or a use that the existing water quality of a surface water will allow.
24. "FBC" means ~~full body~~ full-body contact.
25. "FC" means fish consumption.
26. "Fish consumption" means the use of a surface water by humans for harvesting aquatic organisms for consumption. Harvestable aquatic organisms include, but are not limited to, fish, clams, turtles, crayfish, and frogs.
27. "~~Full body~~ Full-body contact" means the use of a surface water ~~which~~ for swimming or other recreational activity that causes the human body to come into direct contact with the water to the point of complete submergence. The use is such that ingestion of the water is likely ~~to occur~~ and ~~certain~~ sensitive body organs, such as the eyes, ears, or nose , may be exposed to direct contact with the water.
28. "Geometric mean" mean the nth root of the product of n items or values. The geometric mean is calculated using the following formula:

$$G.M._y = \sqrt[n]{(y_1)(y_2)(y_3)\ldots(y_n)}$$

29. "Hardness" means the sum of the calcium and magnesium concentrations, expressed as calcium carbonate ($CaCO_3$) in milligrams per liter.
30. "Intermittent surface water" means a surface water that flows continuously for 30 days or more at times of the year when the surface water receives water from a spring or from another source such as melting snow.

~~30~~ 31. "Mixing zone" means a prescribed area or volume of a surface water that is contiguous to a point source discharge where initial dilution of the discharge takes place.

~~31~~ 32. "National Pollutant Discharge Elimination System" means the point source discharge permit program established by §402 of the Clean Water Act [33 U.S.C. §1342].

~~32~~ 33. "Ninetieth percentile" means the value which may not be exceeded by more than 10% of the observations in a consecutive 12 month period. A minimum of 10 samples, each taken at least 10 days apart, are required to determine a ninetieth percentile.

~~33~~ 34. "NNS" means no numeric standard.

~~34~~ 35. "Oil" means petroleum in any form, including but not limited to crude oil, gasoline, fuel oil, diesel oil, lubricating oil, or sludge.

~~35~~ 36. "~~Partial body~~ Partial-body contact" means the recreational use of a surface water ~~which~~ that may cause the human body to come into direct contact with the water, but normally not to the point of complete

submergence (for example, wading or boating). The use is such that ingestion of the water is not likely ~~to occur, nor will~~ and sensitive body organs, such as the eyes, ears, or nose , will not normally be exposed to direct contact with the water.

~~36~~ 37. "PBC" means ~~partial body~~ partial-body contact.

38. "Perennial surface water" means a surface water that flows continuously throughout the year.

39. "Pollutant" means fluids, contaminants, toxic wastes, toxic pollutants, dredged spoil, solid waste, substances and chemicals, pesticides, herbicides, fertilizers and other agricultural chemicals, incinerator residue, sewage, garbage, sewage sludge, munitions, petroleum products, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and mining, industrial, municipal, and agricultural wastes or any other liquid, solid, gaseous, or hazardous substance.

~~37~~ 40. "Practical quantitation limit" means the lowest level of quantitative measurement that can be reliably achieved during routine laboratory operations.

~~38~~ 41. "Recreational uses" means the ~~full body~~ full-body contact and ~~partial body~~ partial-body contact designated uses.

~~39~~ 42. "Regional Administrator" means the Regional Administrator of Region ~~9~~ IX of the U.S. Environmental Protection Agency.

~~40~~ 43. "Surface water" means a water of the United States and includes the following:

a. ~~All waters which are~~ A water that is currently used, ~~were~~ was used in the past, or may be susceptible to use in interstate or foreign commerce;

b. ~~All~~ An interstate ~~waters~~ water, including an interstate ~~wetlands~~ wetland;

c. All other waters, such as an intrastate ~~lakes, reservoirs, natural ponds, rivers, streams (including intermittent and ephemeral streams), creeks, washes, draws, mudflats, sandflats, wetlands, sloughs, backwaters, prairie potholes, wet meadows, or playa lakes,~~ lake, reservoir, natural pond, river, stream (including an intermittent or ephemeral stream), creek, wash, draw, mudflat, sandflat, wetland, slough, backwater, prairie pothole, wet meadow, or playa lake, the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce, including any such ~~waters~~ water:

i. ~~Which are~~ That is or could be used by interstate or foreign travelers for recreational or other purposes;

ii. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

iii. ~~Which are~~ That is used or could be used for industrial purposes by industries in interstate or foreign commerce;

d. ~~All impoundments of waters otherwise defined as surface waters under this definition~~ An impoundment of a surface water as defined by this definition;

e. ~~Tributaries of surface waters identified in paragraphs~~ A tributary of a surface water identified in subsections (a) through (d) of this definition; and

f. ~~Wetlands adjacent to surface waters identified in paragraphs~~ A wetland adjacent to a surface water identified in subsections (a) through (e) of this definition.

~~41~~ 44. "Total nitrogen" means the sum of the concentrations of ammonia (NH_3), ammonium ion (NH_4+), nitrite (NO_2), and nitrate (NO_3), and dissolved and particulate organic nitrogen expressed as elemental nitrogen.

~~42~~ 45. "Total phosphorus" means all of the phosphorus present in ~~the~~ a sample, regardless of form, as measured by a persulfate digestion procedure.

~~43~~ 46. "Toxic" means ~~those pollutants~~ a pollutant, or combination of pollutants, which after discharge and upon exposure, ingestion, inhalation, or assimilation into ~~any~~ an organism, either directly from the environment or indirectly by ingestion through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations in ~~such organisms~~ the organism or ~~their~~ its offspring.

~~44~~ 47. "Unique water" means a surface water ~~which~~ that ~~has been~~ is classified as an outstanding state resource water by the Director under R18-11-112.

~~45~~ 48. "Use attainability analysis" means a structured scientific assessment of the factors affecting the attainment of a designated use ~~which may include,~~ including physical, chemical, biological, and economic factors.

~~46~~ 49. ~~"Wetlands"~~ "Wetland" means ~~those are as~~ an area that ~~are~~ is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances ~~do~~

does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. ~~Wetlands include swamps, marshes, bogs, cienegas, tinajas,~~ A wetland includes a swamp, marsh, bog, cienega, tinaja, and similar areas.

~~47~~ 50. "Zone of passage" means a continuous water route of volume, cross-sectional area, and quality necessary to allow passage of free-swimming or drifting organisms with no acutely toxic effect produced on the organisms.

R18-11-109. Numeric Water Quality Standards

~~A. The water quality standards prescribed in this Section and in Appendix A apply to surface waters listed in Appendix B and their tributaries. Additional numeric water quality standards for unique waters are prescribed in R18-11-112.~~

~~B. The following water quality standards for fecal coliform, expressed in colony forming units per 100 milliliters of water (cfu / 100 ml), shall not be exceeded:~~

~~1. Fecal coliform~~	~~DWS, PBC, A&W[1], AgI, AgL~~
~~30-day geometric mean (5 sample minimum)~~	~~1000~~
~~10% if samples for a 30-day period~~	~~2000~~
~~Single sample maximum~~	~~4000~~

~~2. Fecal coliform in effluent-dependent waters~~	~~All designated uses~~
~~30-day geometric mean (5-sample minimum)~~	~~200~~
~~10% if samples for a 30-day period~~	~~400~~
~~Single sample maximum~~	~~800~~

~~C~~ A. The following water quality standards for *Escherichia coli (E. coli)*, expressed in colony forming units per 100 milliliters of water (cfu / 100 ml), shall not be exceeded:

E. coli	**FBC**	**PBC**
~~30-day geometric mean (5 sample minimum)~~	~~130~~	
Geometric mean (four-sample minimum)	126	126
Single sample maximum	~~580~~ 235	576

~~D~~ B. The following water quality standards for pH, expressed in standard units, shall not be violated:

pH	**DWS**	**FBC, PBC, A&W[2] [1]**	**AgI**	**AgL**
Maximum	9.0	9.0	9.0	9.0
Minimum	5.0	6.5	4.5	6.5
Maximum change due to discharge	NNS	0.5	NNS	NNS

~~E~~ C. The following maximum allowable increase in ambient water temperature, expressed in degrees Celsius, shall not be exceeded:

Temperature	***A&Ww, A&Wedw***	***A&Wc***
Maximum increase due to a thermal discharge~~[3,4]~~ [2,3]	***3.0***	***1.0***

~~***F. The following water quality standards for turbidity, expressed as a maximum concentration in nepholometric turbidity units (NTU) shall not be exceeded:***~~

~~***Turbidity***~~	~~***A&Ww, A&Wedw***~~	~~***A&Wc***~~
~~***Rivers, streams, and other flowing waters***~~	~~***50***~~	~~***10***~~
~~***Lakes, reservoirs, tanks, and ponds***~~	~~***25***~~	~~***10***~~

D. The following water quality standard for suspended sediment concentration, expressed as a geometric mean (four-sample minimum) shall not be exceeded. The standard applies to a surface water that is at or near base flow and does not apply to a surface water during or soon after a precipitation event:

A&Wc, A&Ww
80 mg / L

~~G~~ E. The following are the water quality standards for dissolved oxygen, expressed in milligrams per liter (mg/L). The dissolved oxygen concentration in a surface water shall not fall below the following minimum concentrations:

1.	**Dissolved oxygen**	**A&Ww**	**A&Wc**
	Single sample minimum~~.~~[5] [4]	6.0	7.0
2.	**Dissolved oxygen in ~~effluent dependent~~ effluent-dependent waters (single sample minimum)**:		**A&W edw**
	~~3~~ Three hours after sunrise to sunset		3.0
	Sunset to~~ 3~~ three hours after sunrise		1.0

3. ~~If the dissolved oxygen (mg/L) of a surface water is less than the water quality standard for dissolved oxygen, but the percent saturation of oxygen is equal to or greater than 90%, then the surface water shall be deemed to be in compliance with the water quality standard for dissolved oxygen~~. A surface water is in compliance with the water quality standard for dissolved oxygen if the percent saturation of dissolved oxygen is equal to or greater than 90%.

~~H~~ F. The following water quality standards for total phosphorus and total nitrogen, expressed in milligrams per liter (mg/L), shall not be exceeded:

		Annual mean	**90th percentile**	**Single Sample Maximum**
1.	Verde River and its tributaries from headwaters to Bartlett Lake:			
	Total phosphorus	0.10	0.30	1.00
	Total nitrogen	1.00	1.50	3.00
2.	Black River, Tonto Creek, and their tributaries that are not located on tribal lands:			
	Total phosphorus	0.10	0.20	0.80
	Total nitrogen	0.50	1.00	2.00
3.	Salt River and its tributaries~~, except Pinal Creek, above Theodore Roosevelt Lake~~ that are not located on tribal lands but not Pinal Creek above Theodore Roosevelt Lake:			
	Total phosphorus	0.12	0.30	1.00
	Total nitrogen	0.60	1.20	2.00
4.	Theodore Roosevelt, Apache, Canyon, and Saguaro Lakes:			
	Total phosphorus	0.03~~a~~ [5]	NNS	0.60~~b~~ [6]
	Total nitrogen	0.30~~a~~ [5]	NNS	1.00~~b~~ [6]
5.	Salt River below Stewart Mountain Dam to confluence with the Verde River:			
	Total phosphorus	0.05	NNS	0.20
	Total nitrogen	0.60	NNS	3.00
6.	Little Colorado River and its tributaries above River Reservoir in Greer, South Fork of Little Colorado River above South Fork Campground, Water Canyon Creek above Apache-Sitgreaves National Forest boundary:			
	Total phosphorus	0.08	0.10	0.75
	Total nitrogen	0.60	0.75	1.10
7.	Little Colorado River at the crossing of Apache County Road No. 124 :			
	Total phosphorus	NNS	NNS	0.75
	Total nitrogen	NNS	NNS	1.80
8.	Little Colorado River above Lyman Lake to above the Amity Ditch diversion near crossing of			

	Arizona Highway 273 (applies only when in-stream turbidity is less than 50 NTU):			
	Total phosphorus	0.20	0.30	0.75
	Total nitrogen	0.70	1.20	1.50
9.	Colorado River, at Northern International Boundary near Morelos Dam:			
	Total phosphorus	NNS	0.33	NNS
	Total nitrogen	NNS	2.50	NNS
10.	San Pedro River, from Curtis to Benson:			
	Total phosphorus	NNS	NNS	NNS
	Total nitrate as N	NNS	NNS	10.00

11. The discharge of wastewater to Show Low Creek and tributaries upstream of and including Fools Hollow Lake shall not exceed 0.16 mg/L total phosphates as P.
12. The discharge of wastewater to the San Francisco River and tributaries upstream of Luna Lake Dam shall not exceed 1.0 mg/L total phosphates as P.

~~I.~~ G. The following water quality standards for radiochemicals shall not be exceeded in surface waters with the domestic water source designated use:

~~1. In all surface waters, the concentration of radio chemicals shall not exceed the limits established by the Arizona Radiation Regulatory Agency in 12 A.A.C. 1, Article 4, Appendix A, Table II, Column 2 (effective June 30, 1977 and no future amendments), which is incorporated by reference and on file with the Office of the Secretary of State and with the Department.~~

~~2.~~ ~~In surface waters that are designated as domestic water sources, the following water quality standards for radiochemicals shall not be exceeded:~~

~~a~~ 1. The concentration of gross alpha particle activity, including radium-226 , but excluding radon and uranium, shall not exceed 15 picocuries per liter of water.

~~b~~ 2. The concentration of combined radium-226 and radium-228 shall not exceed ~~5~~ five picocuries per liter of water.

c. The concentration of strontium-90 shall not exceed ~~8~~ eight picocuries per liter of water.

d. The concentration of tritium shall not exceed 20,000 picocuries per liter of water.

e. The average annual concentration of beta particle activity and photon emitters from ~~man-made~~ manmade radionuclides shall not produce an annual dose equivalent to the total body or any internal organ greater than ~~4~~ four millirems per year.

Footnotes:

~~1~~ ~~Includes A&Wc, A&Ww, and A&We~~

~~2~~ 1 Includes A&Wc, A&Ww, A&Wedw, and A&We.

~~3~~ 2 Does not apply to Cholla Lake.

~~4~~ 3 Does not apply to a wastewater treatment plant discharge to a dry watercourse that creates an ~~effluent-dependent~~ effluent-dependent water or to a stormwater discharge.

~~5~~ 4 The dissolved oxygen water quality standard for a lake shall apply below the surface but not at a depth greater than ~~1~~ one meter.

~~a~~ 5 Means the annual mean of representative composite samples taken from the surface and at ~~2 and 5~~ two and five meter depths.

~~b~~ 6 Means the maximum for any set of representative composite samples taken from the surface and at ~~2 and 5~~ two and five meter depths.

R18-11-110. Salinity ~~of~~ Standards for the Colorado River

A. The flow-weighted average annual salinity in the lower main stem of the Colorado River shall be maintained at or below the following concentrations:

Location	***Total Dissolved Solids***
Below Hoover Dam	***723 mg/L***
Below Parker Dam	***747 mg/L***
At Imperial Dam	***879 mg/L***

B. To preserve the basin-wide approach to salinity control developed by the Colorado River Basin states and to ensure compliance with the numeric criteria for salinity in subsection (A), the Department

adopts the plan of implementation contained in the "1999 Review, Water Quality Standards for Salinity, Colorado River System," Colorado River Basin Salinity Control Forum, 106 West 500 South, Suite 101, Bountiful, Utah 84010-6232 (June, 1999), which is incorporated by reference and on file with the Office of the Secretary of State and the Department. This incorporation by reference contains no future editions or amendments.

R18-11-112. Unique Waters

A The Director shall ~~use rulemaking to~~ classify a surface water as a unique water by rule. The Director shall consider nominations to classify a surface water as a unique water during the triennial review of water quality standards for surface waters.

B. The Director may adopt, by rule, site-specific water quality standards to maintain and protect existing water quality in a unique water.

C. Any person may nominate a surface water for classification as a unique water by filing a ~~petition for rule adoption~~ nomination with the Department. ~~A petition for rule adoption~~ The nomination to classify a surface water as a unique water shall include:

1. A map and a description of the surface water;

2. A written statement in support of the nomination, including specific reference to the applicable criteria for unique ~~waters~~ water classification ~~as~~ prescribed in subsection (D) ~~of this Section~~;

3. Supporting evidence demonstrating that ~~1 or more of~~ the applicable unique ~~waters~~ water criteria prescribed in subsection (D) ~~of this Section has been~~ are met; and

4. Available water quality data relevant to establishing the baseline water quality of the proposed unique water.

D. The Director may classify a surface water as a unique water upon finding that the surface water is an outstanding state resource water based upon ~~1 of~~ the following criteria:

1. The surface water is a perennial water;

2. The surface water is in a free-flowing condition. For purposes of this subsection, "in a free-flowing condition" means that a surface water does not have an impoundment, diversion, channelization, rip-rapping or other bank armor, or another hydrological modification within the reach nominated for unique water classification;

3. The surface water has good water quality. For purposes of this subsection, "good water quality" means that the surface water has water quality that meets or exceeds applicable surface water quality standards. A surface water that is listed as impaired under § 303(d) of the Clean Water Act [33 U.S.C. § 1313] is ineligible for unique waters classification; and

4. The surface water meets one or both of the following conditions:

~~1~~ a. The surface water is of exceptional recreational or ecological significance because of its unique attributes, including but not limited to, attributes related to the geology, flora, fauna, water quality, aesthetic values, or the wilderness characteristics of the surface water.

~~2~~ b. Threatened or endangered species are known to be associated with the surface water and the existing water quality is essential to the maintenance and propagation of a threatened or endangered species or the surface water provides critical habitat for a threatened or endangered species. Endangered or threatened species are identified ~~on the following lists which are hereby incorporated by reference and on file with the Office of the Secretary of State and the Department:~~

~~a. Endangered and Threatened Wildlife and Plants, 50 CFR §17.11 and 17.12 (revised as of October 1, 1994);~~

~~b. "Threatened Native Wildlife of Arizona," Arizona Game and Fish Department (July 21, 1988);~~

~~c. List of highly safeguarded protected native plants in 3 A.A.C. 4, Article 6, Appendix A(A) (December 20, 1994);~~

~~d.~~. ~~Federally Listed Threatened and Endangered Species of Arizona," U.S. Fish & Wildlife Service (June 6, 1995).~~ in Endangered and Threatened Wildlife

and Plants, 50 CFR § 17.11 and § 17.12 (revised as of October 1, 2000) which is incorporated by reference and on file with the Department and the Office of the Secretary of State. This incorporation by reference contains no future editions or amendments.

E. ***The following surface waters are classified as unique waters:***

1. ***The West Fork of the Little Colorado River, above Government Springs;***

2. ***Oak Creek, including the West Fork of Oak Creek;***

3. ***Peeples Canyon Creek, tributary to the Santa Maria River;***

4. ***Burro Creek, above its confluence with Boulder Creek;***

5. ***Francis Creek, in Mohave and Yavapai counties;***

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

7. ***Cienega Creek, from ~~I-10 bridge to Del Lago Dam~~ confluence with Gardner Canyon and Spring Water Canyon at R18E T17S to USGS gaging station at 32°02'09" / 110°40'34," in Pima County;***

8. ***Aravaipa Creek, from its confluence ~~of~~ with Stowe Gulch to the downstream boundary of Aravaipa Canyon Wilderness Area;***

9. ***Cave Creek and the South Fork of Cave Creek (Chircahua Mountains), from the headwaters to the Coronado National Forest boundary; ~~and~~***

10. ***Buehman Canyon Creek, from its headwaters (Lat. 32°24'55.5" N, Long. 110°39'43.5"W) to approximately 9.8 miles downstream (Lat. 32°24'31.5" N, Long. 10°32'08" W);***

11. ***Lee Valley Creek, from its headwaters to Lee Valley Reservoir;***

12. ***Bear Wallow Creek, from its headwaters to the boundary of the San Carlos Indian Reservation;***

13. ***North Fork of Bear Wallow Creek, from its headwaters to Bear Wallow Creek;***

14. ***South Fork of Bear Wallow Creek, from its headwaters to Bear Wallow Creek;***

15. ***Snake Creek, from its headwaters to its confluence with Black River;***

17. ***Hay Creek, from its headwaters to its confluence with the West Fork of the Black River;***

18. ***Stinky Creek, from the Fort Apache Indian Reservation boundary to its confluence with the West Fork of the Black River; and***

19. ***KP Creek, from its headwaters to its confluence with the Blue River.***

F. ***The Department shall hold at least one public meeting in the local area of a nominated unique water to solicit public comment on the nomination.***

G. ***The Director may consider the following factors when making a decision whether to classify a nominated surface water as a unique water:***

1. ***Whether there is the ability to manage the unique water and its watershed to maintain and protect existing water quality;***

2. ***The social and economic impact of Tier 3 antidegradation protection;***

3. ***The public comments in support or opposition to a unique waters classification;***

4. ***The support or opposition of federal and state land management and natural resources agencies to a nomination;***

5. ***Agency resource constraints;***

6. ***The timing of the unique water nomination relative to the triennial review of surface water quality standards;***

7. ***The consistency of a unique water classification with applicable water quality management plans (for example, § 208 water quality management plans); and***

8. ***Whether the nominated surface water is located within a national or state park, national monument, national recreation area, wilderness area, riparian conservation area, area of critical environmental concern, or it has another special use designation (for example, Wild and Scenic River designation).***

~~F.~~ H. ***The following water quality standards apply to the listed unique waters. Water quality standards prescribed in this subsection supplement the water quality standards prescribed ~~pursuant to R18-11-109~~ by this***

Article.

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

Parameter	***Standard***
pH (standard units)	***No change due to discharge***
Temperature	***No increase due to discharge***
Dissolved oxygen	***No decrease due to discharge***
Total dissolved solids	***No increase due to discharge***
Chromium (as Cr)(D)	***10 µg/L***

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

Parameter	***Standard***
pH (standard units)	***No change due to discharge***
Nitrogen (T)	***1.00 mg / L (annual mean)***
	1.50 mg / L (90th percentile)
	2.50 mg / L (single sample max.)
Phosphorus (T)	***0.10 mg/L (annual mean)***
	0.25 mg/L (90th percentile)
	0.30 mg/ L (single sample max.)
Chromium (as Cr) (D)	***5 µg/L***
Turbidity change due to discharge	***3 ~~NTU~~ NTUs***

3. Peeples Canyon Creek, tributary to the Santa Maria River:

Parameter	***Standard***
Temperature	***No increase due to discharge***
Dissolved oxygen	***No decrease due to discharge***
Turbidity change due to discharge	***5 ~~NTU~~ NTUs***
Arsenic (T)	***20 µg/L***
Manganese (T)	***500 µg/L***

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

Parameter	***Standard***
Manganese (T)	***500 µg/L***

5. Francis Creek, in Mohave and Yavapai counties:

Parameter	***Standard***
Manganese (T)	***500 µg/L***

6. Cienega Creek, from ~~I-10 bridge~~ its confluence with Gardner Canyon and Spring Water Canyon at R18E T17S to Del Lago Dam, in Pima County:

Parameter	***Standard***
pH	***No change due to discharge***
Temperature	***No increase due to discharge***
Dissolved oxygen	***No decrease due to discharge***
Total dissolved solids	***No increase due to discharge***
Turbidity	***10 ~~NTU~~ NTUs***

7. Bonita Creek, tributary to the Upper Gila River:

Parameter	***Standard***
pH	***No change due to discharge***
Temperature	***No increase due to discharge***
Dissolved oxygen	***No decrease due to discharge***
Total dissolved solids	***No increase due to discharge***
Turbidity	***15 ~~NTU~~ NTUs***

Abbreviations:
~~(D)~~ "(D)" means dissolved fraction
~~(T)~~ "(T)" means total recoverable
~~NTU~~ "NTUs" means nephelometric turbidity ~~unit~~ units
~~mg / L~~ "mg / L" means milligrams per liter
~~ug / L~~ "µg / L" means micrograms per liter

R18-11-113. ~~Effluent-dependent~~ Effluent-dependent Waters

A. The Director shall ~~use rulemaking to~~ classify a surface water as an ~~effluent-dependent~~ effluent-dependent water by rule.

B. The Director may adopt, by rule, site-specific water quality standards for an ~~effluent-dependent~~ effluent-dependent water.

C. Any person may submit a petition for rule adoption requesting that the Director classify a surface water as an ~~effluent-dependent~~ effluent-dependent water. The petition for rule adoption shall include:

1. A map and a description of the surface water. ,

2. Information that demonstrates that the surface water consists ~~primarily~~ of discharges of treated wastewater. , and

3. Information that demonstrates that the receiving water is an ephemeral water in the absence of the discharge of treated wastewater.

D. The following surface waters are classified as ~~effluent-dependent~~ effluent-dependent waters:

1. In the Colorado River Main Stem Basin:

a. Bright Angel Wash from the South Rim Grand Canyon WWTP outfall to its confluence with Coconino Wash. ,

b. Cataract Creek from the Williams WWTP outfall to ~~1~~ one kilometer downstream from the outfall. ,

c. Holy Moses Wash from the Kingman WWTP outfall to ~~3~~ three kilometers downstream from the outfall. , and

d. Transept Canyon from the North Rim Grand Canyon WWTP outfall to ~~1~~ one kilometer downstream from the outfall.

2. In the Little Colorado River Basin:

a. Dry Lake. ,

b. Lake Humphreys. ,

c. Lower Walnut Canyon Lake. ,

d. Ned Lake. ,

e. Pintail Lake. ,

f. Telephone Lake. ,

g. Rio de Flag from the City of Flagstaff WWTP outfall to its confluence with San Francisco Wash. , and

h. Whale Lake.

3. In the Middle Gila River Basin:

a. Unnamed wash from the Town of Prescott Valley WWTP outfall to ~~the~~ its confluence with the Agua Fria River, and the Agua Fria River below ~~the~~ its confluence with the unnamed wash receiving treated wastewater from the Prescott Valley WWTP to State Route 169. ;

b. Agua Fria river from the El Mirage WWTP outfall to ~~2~~ two kilometers downstream from the outfall. ;

c. Gila River from the Florence WWTP outfall to Felix Road. ,

d. Gila River from its confluence with the Salt River to Gillespie Dam. ;

e. Queen Creek from ~~Superior Mining Division discharge~~ the Town of Superior WWTP outfall to its confluence with Potts Canyon. ;

f. Unnamed wash from the Gila Bend WWTP outfall to its confluence with the Gila River. ;

g. Unnamed wash from the Luke AFB WWTP outfall to ~~the~~ its confluence with the

Agua Fria River. ; and

h. Unnamed wash from the Queen Valley WWTP outfall to its confluence with Queen Creek.

4. In the Rios de Mexico Basin:

a. Mule Gulch, from the Bisbee WWTP outfall to ~~confluence with Whitewater Draw.~~ the Highway 80 bridge, and

b. Unnamed wash from the Bisbee-Douglas International Airport WWTP outfall to Whitewater Draw.

5. In the Salt River Basin:

a. Unnamed wash from the Globe WWTP outfall to its confluence with Pinal Creek and Pinal Creek from its confluence ~~of~~ with the unnamed wash ~~and Pinal Creek~~ to Radium. , and

b. Salt River from the 23rd Avenue WWTP outfall to its confluence with the Gila River.

6. In the San Pedro River Basin:

a. Unnamed wash from the Mt. Lemmon WWTP outfall to 0.25 kilometers downstream. , and

b. Walnut Gulch from the Tombstone WWTP outfall to its confluence with Tombstone Gulch.

7. In the Santa Cruz Basin:

a. Santa Cruz River from the Nogales International WWTP outfall to Tubac Bridge. ,

b. Santa Cruz River from the Roger Road WWTP outfall to Baumgartner Road crossing. ,

c. Unnamed wash from the Oracle WWTP outfall to ~~5~~ five kilometers downstream. , and

d. Sonoita Creek from the Town of Patagonia WWTP outfall to 750 feet downstream.

8. In the Upper Gila River Basin:

a. Bennett Wash from the Arizona Department of Corrections-Safford WWTP outfall to the Gila River. and

b. Unnamed wash from the Arizona Department of Corrections-Globe WWTP outfall to the boundary of the San Carlos Indian Reservation.

9. In the Verde River Basin:

a. American Gulch from the Northern Gila County Sanitary District WWTP outfall to the East Verde River. ,

b. Bitter Creek from the Jerome WWTP outfall to 2.5 kilometers downstream from the outfall. , and

c. Jacks Canyon Wash from the Big Park WWTP outfall to its confluence with Dry Beaver Creek.

10. In the Willcox Playa Basin: Lake Cochise

E. The NPDES permit issuing authority shall use the water quality standards that apply to an ~~effluent-dependent~~ effluent-dependent water to derive discharge limitations for a point source discharge from a wastewater treatment plant to an ephemeral water ~~which~~ that changes that ephemeral water into an ~~effluent-dependent~~ effluent-dependent water.

F. The site-specific standard of 36 µg / L for dissolved copper for the aquatic and wildlife (effluent-dependent water) designated use applies to the Rio de Flag from the City of Flagstaff WWTP outfall to its confluence with the San Francisco Wash .

R18-11-114. Mixing Zones

A. The Director may~~, by order,~~ establish a mixing zone ~~in~~ for a point source discharge to a surface water as a condition of a NPDES permit. Mixing zones are prohibited in ephemeral waters or where there is no water for dilution.

B. The owner or operator of a point source seeking the establishment of a mixing zone shall submit a mixing zone application to the Department on a standard form that is available from the Department. The application shall include:

1. Identification of the pollutant for which the mixing zone is requested;

2. A proposed outfall design;

3. A definition of the boundary of the proposed mixing zone. For purposes of this subsection, the boundary of a mixing zone means the location where the concentration of treated wastewater across a transect of the surface water differs by less than 5%. ; and

4. A complete and detailed description of the existing physical, biological, and chemical conditions of the receiving water and ~~of~~ the predicted impact ~~on such conditions from~~ of the proposed mixing zone on those conditions.

~~5. Information which demonstrates that there will be no acute toxicity in the proposed mixing zone.~~

C. The Department shall review the application for a mixing zone to determine whether the application is complete. If the application is incomplete, the Department shall identify in writing the additional information that must be submitted to the Department ~~before the Department can take administrative action on the application for a mixing zone~~ to complete the mixing zone application.

~~D. When the application for a mixing zone is complete, the Department shall make a preliminary determination of whether to establish the mixing zone. The Department shall give public notice and provide an opportunity for a public hearing on whether to establish a mixing zone pursuant to the administrative procedures prescribed in R18-1-401 and R18-1-402.~~

~~E. In making the determination of whether to grant or deny the request for the establishment of a mixing zone, the Director shall consider the following factors: sediment deposition; bioaccumulation; bioconcentration; predicted exposure of biota and the likelihood that resident biota will be adversely affected; whether there will be acute toxicity in the mixing zone; the known or predicted safe exposure levels for the pollutant of concern; the likelihood of adverse human health effects; the size of the mixing zone; location of the mixing zone relative to biologically sensitive areas in the surface water; concentration gradient within the mixing zone, the physical habitat, the potential for attraction of aquatic life to the mixing zone, and the cumulative impacts of other mixing zones and other discharges to the surface water.~~

D. The Director shall consider the following factors when deciding whether to grant or deny a request for a mixing zone:

1. The assimilative capacity of the receiving water;

2. The likelihood of adverse human health effects;

3. The location of drinking water plant intakes and public swimming areas;

4. The predicted exposure of biota and the likelihood that resident biota will be adversely affected;

5. Bioaccumulation and bioconcentration;

6. Whether there will be acute toxicity in the mixing zone, and, if so, the size of the area of acute toxicity;

7. The known or predicted safe exposure levels for the pollutant of concern;

8. The size of the mixing zone;

9. The location of the mixing zone relative to biologically sensitive areas in the surface water;

10. The concentration gradient of the pollutant within the mixing zone;

11. Sediment deposition;

12. The potential for attracting aquatic life to the mixing zone; and

13. The cumulative impacts of other mixing zones and other discharges to the surface water.

~~F.~~E. The Director shall deny the request to establish a mixing zone if water quality standards outside the boundaries of the proposed mixing zone will be violated ~~or if concentrations of pollutants within the proposed mixing zone will cause acute toxicity to aquatic life. Denials of applications~~ The denial of a request for a mixing zone shall be in writing and shall state the ~~reasons~~ reason for the denial. If the Director determines that a mixing zone should be established, ~~he shall issue an order to~~ the Director shall establish ~~a~~ the mixing zone as a condition of a NPDES permit. The Director may include mixing zone conditions in the ~~order~~ NPDES permit that the Director deems necessary to protect human health and the designated uses of the surface water. ~~A copy of the Director's decision and order shall be sent by certified mail to the applicant.

~~G.~~F. Any person who is adversely affected by ~~an order of the Director pertaining to~~ the Director's decision to grant or deny a request for a mixing zone may appeal the ~~director's~~ decision to an administrative law

judge ~~pursuant to~~ under A.R.S. § 49-321 and A.R.S. §41-1092 et. seq.

~~H.~~G. The Department shall reevaluate a mixing zone upon issuance, reissuance, or modification of the National Pollutant Discharge Elimination System permit for the point source or a modification of the outfall structure.

~~I.~~ H. The length of ~~the~~ a mixing zone shall not exceed 500 meters in ~~flowing streams~~ a stream. The total horizontal area allocated to all mixing zones on a lake shall not exceed 10% of the surface area of the lake. Adjacent mixing zones in a lake shall be no closer than the greatest horizontal dimension of any ~~of the~~ individual mixing ~~zones~~ zone.

~~J.~~ I. A mixing zone shall provide for a zone of passage of not less than 50% of the cross-sectional area of a river or stream.

~~K.~~ J. The discharge outfall shall be designed to maximize initial dilution of the treated wastewater in a surface water.

K A mixing zone is prohibited for the following persistent, bioaccumulative pollutants:

1. Chlordane,
2. DDT and its metabolites (DDD and DDE),
3. Dieldrin,
4. Dioxin,
5. Endrin,
6. Endrin aldehyde,
7. Heptachlor,
8. Heptachlor epoxide,
9. Lindane,
10. Mercury,
11. PCBs, and
12. Toxaphene.

~~***R18-11-115. Nutrient Waivers***~~ ***Repealed***

~~***A. The Department may waive the water quality standards for total phosphorus or total nitrogen on a discharger-specific basis for a discharge to an ephemeral water which is tributary to a surface water for which water quality standards for total nitrogen or total phosphorus are prescribed in R18-11-109(H).***~~

~~***B. A discharger who seeks a nutrient waiver shall submit an application to the Department on a standard form that is available from the Department. The application shall include:***~~

~~***1. Idnetification of the applicant.***~~
~~***2. Information on the discharging facility, including:***~~
~~***a. Date the facility was placed in service;***~~
~~***b. Location of the facility;***~~
~~***c. Location of the discharge point;***~~
~~***d. Wastewater treatment method; and***~~
~~***e. Discharge flow.***~~
~~***3. Information on the receiving surface water, including:***~~
~~***a. Name of the receiving water;***~~
~~***b. Distance in river miles to the nearest downstream surface water; and***~~
~~***c. Distance from the point of discharge to the point where the flow goes subsurface during an average dry season.***~~
~~***4. Information which demonstrates that the nearest downstream surface water is free from pollutants in amounts or combinations which cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth, or propagation of other aquatic life or that impair recreational uses.***~~
~~***5. Water quality data, including:***~~
~~***a. Monthly average, 90th percentile, and single sample maximum concentrations of total phosphorus and total nitrogen as measured at the point of discharge.***~~

~~b. Monthly average, 90th percentile, and single sample maximum concentrations of total phosphorus and total nitrogen as measured at a downstream control point established by the Department; and~~

~~c. Discharge flow at the time of sampling.~~

~~C. The Department shall review the application for completeness and shall notify the applicant in writing whether the application is complete or whether additional information needs to be submitted to the Department.~~

~~D. Once an application for a nutrient waiver is complete, the Department shall make a preliminary determination of whether to grant or deny the nutrient waiver. The Department shall issue public notice and provide an opportunity for a public hearing on whether the request for a nutrient waiver should be granted pursuant to procedures prescribed in A.A.C. R18-1-401 and R18-1-402.~~

~~E. The Director may, by order, grant a nutrient waiver provided the discharge will not cause a violation of a water quality standard for total phosphorus or total nitrogen in any downstream surface water or cause a violation of narrative standards prescribed in R18-11-108. A copy of the Director's decision and order shall be sent by certified mail to the applicant.~~

~~F. Any person who is adversely affected by an order granting or denying a nutrient waiver may appeal the decision to an administrative law judge pursuant to A.R.S. §49-321.~~

~~G. A nutrient waiver expires after a fixed term not to exceed 5 years. The Department shall reevaluate a nutrient waiver upon issuance, reissuance, or modification of the National Pollutant Discharge Elimination System permit for the point source.~~

R18-11-121. Schedules of Compliance

A. A schedule to bring an existing point source into compliance with a new or revised water quality standard may be established in a National Pollutant Discharge Elimination System permit for ~~the~~ an existing point source. A compliance schedule for an existing point source, other than a storm water discharge, shall require compliance with a discharge limitation based upon a new or revised water quality standard no later than ~~3~~ three years after the effective date of the National Pollutant Discharge Elimination System permit. ~~In order for~~ For a schedule of compliance to be granted, the owner or operator of the existing point source shall demonstrate that all requirements under §301(b) and §306 of the Clean Water Act [33 U.S.C. §1311(b) and §1316] have been achieved and that the point source cannot comply with a discharge limitation based upon the new or revised water quality standard through the application of existing water pollution control technology, operational changes, or source reduction.

B. A schedule of compliance ~~shall not~~ may be established in a National Pollutant Discharge Elimination System permit for a new point source. The first National Pollutant Discharge Elimination System permit issued to a new point source may contain a schedule of compliance only when necessary to allow a reasonable opportunity to attain compliance with a new or revised water quality standard that becomes effective after commencement of construction but less than three years before commencement of the discharge. For purposes of this subsection, ~~a new point source means a point source, the construction of which commences after the effective date of a water quality standard. Commencement~~ commencement of construction means that the owner or operator of the point source has obtained the federal, state, and local approvals or permits necessary to begin physical construction of the point source and either:

1. On-site physical construction ~~program~~ has begun; or

2. The owner or operator has entered into a contract for physical construction of the point source and the contract cannot be cancelled or modified without substantial loss. For purposes of this subsection, "substantial loss" means in excess of 10% of the total cost incurred for physical construction.

C. A schedule of compliance may be established in a National Pollutant Discharge Elimination System permit for a recommencing point source discharge. The first National Pollutant Discharge Elimination System permit issued to a recommencing point source discharge may contain a schedule of compliance only when necessary to allow a reasonable opportunity to attain compliance with a new or revised water quality standard that becomes effective less than three years before recommencement of discharge.

~~C~~ ***D.*** ***A schedule to bring a point source discharge of storm water into compliance with a water quality standard may be established in a National Pollutant Discharge Elimination System permit. A compliance schedule for a storm water discharge shall require implementation of all reasonable and cost-effective best management practices to control the discharge of pollutants in storm water.***

R18-11-122. Variances

A. The Director may grant a variance from a water quality standard for a point source discharge ~~provided~~ if the discharger demonstrates that treatment more advanced than that required to comply with technology-based effluent limitations is necessary to comply with the water quality standard and:
   1. It is not technically feasible to achieve compliance within the next ~~5~~ five years~~, or~~ ,
   2. The cost of the treatment would result in substantial and widespread economic and social impact~~;~~, or
   3. Human-caused conditions or sources of pollution prevent attainment of the water quality standard and cannot be remedied within the next five years.

B. A variance may be granted only on a pollutant-specific basis. A point source discharge is required to comply with all other applicable water quality standards for which a variance is not granted.

C. A variance applies only to a specific point source discharge. The granting of a variance does not modify a water quality standard. Other point source dischargers to the surface water shall comply with applicable water quality standards, including any water quality standard for which a variance has been granted for a specific point source discharge.

D. A variance is for a fixed term not to exceed ~~5~~ five years. Upon expiration of a variance, a point source discharger shall either comply with the water quality standard or apply for renewal of the variance. ~~In order for a variance to be renewed~~ To renew a variance, the applicant shall demonstrate reasonable progress towards compliance with the water quality standard during the term of the variance.

E. The Department shall reevaluate a variance upon the issuance, reissuance, or modification of the National Pollutant Discharge Elimination System permit for the point source discharge.

F. A person who seeks a variance from a water quality standard shall submit a ~~letter~~ a written request for a variance to the Department ~~requesting a variance~~. A request for a variance shall include the following information:
   1. Identification of the specific pollutant and water quality standard for which a variance is sought;
   2. Identification of the receiving surface water;
   3. For an existing point source discharge, a detailed description of the existing discharge control technologies that are used to achieve compliance with applicable water quality standards. For a new point source discharge, a detailed description of the proposed discharge control technologies that will be used to achieve compliance with applicable water quality standards;
   4. Documentation that the existing or proposed discharge control technologies will comply with applicable technology-based effluent limitations and that more advanced treatment technology is necessary to achieve compliance with the water quality standard for which a variance is sought;5. A detailed discussion of the reasons why compliance with the water quality standard cannot be achieved;
   6. A detailed discussion of the discharge control technologies that are available for achieving compliance with the water quality standard for which a variance is sought;
   7. Documentation of ~~1 or both~~ one of the following:
      a. That it is not technically feasible to install and operate any of the available discharge control technologies to achieve compliance with the water quality standard for which a variance is sought~~; or~~ ,
      b. That installation and operation of each of the available discharge technologies to achieve compliance with the water quality standard would result in substantial and widespread economic and social impact~~;~~ ***, or***
      C. That human-caused conditions or sources of pollution prevent the attainment of the water quality standard for which the variance is sought and it is not possible to remedy the conditions or sources of pollution within the next five years,

8. Documentation that the point source discharger has reduced, to the maximum extent practicable, the discharge of the pollutant for which a variance is sought through implementation of a local pretreatment, source reduction, or waste minimization program~~;~~ , and
9. A detailed description of proposed interim discharge limitations ~~which~~ that represent the highest level of treatment achievable by the point source ~~discharge~~ discharger during the term of the variance. Interim discharge limitations shall not be less stringent than technology-based effluent limitations.

G. In making a decision on whether to grant or deny the request for a variance, the Director shall consider the following factors: ~~bioaccumulation, bioconcentration, predicted exposure of biota and the likelihood that resident biota will be adversely affected, the known or predicted safe exposure levels for the pollutant of concern, and the likelihood of adverse human health effects~~.
1. Bioaccumulation and bioconcentration,
2. The predicted exposure of biota and the likelihood that resident biota will be adversely affected,
3. The known or predicted safe exposure levels for the pollutant of concern, and
4. The likelihood of adverse human health effects.

H. The Department shall issue a public notice and shall provide an opportunity for a public hearing on whether the request for a variance should be granted or denied ~~pursuant to~~ under procedures prescribed in ~~A.A.C~~. R18-1-401 and R18-1-402.

I. Any person who is adversely affected by a decision of the Director to grant or deny a variance may appeal the decision to an administrative law judge ~~pursuant to~~ under A.R.S. §49-321 and A.R.S. §41-1092 et.seq.

J. The Department shall not grant a variance for a point source discharge to a unique water listed in R18-11-112.

K. A variance is subject to review and approval by the Regional Administrator of the U.S. Environmental Protection Agency.

R18-11-123. Prohibition Against Discharge~~; Sabino Creek~~

A. The discharge of treated wastewater to Sabino Creek is prohibited.

B. The discharge of human body wastes and the wastes from toilets and other receptacles intended to receive or retain those wastes on a vessel to Lake Powell is prohibited.

Conservation Measures

As discussed during a meeting on September 17, 2003, and communicated in correspondence including a letter from ADEQ dated October 27, 2003, a letter from EPA dated November 06, 2003, telephone conversations, and electronic transmissions, the BE has been amended to include the conservation measures below.

Conservation Measures to be completed by ADEQ:

1) Review the numeric suspended sediment concentration (SSC) criterion in Arizona's next triennial review of water quality standards to determine whether revisions to this standard are appropriate.

2) Continue to collect turbidity, suspended sediment concentration, and TSS data at all of its monitoring sites as part of its routine ambient water quality monitoring program.

3) Complete a water quality investigation on the relationship between turbidity, SSC, and flow on two streams in the White Mountains of Arizona. Two of the primary objectives of the investigation shall be to determine a) whether a relationship between SSC and turbidity exists, and b) to develop sediment rating curves for these two streams. Results of this investigation will be provided as a final report upon its completion.

4) Complete development of specific procedures to implement its narrative bottom deposits criterion in 2004.

5) Develop a 5-year work plan to guide future ADEQ research into defining the characteristics of physical integrity for Arizona surface waters. ADEQ will also continue research into the concept of natural stream channel stability and the use of applied geomorphology survey techniques with the long-term goal of developing narrative physical integrity standards for Arizona surface waters.

Conservation Measure to be completed by EPA:

6) Provide a brief annual report on the implementation status of items 1 through 5 above. The annual reports will no longer be required when either Items 1 through 5 above have been completed or until initiation of the next triennial review.

Status of the Species

For information on all threatened and endangered plants and animals and critical habitats in, adjacent to, or dependent on, surface waters in Arizona which are considered in this opinion, refer to Appendices 1 (list of species) and 2 (general species accounts). Should you wish to use the internet, the status of all listed species in Arizona can be found at AESO's public website at http://arizonaes.fws.gov in the "Document Library" under "Documents by Species. Click on the "Document Library", next "Documents by Species", and search for information on a species of choice. Beginning with plants, the species are divided by taxonomic groups. Click on a species, then refer to the "General Species Information" in the Title column. Choose the saguaro cactus icon on the left to access the general species account. Readers need Adobe Acrobat Reader in order to access the species accounts. For more information, scroll down the list of available documents for a species. Some species have "Fact Sheets" available that also provide status and environmental baseline information. Please note that, because the status of a species changes over time, this document used the hard copy versions of the general species accounts included as Appendix 2 which were current at the time of this document's completion.

Environmental Baseline and Status of the Species in the Action Area

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The purpose of the environmental baseline is to define the current status of species and their habitats in the action

area to provide a platform from which to assess the effects of the action now under consultation. However, given that the action area is statewide and addresses 30 species, we offer the following discussion of species' status, in the context of the environmental baseline, as organized in the following guilds. Information for each species in this opinion is also included as Appendix 2. Further information, such as species recovery plans, listing rules, etc. is available on our public website by following the website access instructions presented immediately above under "Status of the Species".

Salmonid Fish

Two species of salmonid fish are considered in this BO. The following discussion is a brief summary of factors contributing to the species environmental baseline. Further information can be found in recovery plans and on our web page.

Apache trout (*Onchorhyncus apache*) and Gila trout (*Onchorhyncus gilae*) comprise Arizona's only native salmonid species and are currently listed as threatened and endangered, respectively. At least 20 unhybridized and uncompromised (i.e., no non-native trouts) Apache trout populations exist within Gila, Apache, and Greenlee counties of Arizona. These 20 populations represent 13 discrete natural stocks (or lineages) of genetically pure Apache trout. Three additional populations contain genetically pure Apache trout in combination with brook trout (*Salvelinus fontinalis*) (Lee Valley Creek) or brown trout (*Salmo trutta*) (Hayground and Stinky creeks). Various other Apache trout populations have been genetically influenced by nonnative trout species such as rainbow trout (*Oncorhynchus mykiss*) or cutthroat trout (*Oncorhynchus clarki*).

Gila trout are currently only known to exist in two streams in Arizona. One stream, Dude Creek, is a tributary of the East Verde River near Payson, in Gila County, Arizona (USFWS 2003). Non-native trout species which previously inhabited Dude Creek were destroyed in the 1989 Dude Fire which allowed the opportunity for reintroduction of Gila trout which currently occupy approximately 2 stream miles of Dude Creek (USFWS 2003). The second population of Gila trout in Arizona resides in Raspberry Creek which is located in Greenlee County and was stocked with 113 young of year Gila trout in November 2000 (USFWS 2003).

Historically, grazing and timber practices within the Upper Gila Drainage represented the most significant threats to Gila trout habitat. Mortality from angling was also a significant concern, predominantly during the 1960's. Currently, the most significant threats to Gila trout and their habitat in Arizona are high-intensity forest fires and hybridization. High-intensity wildfires have caused the extirpation of three populations of Gila trout in New Mexico. As stated in the Gila Trout Recovery Plan (USFWS 2003), "Severe forest fires capable of extirpating or decimating fish populations are a relatively recent phenomena, resulting from the cumulative effects of historical or ongoing overgrazing by domestic livestock and fire suppression (Madany and West, 1983; Savage and Swetnam, 1990; Swetnam, 1990; Touchan *et al.*, 1995; Swetnam and Baisan, 1996; Gresswell, 1999)".

Hybridization with non-native trout species, such as rainbow, trout is a major cause for population declines and the continued imperilment of Gila trout (Miller, 1950; David, 1976, USFWS 2003). Hybridization has resulted in the loss of previously presumed pure populations and the detection of recent introgression of rainbow trout genes in others (Leary and Allendorf, 1998, USFWS 2003). Hybridization is a threat to Arizona's native trout because it results in erosion and loss of the unique genetic identity of the species, which represents its evolutionary history and local adaptation to its unique environment (USFWS 2003). To address concerns regarding genetic contamination, various wildlife and resource agencies have implemented an array of projects designed to address this problem. For example, several hatcheries are producing genetically-pure Gila and Apache trout which are used for supplemental stocking of both occupied and unoccupied habitat within their historical distribution. In addition to stocking efforts, fish barriers have been constructed in certain streams to prevent the migration of nonnative species into habitat supporting Gila and Apache trout.

Non-Salmonid Fish

Seventeen species in the non-salmonid fish guild are considered within this BO. The following discussion of their status as part of the environmental baseline is provided.

Arizona's native warm-water fish species are the most imperiled guild of native wildlife in Arizona and have been met with an ever-increasing number of threats effecting their status including habitat loss, non-native organisms, roads, bridges, grazing, recreation and other factors. Nineteen of Arizona's 31 native fish species (61%) are either listed or proposed for listing and the remaining 12 non-listed warm-water species are declining throughout their range in Arizona. There are several factors acting independently or in concert on various species.

Dewatering of stream reaches is caused by groundwater pumping, stream channelization, water diversion, or damming. Much of the historical native fish habitat in Arizona is now dry (for example, reaches of the Gila, Salt, and San Pedro rivers in Arizona).

Impoundment results in creation of lentic habitat, which eliminates and excludes swift-water habitats. Downstream effects of dams may include dewatering (above), alteration in flow regime, amelioration of natural flood events, changes in thermal and chemical character of the stream, elimination of organic drift typical of flowing waters, and other impacts, which may have a variety of lethal and sublethal effects on fishes. Natural flooding of desert streams may play a significant role in life history of native fishes because it rejuvenates habitats (Propst *et al.* 1988), but perhaps more importantly because desert fishes effectively withstand such disturbances while non-native forms apparently do not (Meffe and Minckley 1987). Major reaches of the Gila and Salt rivers are influenced by dams and their reservoirs and tailwaters.

Both historical and present landscapes with native fish habitats statewide have been impacted to varying degrees by domestic livestock grazing, mining, agriculture, timber harvest, or other development (Hastings and Turner 1965, Hendrickson and Minckley 1985). These activities contribute to habitat degradation by altering flow regimes, increasing watershed and channel

erosion and thus sedimentation, and adding contaminants such as acutely- or chronically-toxic materials, or nutrient-enriching fertilizers to streams and rivers. These perturbations may affect fishes in a variety of ways, such as direct mortality, interference with reproduction, and reduction in requisite resources such as food and cover.

At various levels, excessive sedimentation (siltation) has been targeted as the most significant pollutant of surface water in the United States. The U.S. Fish and Wildlife Service conducted a survey in 1982 which concluded that excessive siltation of surface water was the most important factor adversely affecting the nation's fishery habitat in streams (Judy et al. 1984). Lemly (1982) stated that "sediment appears to overshadow all other pollutants in both overall quantity added to the receiving waters and total economic and ecological impact". In 1990, EPA identified siltation as the most important cause of surface water (lotic systems) pollution; almost 50% greater than the second most important cause in terms of stream distance impacted (USEPA 1990). In 1998, EPA identified sediment as the single most widespread cause of impairment of the Nation's rivers and streams, lakes, reservoirs, ponds, and estuaries (USEPA 1998). Waters (1995) stated "Sediment is widely considered the most significant threat to fresh water systems in the U.S.; over 40% of stream miles are impaired by siltation."

In Arizona, much like other surface water ecosystems in North America, the macroinvertebrate community in streams can often be diverse and may include immature mayflies, stoneflies, caddisflies (these three taxa are often referred to as EPT), midges, crane fly larvae, beetle larvae, crustaceans, sow bugs, worms clams and snails. Collectively, EPT is commonly used as an index of food availability for stream-inhabiting fish species (Lenat 1988). Minshall (1984) stated that macroinvertebrates are more abundant in habitats of greatest heterogeneity, rather than of larger particle size, as previously believed. A reduction of macroinvertebrate biodiversity, due to an increase in sedimentation of the substrate, has an adverse effect on the aquatic species which prey upon macroinvertebrate species by lessening the amount, availability and diversity of prey species available.

The presence of a sufficient food base is an important characteristic of a habitat capable of supporting native fish populations. Macroinvertebrates are eaten by many native fish species and may even serve as indicators of aquatic habitat quality in general. Documented effects to macroinvertebrates include interference with respiration processes as well as the fine-meshed catchnets used for obtaining drifting food particles by filtering species (Waters 1995).

Non-native fishes, introduced for sport, forage, bait, or accidentally, impact native fishes. Ictalurid catfishes, and centrarchids, including largemouth bass, smallmouth bass, and green sunfish (*Lepomis cyanellus*), prey upon native fishes. At higher elevations, introduced salmonids (brown trout and rainbow trout) may similarly influence native fish populations. Red shiner may be particularly important for many native fish including spikedace; for example, because the two species where allopatric occupy essentially the same habitats, and where sympatric there is some evidence that there is displacement of the native to habitats which otherwise would scarcely be used (Marsh *et al.* 1989). Moreover, the concomitant reduction of spikedace and expansion of the shiner is one example where nonnative fish species have displaced native non-salmonids in suitable habitats throughout much of their former range.

Birds

Six species of birds are considered within this BO. The following brief discussion of factors contributing to their environmental baseline, is provided.

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle has been reclassified to threatened and the status of the birds in the Southwest is on an upward trend. The species has been proposed for delisting (64 FR 36454). However, the Arizona population remains small and under threat from a variety of factors. Human disturbance of bald eagles is a continuing threat which may increase as numbers of bald eagles increase and human development continues to expand into rural areas (USFWS 1999). The bald eagle population in Arizona is exposed to increasing hazards from the regionally increasing human population. These include extensive loss and modification of riparian breeding and foraging habitat through clearing of vegetation, changes in groundwater levels, groundwater pumping, surface water diversion, alteration of natural hydrologic regimes, changes in water quality, and alteration of prey base from exotic aquatic species. Threats persist in Arizona largely due to the proximity of bald eagle breeding areas to major human population centers and recreation areas. Additionally, because water is a scarce resource in the Southwest, recreation is concentrated along available water courses. Some of the continuing threats and disturbances to bald eagles include entanglement in monofilament fish line and fish tackle; overgrazing and related degradation of riparian vegetation; malicious and accidental harassment, including shooting, off-road vehicles, recreational activities (especially watercraft), and low-level aircraft overflights; alteration of aquatic and riparian systems for water distribution systems and maintenance of existing water development features such as dams or diversion structures; collisions with transmission lines; poisoning; and electrocution (Beatty *et al.* 1999; Stalmaster 1987).

One program, the Arizona Bald Eagle Nestwatch Program (ABENWP), has made a significant difference in the conservation efforts for bald eagles in Arizona. The nestwatchers perform an array of functions, including collecting behavioral data, contacting and educating the public within the immediate breeding area, and identifying potential threats to the success of the breeding cycle (AGFD 2000). Since 1983, the ABENWP has helped save over two years in bald eagle productivity which represents 16 percent of all young that fledged in Arizona during that time (AGFD 2000).

Brown Pelican (*Pelecanus occidentalis californicus*)

Brown pelicans, typically a costal species, are not known to nest in Arizona. Observations of immature brown pelicans are made at several locations within Arizona every year. Few significant threats exist for the small number of pelicans which visit Arizona. The biggest threat to brown pelican survival has historically been related to human activities. Brown pelicans experienced widespread reproductive failures in the 1960s and early 1970s. Much of the failure was attributed

to eggshell thinning caused by high concentrations of DDE, a metabolite of DDT. In 1972, the Environmental Protection Agency banned the use of DDT in the U.S. and placed restrictions on the use of other pesticides. Since then, the level of chemical contaminants in pelican eggs has decreased and brown pelican nesting success has subsequently increased. The brown pelican was the first species to apparently recover from the effects of pesticides.

California Condor (*Gymnogyps californicus*)

The first release of condors to the wild in northern Arizona occurred on December 12, 1996. They were released as a nonessential experimental population [section 10(J)] in northern Arizona. The area is bounded by Interstate 40 on the south, U.S. Highway 191 on the east, Interstate 70 on the north, and Interstate 15 to U.S. Highway 93 on the west. A five-year review of the effort indicates that, as of January 2002, 47 condors had been released in nine release events (Arizona Condor Review Team 2002). Reintroduction efforts have been complicated by predation, lead poisoning, bird-human interactions, and shootings. As of the date of the published review, 18 birds had died and four had been returned to captivity due to behavioral concerns. After the first five years, there were 25 free-flying condors in northern Arizona.
In November, 2003 a wild condor fledged in the Grand Canyon of Arizona.

Southwestern Willow Flycatcher (*Empidonax trailli extimus*)

Unitt (1987) summarized the status of southwestern willow flycatcher in Arizona stating "...probably the steepest decline in the population level of *E.t. extimus* has occurred in Arizona..." Historical records for Arizona indicate the former range of the southwestern willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River.

In 2001, 346 territories were known from 46 sites along 11 drainages in Arizona (Smith *et al.* 2002). The lowest elevation where territorial pairs were detected was 459 feet at Topock Marsh on the Lower Colorado River; the highest elevation was at the Greer River Reservoir (8202 feet).

As reported by Smith *et al.* (2002), the largest concentrations or breeding locations of willow flycatchers in Arizona in 2001 were at the Salt River and Tonto Creek inflows to Roosevelt Lake (255 flycatchers, 141 territories) and near the San Pedro/Gila river confluence (219 flycatchers, 118 territories). The Roosevelt Lake and the San Pedro/Gila confluence breeding areas make up 259 (75%) of the 346 territories known in the state.

In 2001, 47% of the known Arizona flycatcher territories were located around man-made reservoir, 33% were upstream of reservoirs on free-flowing rivers, and 20% were downstream of reservoirs on regulated rivers. At Roosevelt Lake (n=141) and Alamo Lake (n=21), 162 territories (47% of statewide total) are found in the lake bottom (Smith *et al.* 2002). Recorded for the first time in the 2002 season, 5 to 10 territories were discovered in the conservation space of Horseshoe Reservoir on the Verde River (M. Ross, USFS, pers. comm.).

Range-wide declines of southwestern willow flycatcher numbers have been attributed to loss, modification, and fragmentation of riparian breeding habitat, loss of wintering habitat, and brood parasitism by the brown-headed cowbird (Sogge *et al.* 1997, McCarthey *et al.* 1998). Habitat loss and degradation are caused by a variety of factors, including urban, recreational, and agricultural development, water diversion and groundwater pumping, channelization, dams, and livestock grazing. Fire is an increasing threat to willow flycatcher habitat (Paxton *et al.* 1996), especially in monotypic saltcedar vegetation (DeLoach 1991) and where water diversions and/or groundwater pumping desiccates riparian vegetation (Sogge *et al.* 1997). Willow flycatcher nests are parasitized by brown-headed cowbirds (*Molothrus ater*), which lay their eggs in the host's nest. Feeding sites for cowbirds are enhanced by the presence of livestock and range improvements such as waters and corrals, agriculture, urban areas, golf courses, bird feeders, and trash areas. When these feeding areas are in close proximity to flycatcher breeding habitat, especially coupled with habitat fragmentation, cowbird parasitism of flycatcher nests may increase (Hanna 1928, Mayfield 1977a,b, Tibbitts *et al.* 1994).

Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)

The historical range of the Arizona Distinct Population Segment (DPS) of the cactus ferruginous pygmy-owl (CFPO) extends from the International Border with Mexico north to central Arizona. The northernmost historical record for the CFPO is from New River, Arizona, about 35 miles north of Phoenix, where Fisher (1893) reported the CFPO to be "quite common" in thickets of intermixed mesquite and saguaro cactus. According to early surveys referenced in the literature, the CFPO, prior to the mid-1900s, was "not uncommon," "of common occurrence," and a "fairly numerous" resident of lowland central and southern Arizona in cottonwood forests, mesquite-cottonwood woodlands, and mesquite bosques along the Gila, Salt, Verde, San Pedro, and Santa Cruz rivers and various tributaries (Breninger 1898, Gilman 1909, Swarth 1914). Additionally, CFPOs were detected at Dudleyville on the San Pedro River as recently as 1985 and 1986 (Arizona Game and Fish Department unpubl. data, Hunter 1988). To a large degree, survey effort plays an important factor in where owls have been documented. Survey efforts have not been consistent over the past several years in all areas of the state, affecting the known distribution and numbers of owls in particular areas. For example, before 1998, very few surveys had been completed in the Altar Valley in southern Pima County (but see Table 1). Prior to 1999, the highest known concentration of CFPOs in the state was in northwestern Tucson.

CFPOs have also been detected in southern Pinal County, at Organ Pipe, Cabeza Prieta National Wildlife Refuge (Cabeza), the Altar Valley, and on the Coronado National Forest.

Table 1. Numbers and distribution of documented CFPO locations 1993 - 2002 (Abbate et al. 1996, 1999, 2000, AGFD unpubl. data).

Area	Year	# of Sites	# of Adults	# of Young
Northwest Tucson	1993-1997	9	19	6
	1998	4	7	11
	1999	6	10	16
	2000	8	11	11
	2001	5	8	10
	2002	9	9	2
Total (% of all areas)		19 (33%)	65 (38%)	56 (51%)
Pinal County	1993-1997	2	6	1
	1998	2	2	0
	1999	3	5	5
	2000	2	3	5
	2001	0	0	0
	2002	1	1	0
Total (% of all areas)		6 (11%)	17 (10%)	11 (10%)
Altar Valley	1998	2	4	unknown
	1999	14	18	11
	2000	6	8	4
	2001	11	18	12
	2002	8	10	7
Total (% of all areas)		21 (37%)	58 (34%)	34 (31%)
Organ Pipe/Cabeza	1993-1997	2	2	0
	1998	1	2	4
	1999	3	4	unknown
	2000	6	8	0
	2001	7	10	5
	2002	3	4	0
Total (% of all areas)		11 (19%)	30 (18%)	9 (8%)

The pygmy-owl is threatened by present and potential future destruction and modification of its habitat throughout a significant portion of its range in Arizona (Phillips *et al.* 1964, Johnson et al. 1979, Monson and Phillips 1981, Johnson and Haight 1985, Hunter 1988, Millsap and Johnson 1988). One of the most urgent threats to pygmy-owls in Arizona continues to be the loss and fragmentation of habitat (USFWS 1997b, Abbate *et al.* 1999). The complete removal of vegetation and natural features required for many large-scale and high-density developments directly and indirectly impacts the pygmy-owl (Abbate *et al.* 1999).

Pygmy-owls are capable flyers, but rarely make flights greater than 100 ft. (observational data from AGFD and FWS). Typical flight patterns are more likely to be from one tree to another nearby tree, avoiding long flights in open areas, presumably to avoid exposure to predation (G. Proudfoot, unpubl. data, AGFD, unpubl. data). However, as habitat openings (i.e., gaps between trees or large shrubs) increase, coupled with increasing threats (e.g., moderate to high traffic volumes and other human disturbances), relatively wide open areas may restrict pygmy-owl movement. Wide roadways and associated clear zones cause large gaps between tree canopies on either side of roadways, resulting in lower flight patterns over roads. This low flight level may result in owls flying directly into the pathway of oncoming cars and trucks, significantly increasing the threat of owls being struck. Measures can be implemented in roadway design to minimize these threats and allow successful movement across roadways. Among other measures, decreasing the canopy openings between trees on either side of roads and increasing the density of trees along roadways to provide greater shelter and cover from predators and human activities can be utilized to minimize adverse effects to owls attempting to cross roads. Specific research is needed to determine the distance at which road and clear zone widths significantly affect successful owl movement, types of vegetation needed, roadway and landscaping designs, speed limits, etc.

Researchers in Arizona have found that pygmy-owls require habitat linkages, within and among home ranges, for movement and dispersal of young. Continuous cover or patches of trees and large shrubs spaced at close, regular intervals, to provide concealment and protection from predators and mobbing, as well as to provide shade and cool temperatures, is necessary (AGFD unpubl data, Abbate *et al.* 1999). Pygmy-owls, particularly juveniles because of their inexperience, are susceptible to predation, weather extremes, human-related injury/mortality factors (e.g., cars, buildings, fences, domestic cats, etc.) and other mortality factors (mortality of juveniles is typically 50% or more for owls and other raptors). Therefore, it is important to maintain habitat conditions that reduce their exposure to these threats and provide protection as they disperse from their natal areas. A high degree of cover throughout the landscape increases the likelihood of survivorship to the next breeding season. Limiting these mortality factors is important, especially for small, depressed populations, such as pygmy-owls in Arizona.

Although the pygmy-owl in Arizona is considered nonmigratory, it is protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712). The MBTA prohibits "take" of any migratory bird; however, unlike the ESA, there are no provisions in the MBTA preventing habitat destruction unless direct mortality or destruction of an active nest occurs. Other Federal and

State regulations and policies such as the Clean Water Act, military policies (Barry M. Goldwater Range), National Park Service policy, and including the pygmy-owl on the State of Arizona's list of Species of Special Concern will not adequately protect the pygmy-owl in Arizona from further decline. There are currently no provisions under Arizona statute addressing the destruction or alteration of pygmy-owl habitat.

We identified other factors that may affect the pygmy-owl, including: low levels of genetic variation, possible contamination from pesticides, and potential competition from other bird species that use cavities for nesting [e.g., European starlings (*Sturnus vulgaris*)].

Application of pesticides and herbicides in Arizona occurs year-round, and these chemicals may pose a threat to the pygmy-owl. The presence of pygmy-owls in proximity to residences, golf courses, agricultural fields, and nurseries may cause direct exposure to pesticides and herbicides. Furthermore, ingestion of affected prey items may cause death or reproductive failure (Abbate et al. 1999). Illegal dumping of waste also occurs in areas occupied by pygmy-owls and may be a threat to pygmy-owls and their prey; in one case, drums of toxic solvents were found within one mile of a pygmy-owl detection (Abbate et al. 1999).

Although not used as the basis of listing, we identified several other potential threats to the pygmy-owl in the final listing rule which included recreational birding, parasites and disease, and human-related mortality (USFWS 1997b).

Yuma Clapper Rail (*Rallus longirostris yumanensis*)

In the action area, the largest population of the Yuma clapper rail is on the lower Colorado River marshes from the border with Mexico to Havasu National Wildlife Refuge. Smaller numbers of rails are found along the lower Gila River in Yuma County, the Phoenix metropolitan area (including portions of the Gila, Salt and Verde rivers) in Maricopa County, Roosevelt Lake in Gila County, Picacho Reservoir in Pinal County, and the Bill Williams River in La Paz County, Arizona (USFWS annual survey data).

Various actions may have adverse effects to the Yuma clapper rail including the 1) projects associated with the issuance of Clean Water Act section 404 permits for dredging or filling in wetlands, and placement of seawalls or other shoreline modifications on all rivers and streams supporting Yuma clapper rail, and 2) projects associated with managing the lower Colorado River including dredging, bank stabilization, and other channel maintenance activities. Environmental contaminants may also be considered a threat to the species. Sampling of rail prey items such as small fish and invertebrates in 1998 and 1999 indicated selenium concentrations exist in crayfish at almost three-times that potentially toxic level (King, *et al.* 2000). The Yuma clapper rail is showing signs of recovery as a population in Arizona and has been discussed as a species for further consideration of delisting.

Amphibians

Two species of amphibian are considered in this BO. The following discussion of their representative status, as considered part of the environmental baseline, is provided.

Chiricahua Leopard Frog (*Rana chiricahuensis*)

Based on Painter (2000) and the latest information for Arizona, the species is still extant in most major drainages in Arizona with the exception of the Little Colorado River drainage. However, it has not been found recently in many rivers, valleys, and mountains ranges, including the following in Arizona: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek mainstem. In southeastern Arizona, no recent records (1995 to the present) exist for the following mountain ranges or valleys: Pinaleno Mountains, Peloncillo Mountains, Sulphur Springs Valley, and Huachuca Mountains. Moreover, the species is now absent from all but one of the southeastern Arizona valley bottom cienega complexes. In many of these regions, Chiricahua leopard frogs were not found for a decade or more despite repeated surveys. Recent surveys suggest the species may have recently disappeared from some major drainages in New Mexico (C. Painter, pers. comm. 2000).

Threats to this species include predation by nonnative organisms, especially bullfrogs, fish, and crayfish; disease; drought; floods; degradation and loss of habitat as a result of water diversions and groundwater pumping, poor livestock management, a history of fire suppression and grazing that has increased the likelihood of crown fires, mining, development, and environmental contamination; disruption of metapopulation dynamics; and increased chance of extirpation or extinction resulting from small numbers of populations. Loss of Chiricahua leopard frog populations is part of a pattern of global amphibian decline, suggesting other regional or global causes of decline may be important as well (Carey *et al*. 2001). Numerous studies indicate that declines and extirpations of Chiricahua leopard frogs are at least in part caused by predation and possibly competition with nonnative organisms, including fish in the family Centrarchidae (*Micropterus*, *Lepomis*), bullfrogs (*Rana catesbeiana*), tiger salamanders (*Ambystoma tigrinum mavortium*), crayfish (*Orconectes virilis* and possibly others), and several other species of fish (Fernandez and Rosen 1998, 1996; Rosen *et al.* 1996; 1994; Snyder *et al.* 1996; Fernandez and Bagnara 1995; Sredl and Howland 1994; Clarkson and Rorabaugh 1989). For instance, in the Chiricahua region of southeastern Arizona, Rosen *et al.* (1996) found that almost all perennial waters investigated that lacked introduced predatory vertebrates supported Chiricahua leopard frogs. All waters except three that supported introduced vertebrate predators lacked Chiricahua leopard frogs. Sredl and Howland (1994) noted that Chiricahua leopard frogs were nearly always absent from sites supporting bullfrogs and nonnative predatory fish. Rosen *et al.* (1996) suggested further study was needed to evaluate the effects of mosquitofish, trout, and catfish on frog presence.

While poor water quality has not been identified as a leading cause for the decline of Chiricahua leopard frog in Arizona, there have been incidences where water quality has resulted in the taking

of amphibians, including the Chiricahua leopard frog. Most notably, pollutants associated with acute or chronic releases from mining operations (heavy metals, pH, etc.) have adversely affected local populations (Jim Rorabaugh, USFWS, pers. comm. 2003).

Sonoran Tiger Salamander (*Ambystoma tigrinum stebbensi*)

The Sonora tiger salamander is known from approximately 53 breeding localities, although not all are currently occupied (USFWS 2002e, Abbate 1998, Collins and Jones 1987, Collins 1996). During intensive surveys in 1997, from one to 150 Sonora tiger salamanders were found at 25 stock tanks (Abbate 1998). Populations and habitats are dynamic, thus the number and location of extant aquatic populations changes over time, as exhibited by the differences between survey results in 1985 and 1993-1996 (Collins and Jones 1987; Collins 1996; J. Collins, Arizona State University (ASU), pers. comm. 1996). In 1999, the lab of Dr. James Collins, ASU, found Sonora tiger salamanders at 17 localities (Collins 1999). All sites where Sonora tiger salamanders have been found are located in Arizona in the Santa Cruz and San Pedro river drainages, including sites in the San Rafael Valley and adjacent portions of the Patagonia and Huachuca mountains in Santa Cruz and Cochise counties. All confirmed historical and extant aquatic populations are found in cattle tanks or impounded cienegas within 19 miles of Lochiel, Arizona.

Primary threats to the salamander include predation by nonnative fish and bullfrogs, diseases, catastrophic floods and drought, illegal collecting, introduction of other subspecies of salamanders that could genetically swamp *A. t. stebbinsi* populations, and stochastic extirpations or extinction characteristic of small populations. Predation by catfish, bass, mosquito fish, and sunfish can eliminate stock tank populations of Sonora tiger salamander (J. Snyder, ASU, pers. comm., 1996; Collins et al. 1988). The salamanders can apparently coexist with bullfrogs, but bullfrogs prey on salamanders (J. Snyder, ASU, pers. comm., 1996) and, if they are present in sufficient densities, perhaps could reduce or eliminate salamander populations. Tadpoles of wood frogs, *Rana sylvatica*, are known to feed on spotted salamander, *Ambystoma maculatum*, eggs (Petranka *et al*. 1998), but under experimental conditions bullfrog tadpoles do not feed on viable salamander eggs or hatchlings (Collins 1996, J. Collins, ASU, pers. comm., 1996). A salamander population in Garden Canyon, Fort Huachuca, near the crest of the Huachuca Mountains, may contain hybrids, as well (Storfer *et al.* 1999).

Tiger salamander populations in the western United States and Canada, including populations of the Sonora tiger salamander, exhibit frequent epizootics (Collins *et al.* 2001). Sonora tiger salamander populations experience frequent disease-related die-offs (approximately 8 percent of populations are affected each year) in which almost all salamanders and larvae in the pond die. *Ambystoma tigrinum* virus (ATV) is the pathogen believed to be primarily responsible for these die-offs (Jancovich *et al.* 1997), as well as die-offs observed in other tiger salamander populations in the United States and Canada (Collins *et al.* 2000). It is also possible that some die-offs might occur as a result of low pH (M. Pruss, AGFD, pers. comm.). A copper smelter at Cananea, Sonora, less than 25 miles south of the border, may have released sulfur plumes resulting in acid precipitation (Platz 1994, Blanchard and Stromberg 1987), but currently there is no evidence to connect salamander die-offs with the copper smelter, and the smelter has not been operated since

1999. ATV may be spread by bullfrogs, birds, cattle, or other animals that move among tanks (Jancovich *et al.* 1998). The disease could also be spread by researchers or anglers if equipment such as waders, nets, or fishing tackle used at a salamander tank are not allowed to dry or are not disinfected before use at another tank.

Sonora tiger salamanders also contract chytridiomycosis, a fungal disease associated with global declines of frogs and toads (Longcore *et al.* 1999, Berger *et al.* 1998). However, compared to anurans, infected salamanders exhibit only minimal symptoms (Davidson *et al.* 2000). The effect of the disease on salamander populations needs further study.

With the exception of Bog Hole in the San Rafael Valley and a site on Fort Huachuca, cattle grazing occurs throughout the range of the Sonora tiger salamander. Cattle can degrade habitat at stock tank breeding sites and overgrazing can cause loss of cover and erosion that can threaten the integrity of stock tanks used by the salamander. However, the salamander has coexisted for about 250 years with grazing and, because of its current use of livestock tanks for breeding, is now dependent upon maintenance of cattle waters by ranchers (U.S. Fish and Wildlife Service 2000e).

Plants

Three species of plants are considered within this BO; none of which currently have a final Recovery Plan. The following is a brief discussion of the environmental baseline. Additional information can be found in Federal Register listing documents and on our web page.

Huachuca Water Umbel (*Lilaeopsis schaffneriana* var. *recurva*)

Huachuca water umbel has been documented from 27 sites in Santa Cruz, Cochise, and Pima counties, Arizona (and in adjacent Sonora, Mexico, west of the continental divide) (Haas and Frye 1997, Saucedo 1990, Warren et al. 1989, Warren et al. 1991, Warren and Reichenbacher 1991). The plant has been extirpated from six of the 27 sites. The 21 extant sites occur in four major watersheds - San Pedro River, Santa Cruz River, Rio Yaqui, and Rio Sonora. All sites are between 3,500 and 6,500 feet in elevation.

Huachuca water umbel has an opportunistic strategy that ensures its survival in healthy riverine systems, cienegas, and springs. In upper watersheds that generally do not experience scouring floods, the umbel occurs in microsites where interspecific plant competition is low. At these sites, the umbel occurs on wetted soils interspersed with other plants at low density, along the periphery of the wetted channel, or in small openings in the understory. In stream and river habitats, Huachuca water umbel can occur in backwaters, side channels, and nearby springs. After a flood, it can rapidly expand its population and occupy disturbed habitat until interspecific competition exceeds its tolerance. The expansion and contraction of Huachuca water umbel populations appear to depend on the presence of "refugia" where the species can escape the effects of scouring floods, a watershed that has an unaltered hydrograph, and a healthy riparian community that stabilizes the channel.

Overgrazing, mining, hay harvesting, timber harvest, fire suppression, and other activities in the nineteenth century led to widespread erosion and channel entrenchment in southeastern Arizona streams and cienegas when above-average precipitation and flooding occurred in the late 1800s and early 1900s (Bahre 1991, Bryan 1925, Dobyns 1981, Hastings and Turner 1980, Hendrickson and Minckley 1984, Martin 1975, Sheridan 1986, Webb and Betancourt 1992, Hereford 1993).

Wetland degradation and loss continues today. Human activities such as groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, chaining, agriculture, mining, sand and gravel operations, road building, nonnative species introductions, urbanization, wood cutting, and recreation all contribute to riparian and cienega habitat loss and degradation in southern Arizona. The local and regional effects of these activities are expected to increase with the increasing human population.

A suite of nonnative plant species has invaded wetland habitats in southern Arizona (Stromberg and Chew 1997), including those occupied by the Huachuca water umbel (Arizona Department of Water Resources 1994). In some cases their effect on the umbel is unclear; however, in certain microsites, the nonnative Bermuda grass (*Cynodon dactylon*) may directly compete with the umbel. Bermuda grass forms a thick sod in which many native plants are unable to establish. Watercress is another nonnative plant now abundant along perennial streams in Arizona. It is successful in disturbed areas and can form dense monocultures that can outcompete Huachuca water umbel populations.

Limited numbers of populations and the small size of populations make the Huachuca water umbel vulnerable to extinction as a result of stochastic events that are often exacerbated by habitat disturbance. For instance, the restriction of this taxon to a relatively small area in southeastern Arizona and adjacent Sonora increases the chance that a single environmental catastrophe, such as a severe tropical storm or drought, could eliminate populations or cause extinction. Populations are in most cases isolated as well, which makes the chance of natural recolonization after extirpation less likely. Small populations are also subject to demographic and genetic stochasticity, which increases the probability of population extirpation (Shafer 1990, Wilcox and Murphy 1985).

Navajo sedge (*Carex specuicola*)

Navajo sedge occurs in hanging gardens within the Great Basin Conifer Woodland. The seep-spring pockets are on Navajo Sandstone bedrock at an elevation of 5710 to 5980 feet. The species occurs in a variety of situations in the sandstone from almost inaccessible sheer cliff faces to accessible alcoves. The dominant associated species include monkey flower (*Mimulus eastwoodiae*), *Epipactis gigantea*, water bentgrass (*Agrostis semiverticillata*), sand bluestem (*Andropogon hallii*), *Cirsium* sp., foxtail barley (*Hordeum jubatum*), and common reed (*Phragmites communis*).

As of the publication of the Navajo Sedge Recovery Plan (USFWS 1987a), the Navajo sedge population along Inscription House Ruin Trail was comprised of three subpopulations that occur

along the same canyon and seep. As of 1998, the Arizona Game and Fish Department Heritage Data Management System reported a total of 21 element occurrences of the species in Arizona (Arizona Game and Fish Department 1998). The majority (17) of the locations are near and essentially centered around Inscription House Ruin, and associated with several canyons that form the head of the Navajo Creek drainage between Gray Mesa and Shonto Plateau. Two locations are associated with Tsegi and Long canyons near Navajo National Monument. Two locations are associated with Chinle Valley in the vicinity of Mexican Water. The size and status of the populations at each of these sites is unknown.

The two major threats to Navajo sedge are grazing of accessible sites and lowering of the water table by water development. At least one subpopulation in the Inscription House Ruin area has drastically declined due to grazing within a corral that was built around the supporting seep. Water development (wells and troughs) has affected another subpopulation in the Inscription House Ruin area. Accessible habitat may also be vulnerable to off-road vehicle traffic.

Canelo Hills Ladies'-Tresses (*Spiranthes delitescens*)

This species is known from five sites at about 5,000 feet elevation in the San Pedro River watershed in Santa Cruz and Cochise counties, southern Arizona (Newman 1991; M. Falk, USFWS, pers. comm.). The total amount of occupied habitat is less than 200 acres. Four of the populations are on private land less than 23 miles north of the U.S. and Mexico border; one additional small site containing four individuals was discovered on public land in 1996 (M. Falk, USFWS, pers. comm.). This site is located near a known population and may not be a distinct population. Potential habitat in Sonora, Mexico, has been surveyed but no *Spiranthes delitescens* populations have been found.

Four of the five populations of Canelo Hills ladies' tresses occur to the west of Fort Huachuca. These populations occur on Nature Conservancy, USFS (Coronado NF), and private land (Arizona Rare Plant Committee 2001). The fifth population occurs on private land at the Babocomari Cienega, about 1.5 miles north of the northwest corner of Fort Huachuca.

Threats to the Canelo Hills ladies'-tresses include groundwater pumping, water diversions, sand and gravel mining, recreation impacts, illegal collection, and invasion of cienega habitats by nonindigenous plant species, such as Johnson grass and Bermuda grass (USFWS 1997a). The nonindigenous Johnson grass is invading one *Spiranthes* site (D. Gori, Arizona Nature Conservancy, in litt. 1993). This tall grass forms a dense monoculture, displacing less competitive native plants. If Johnson grass continues to spread, the Canelo Hills ladies'-tresses population at this site may be lost (Dave Gori, in litt. 1993). The effect of livestock grazing on the Canelo Hills ladies'-tresses is unclear. A *Spiranthes* population growing at a site grazed for more than 100 years was found to be larger and more vigorous than a population growing at a site ungrazed since 1969 (McClaran and Sundt 1992, Newman 1991).

Limited numbers of populations and individuals threaten this taxon with demographic and environmental extinction as a result of stochastic events that are often exacerbated by habitat disturbance. For instance, the restriction of the species to a relatively small area in southeastern Arizona increases the chance that a single environmental catastrophe, such as a severe tropical storm or drought could eliminate populations or cause extinction.

As stated previously in the "Description of the Proposed Action", the action area for the proposed action consists of all surface waters and their tributaries in Arizona. Subsequently, analysis and discussion of the environmental baseline in the action area is very general to address the vast geographic area, the diverse habitats occurring state-wide, and the variability of water quality status among and between Arizona's surface waters. However, we offer the following tabulated analysis of Arizona's water quality in reference to ADEQ's Integrated 305(b) Assessment and 303(d) Listing Report for 2002:

Table 2. Designated use support summary for Arizona streams (ADEQ 2002a). Note: **bold** type represents the combined stream mileage assessment for each designated use category.

Designated Uses	Attaining (miles)	Inconclusive (miles)	Impaired (miles)	Not Attaining (miles)	Total Assessed (miles)
Overall Use Support	**1253.7**	**929.2**	**342.1**	**22**	**2547**
A&W (combined)	**775.1**	**1255.8**	**308.3**	**21**	**2360.3**
$A\&W_{cold}$	374.2	564	90.4	0	1028.6
$A\&W_{warm}$	395.6	633.3	185.1	20	1234
$A\&W_{ephemeral}$	0	16.4	10.9	1	28.4
$A\&W_{edw}$	5.3	42.1	21.8	0	69.2
Recreation (combined)	**1204.4**	**1097.5**	**105.2**	**1**	**2408.1**
Fish Consumption	1190.8	1130.7	10	0	2331.5
Full Body Contact	839.4	1301.3	58.3	1	2200
Partial Body Contact	5.3	101.7	36.9	0	143.9
Domestic Water Source	**220.8**	**274.8**	**17**	**0**	**512.6**
Agriculture (combined)	**1171.2**	**1114.6**	**87.8**	**0**	**2373.6**
Agriculture Irrigation	632.8	953.6	42.2	0	1628.6
Agriculture Livestock Watering	1149.4	1126.5	82.5	0	2358.4

During the most recent two-year assessment period, approximately 2,547 miles of streams, canals, and washes were assessed for compliance with Arizona's WQS which equates to approximately 3% of the total 90,375 stream miles and 57% of the perennial stream miles and canals within the state boundaries (ADEQ 2002a). Converting the numerical data presented in Table 1 into percentages (of stream miles assessed), the results are 49.2% attaining, 36.5% inconclusive, 13.4% impaired, and 0.9 % not attaining.

Metals such as arsenic, beryllium, boron, cadmium, copper, manganese, silver, and zinc currently are the leading category of pollutants impairing Arizona's streams (ADEQ 2002a). Of these metals, copper, zinc, and cadmium are the top contaminants with 122.8, 96, and 36.7 stream miles impaired, respectively (ADEQ 2002a). Other contaminants impairing Arizona's streams are turbidity (125.4 stream miles), pathogens (60.6 stream miles), fluoride (28.5 stream miles), low pH (18.3 stream miles), nitrate (15.5 stream miles), and chlorine (7.2 stream miles) (ADEQ 2002a). It should be noted that ADEQ's 305(b) report for calendar year 2000, "The Status of Water Quality in Arizona: Clean Water Act Section 305(b) Report 2000" (ADEQ 2000), indicated turbidity as Arizona's leading pollutant in overall stream miles impacted (~500 stream miles). Further exacerbating the magnitude of turbidity or suspended sediment concentration as a significant pollutant of Arizona's streams are the catastrophic effects of recent wildfires statewide and the propensity for landscapes which have experienced these fires to produce excessive sediment during precipitation events. After the 305(b) report was completed for 2000, ADEQ amended the assessment protocols and greatly increased the number of samples required to assess a given reach. Therefore, in completing assessments for the 305(b) report for 2002, if a reach was not sampled enough times to make a designated use assessment under the new assessment protocols, it was labeled as "inconclusive" and not included in the total figure of impaired stream mileage for a given pollutant. However, for perspective, the 2000 305(b) report indicated that 76% of all streams assessed were in full support, 15% were in non-support, and 9% were in partial support of their designated uses. It should also be noted that the 2000 305(b) report was generated using a more inclusive approach to assessment policies and procedures, as compared to the 2002 305(b) report.

A brief review of the data included in ADEQ's 2000 and 2002 305(b) reports provides a general summary of streams that have been either partially or totally impaired by turbidity since 1995. The table below summarizes this information.

Table 3. Arizona streams with partial or total turbidity impairments (ADEQ 2000, ADEQ 2002a). This list of streams does not specify what reach(es) within those streams have been identified with turbidity concerns. Additionally, species presence and critical habitat (CH) may only occur in portions of a given stream or in its tributaries. Therefore, this table should only be used as a general reference.

Watershed	Stream	Comments
Bill Williams	Burrow Creek	
Colorado River/Grand Canyon	Havasu Creek	
	Colorado River	Humpback chub **and** CH present. Razorback sucker **and** CH present. Bonytail chub **and** CH present.
	Virgin River	Woundfin **and** CH present. Virgin River chub **and** CH present.
Little Colorado River/San Juan	Buck Springs Canyon Creek	
	Little Colorado River	Humpback chub **and** CH present. Little Colorado spinedace present.
	Mineral Creek	Apache trout present.
	Nutrioso Creek	Little Colorado spinedace **and** CH present.
	Show Low Creek	
	Silver Creek	Little Colorado spinedace present.
Middle Gila	Agua Fria River	
Salt River	Canyon Creek	
	Christopher Creek	
	Hunter Creek	
	Salt River	Razorback sucker **and** CH present.
	Tonto Creek	Loach minnow CH present. Spikedace CH present.
San Pedro/Wilcox Playa/Rio Yaqui	San Pedro River	Loach minnow CH present. Spikedace **and** CH present.
Santa Cruz	East Nogales Wash	Gila topminnow present.
	Santa Cruz River	Gila topminnow present.

Upper Gila	Blue River	Razorback sucker present. Loach minnow **and** CH present. Spikedace CH present.
	Eagle Creek	Loach minnow CH present. Spikedace **and** CH present.
	Gila River	Razorback sucker **and** CH present. Loach minnow **and** CH present. Spikedace **and** CH present.
	San Francisco River	Razorback sucker present. Loach minnow **and** CH present. Spikedace CH present.
Verde River	East Verde River	
	Beaver Creek	Loach minnow CH present. Spikedace CH present.
	Oak Creek	Loach minnow CH present. Spikedace CH present.

In addition to streams, canals, washes, etc., ADEQ is responsible for the assessment of the water quality in Arizona's lakes and reservoirs. The following table provides a summary of Arizona's lakes and reservoirs during the 2002 305(b) assessment period.

Table 4. Designated use support summary for Arizona lakes (ADEQ 2002a). Note: the numbers in **bold** type represent the combined stream mileage assessment for each designated use category.

Designated Uses	Attaining (acres)	Inconclusive (acres)	Impaired (acres)	Not Attaining (acres)	Total Assessed (acres)
Overall Use Support	**20275**	**51392**	**12136**	**840**	**84643**
A&W (combined)	**19697**	**52040**	**12247**	**560**	**84544**
$A\&W_{cold}$	1158	29295	125	231	30809
$A\&W_{warm}$	18539	22930	11950	95	53514
$A\&W_{ephemeral}$	0	0	0	220*	220*
$A\&W_{edw}$	0	0	0	0	0
Recreation (combined)	**20291**	**51472**	**12136**	**634**	**84533**
Fish Consumption	32486	51658	0	169	84313
Full Body Contact	16341	55605	11950	245	84141
Partial Body Contact	0	72	0	220*	292

Domestic Water Source	**19561**	**45372**	**0**	**0**	**64933**
Agriculture (combined)	**20308**	**51411**	**12136**	**245**	**84100**
Agriculture Irrigation	20080	51480	12136	125	83821
Agriculture Livestock Watering	20216	51479	12136	245	84076

There are approximately 168,000 acres of perennial lakes in Arizona for which slightly over half (86,643 acres) have been assessed within the past two years (ADEQ 2002a). Due to recent changes to ADEQ's assessment criteria and protocols, the majority (62%) of lake acreage was assessed as inconclusive for designated use support. The remainder of acreage assessed as 23% attaining, 14% not attaining, and 1% impaired for designated use support (ADEQ 2002a).

Most of the lakes and reservoirs in Arizona do not support listed fish species; however, water is released downstream into lotic fish habitat. High pH is currently the leading factor impairing Arizona's lakes with a total of 1,974 acres either impaired or not attaining (ADEQ 2002a). Of slightly less significance is low dissolved oxygen concentrations affecting Arizona's lakes. Approximately 1,820 lake-acres contained low dissolved oxygen concentrations (ADEQ 2002a). Other contaminants impairing Arizona's lakes are sulfides (1,414 acres), nutrients (231 acres), pathogens (186 acres), and mercury (169 acres) (ADEQ 2002a). Turbidity, although a parameter assessed for lakes in Arizona, has not been historically significant as a pollutant in Arizona lakes.

Effects of the Action and Discussion of Amendments to Standards

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur (50 CFR §402.02). Therefore, when examining indirect effects, we analyze whether an indirect effect is caused by the action, is reasonably certain to occur, and is later in time.

Section R18-11-101. Definitions

Definition # 7 "Aquatic and Wildlife cold water fishery" and #10 "Aquatic and Wildlife warm water fishery"

ADEQ is recommending three amendments to the definitions for the terms "Aquatic and Wildlife cold water fishery" (A&Wc) and "Aquatic and Wildlife warm water fishery" (A&Ww). One

amendment was to repeal the term "fishery" from the definition. This amendment was grammatical in nature and thus will not result in changes to water quality protection. According to their preamble, ADEQ did not intend to unnecessarily restrict this designated use term to apply to waters supporting fisheries but rather to the aquatic community as a whole, as not all surface waters in Arizona contain fisheries.

The second amendment repeals the reference to whether salmonids are present or absent for determining whether a given reach should be designated as a "warm water" (salmonids absent) or a "cold water" (salmonids present) reach. The obvious problems with referring to the presence or absence of salmonids are two-fold. First, as stated previously, not all surface waters support a fishery, much less salmonids. Consequently, designated use terminology will be either Aquatic and Wildlife cold water ($A\&W_{cold}$ or A&Wc) or Aquatic and Wildlife warm water ($A\&W_{warm}$ or A&Ww) with respect to these two designated use terms.

We concur with EPA's determination that the above two proposed amendments to the definitions of A&Wc and A&Ww are not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat. Additionally, we find that the above two proposed amendments to the definitions are not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub. We base this concurrence on the fact that the proposed amendments are a better description of Arizona's unique surface water ecosystems, and provide a more accurate intent for on-the-ground conditions.

The third amendment to this definition is the reclassification of "cold" and "warm" uses by the geographic elevation in which a given reach is located. Specifically, ADEQ is proposing the elevation of 5,000 feet to divide the two designated uses into A&Wc (>5,000 feet elevation) and A&Ww (<5,000 feet elevation). This decision is based primarily upon the distinction between two broad macroinvertebrate communities which are independently representative of higher and lower elevation streams with 5,000 feet in elevation being a statistical dividing line between the two. Sixty-five surface water reaches in 5 drainage basins (see Appendix 4, Table 2) will be reclassified from A&Wc to A&Ww as a result of this amendment. This change in classification relaxes the numeric water quality standards for 16 chemical constituents (see Appendix 4 Table 1). It is not known if these new lower standards will provide adequate protection to listed species and their habitats.

Originally, it was the mutual understanding of our agencies that the analysis of effects regarding chemical constituents was to be addressed through the "Memorandum of Agreement Between the Environmental Protection Agency, Fish and Wildlife Service, and National Marine Fisheries Service Regarding Enhanced Coordination Under the Clean Water Act and Endangered Species Act" (66 FR 36 [11201-11217]) (MOA). This MOA commits our agencies to section 7 consultation at the national level on Clean Water Act section 304(a) numeric criteria. However, it was recently discovered that only five of the 16 constituents subject to this revision are part of the National consultation (see Appendix 4). We believe this amendment may have adverse effects to species listed in Appendix 1 which occupy some of the 65 surface water reaches affected by the

amendment, and may also adversely affect their critical habitat, where designated, because the A&Ww numeric standards are not as protective as A&Wc numeric standards for these constituents. However, this specific amendment to this particular definition is not considered in this opinion pursuant to EPA's determination of "No Effect" in correspondence dated March 19, 2003 and, subsequently, potential incidental take to federally listed species as a result of this amendment is not included in this biological opinion.

Definition #21 "Effluent-Dependent Water"

ADEQ is proposing to change its definition of effluent-dependent water (EDW) to include only waters which would be ephemeral in absence of the discharge of treated water. The intent of this definition existed in the previous definition when ADEQ used the word "primarily" to describe the source of flow in an EDW. This modification prevents surface waters which have A&Wc and A&Ww designated uses from being redesignated as EDW due to wastewater treatment plant discharges.

We concur with EPA's determination that amending the definition of EDW in this manner is not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat. Additionally, we find that amending the definition of EDW in this manner is not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub. Our concurrence is based on the fact that ADEQ's proposed revision 1) further refines the original intent of the definition of EDW and 2) removes the potential for the relaxation of numeric water quality standards for specific constituents should a particular reach designated as A&Wc or A&Ww become subject to discharges of treated effluent.

R18-11-109. Numeric Water Quality Criteria

R18-11-109(E) Temperature

ADEQ is proposing to remove the applicability of the temperature standard for stormwater discharges. Arizona Revised Statutes (ARS) R18-11-109(E) prescribe limits on the maximum allowable increase in temperature of a receiving water body. The current maximum temperature increase allowed is 3° C for A&Ww and A&W effluent-dependent water (A&Wedw) designated uses and 1° C for A&Wc designated uses. ADEQ intended for these numeric standards to apply to point source discharges for which temperatures can be monitored and controlled. It is not feasible for stormwater discharges to be cooled prior to discharge, nor has ADEQ been informed of stormwater discharges adversely affecting an aquatic community to date. For these reasons, ADEQ has recommended this revision to the applicability of numeric temperature standard.

We concur with EPA's determination that amending the applicability of the numeric temperature standard to exclude stormwater discharges is not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat. Additionally, we find amending the applicability of the numeric temperature standard to exclude stormwater discharges is not likely to

jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub. Our concurrence is based on the fact that: 1) it is inappropriate to require a numeric standard over which little or no technical control can be assured; and, 2) ADEQ has never attributed a temperature violation to stormwater discharge and is unaware of any instances where the temperature of stormwater has adversely affected aquatic communities in Arizona.

R18-11-109 ~~F~~. Turbidity and D. Suspended Sediment Concentration

ADEQ is proposing to repeal the numeric standard for turbidity for replacement with suspended sediment concentration. Use of suspended sediment concentration is proposed to be coupled with a narrative bottom deposit standard which is under development by ADEQ and is expected to be completed in 2003. However, this narrative bottom deposit standard is not considered part of the proposed action.

Turbidity is an optical property of water resulting in a loss of light transmission due to absorption or scattering (Dieter 1990). Turbidity, including small particles such as clay, silt, and organic and inorganic matter, as well as microorganisms, is expressed in Nephelometric Turbidity Units, or NTU's, which is an index of light refraction when a known amount of light is passed through a water sample. Turbidity measurements are inexpensive and are commonly performed in the field. This resulting value is used as an estimate, or surrogate, to determine the relative amount of solids in suspension. Prior to this WQS revision, numeric turbidity standards were 50 NTUs for A&Ww-designated streams, 10 NTUs for A&Wc-designated streams, 25 NTUs for A&Ww-designated lakes and 10 NTUs for A&Wc-designated lakes.

As written in the Preamble to the Standards, ADEQ cited the following six primary reasons for the decision to repeal the turbidity numeric standard:

1. The current numeric turbidity standards appear to be based upon Green Book criteria recommendations that were made in 1968. The scientific defensibility of this as the current turbidity criteria is questionable. Current EPA criteria guidance for turbidity no longer includes the Green Book recommendations.

2. The current turbidity criteria are expressed as single sample maximum concentrations. In Arizona, with its variable climate and hydrology, a single sample maximum measurement of turbidity is unlikely to be reliable. A single sample maximum does not account for the spatial and temporal variability in Arizona surface waters. Many variables can affect the suspended and settleable solids concentrations in a surface water. These variables include, but are not limited to, watershed size, land uses, slopes, precipitation intensity and duration, soil types, channel morphology, stream stability, and vegetative cover.

3. A single sample exceedance of the current turbidity standards is not correlated to impairment of aquatic life. There is no evidence presumed that a one-time exceedance of the current turbidity criteria results in impairment of aquatic life designated uses.

4. Turbidity measurements are qualitative and they do not directly relate to the concentration of suspended solids in surface waters.

5. Turbidity data can be unreliable because of quality assurance and quality control problems associated with both field and laboratory measurements of turbidity. The laboratory measurement of turbidity in surface water may be unreliable due to exceedance of recommended sample holding times for turbidity analysis. Standard analytical methods recommend that water samples be analyzed in the laboratory on the same day that the sample is collected. Field measurements of turbidity are considered to be more reliable, but they may be affected by many variables including air bubbles; the sizes, shapes, and refractive characteristics of the particles that are suspended in the water; and differences in instrumentation. Standard Methods notes that variations of up to five times can result if different turbidimeters, all calibrated against the same standard, are used to measure the turbidity of a surface water.

6. According to Standard Methods, there is no direct relationship between the intensity of light scattered at a 90° angle (as measured in NTUs) and Jackson candle turbidity (JTUs). The absence of a direct relationship calls the current turbidity criteria into question because it appears that the units of measurement changed from JTUs to NTUs while the same numeric criteria that were adopted in 1968 have been maintained. In other words, because of fundamental differences between modern turbidimeters and the Jackson candle turbidimeter, results that are expressed in JTUs may not be equivalent to results expressed in NTUs.

As stated previously, ADEQ intends to replace the numeric turbidity standard with a numeric suspended sediment concentration (SSC) standard. The new standard, 80 mg/L, will be applied to all lakes and streams with A&Ww and A&Wc designated uses. ADEQ based this numeric standard on a 1965 report by the European Inland Fisheries Advisory Commission (EIFAC 1965) which discusses the relative effect of various levels of suspended sediment on various species of freshwater fish, none of which are indigenous to the United States.

In addition to repealing the numeric turbidity standards for A&Ww and A&Wc and replacing them with the 80 mg/L suspended sediment standard, ADEQ is proposing to amend the sampling protocols to sample suspended sediment concentrations only during baseflow conditions. Previously, ADEQ collected turbidity samples during flood events *and* during baseflow conditions. Collecting samples only during baseflow conditions raises two concerns. First, ADEQ will no longer be able to assess acute exposures to aquatic communities from suspended sediment during flooding events. Depending on the intensity and duration of a flood event, the effects will vary. During flood events in the arid southwest, streams become excessively turbid

with suspended sediment originating from adjacent uplands within the watershed and from the stream channel itself. Excessive suspended sediment during flood events is a natural background condition in some watersheds statewide due to Arizona's unique soil types, topography, and intensity of precipitation events. While many of Arizona's native warm water fish species have evolved to withstand higher sediment loads for short durations, or longer durations, depending on the species, some of Arizona's native cold water species did not evolve with this capability. It is well documented that Arizona's uplands have been severely impacted by current and historical land uses such as timber harvest, livestock grazing, mining, and agriculture which liberate sediment in the uplands at an unnatural rate and at unnatural levels, and high sediment loads in these watersheds should not be considered as natural background. ADEQ's proposal to sample suspended sediment concentration at baseflow limits the ability to correlate suspended sediment concentrations during higher flows with the condition of the uplands, and the effects of various large-scale land uses over a watershed. This, in turn, does not provide ADEQ and other Municipal, County, State, and Federal land managers with data [provided in biannual 305(b) reports] to understand how and whether the land uses are contributing to the unnatural liberation of sediment. The Total Maximum Daily Load (TMDL) analysis for various reaches and their representative watersheds will be significantly limited by a lack of data, which might limit the ability to detect unnatural trends in sediment production.

Second, and somewhat interrelated in terms of the effects to aquatic species, ADEQ will not be required to assess the effects of excessive, unnatural suspended sediment concentrations in many of Arizona's intermittent streams. Intermittent streams may only flow continuously for a period of days or hours in response to precipitation, yet are habitat for many native aquatic species, including federally listed fishes considered in this document. Sampling protocols which require only sampling during baseflow conditions may effectively preclude intermittent waters from receiving environmental protections against acute exposure to excessive, unnatural suspended sediment liberated by non-functioning upland watersheds. Native fish use flowing intermittent channels to recolonize permanent or semi-permanent pool refugia upstream and downstream in drainages and will be adversely affected by the lack of monitoring during flood events. On non-tribal lands in Arizona, intermittent streams comprise 10.3% of the total stream miles as compared to 4% of the total stream miles classified as perennial. The remaining 85.7% of stream miles on non-tribal lands are classified as ephemeral[1] and are not considered suitable habitat for most species considered as "aquatic". These percentages illustrate the significant geographic scope of potential effects.

For example, watersheds which have experienced catastrophic wildfires are known to produce sediment at extremely high levels of runoff. However, the effects of acute exposure from this sediment may go unmeasured and will therefore not be addressed by land managers or ADEQ. In summary, ADEQ's proposed procedures for collecting suspended sediment concentration samples only during baseflow conditions will not provide sufficient information on catastrophic events,

[1] An ephemeral water is defined in rule as a surface water that has a channel that is at all times above the water table and that flows only in direct response to precipitation.

recovery times, and long-term trends in aquatic communities under ADEQ's jurisdiction.

Another concern about replacing the turbidity standard with a suspended sediment standard is the feasibility, cost, and convenience of sample collection. Turbidity samples are easily collected and analyzed as a field measurement using a turbidimeter, which is both convenient and inexpensive. However, a suspended sediment concentration sample can only be analyzed by a laboratory licensed for the specific analytical method. These analyses may be expensive, which could dissuade many would-be samplers from collecting usable data. The resulting inability of ADEQ to perform assessments of many surface water reaches, due to a lack of data otherwise generated by third parties, has an adverse effect because environmental protections to aquatic communities which otherwise may have been identified as impaired would be precluded.

ADEQ's primary basis for the proposed suspended sediment concentration standard (EIFAC 1965), established four ranges of SSC and described the relative effects that each range may have on the fish species evaluated. The first range, SSC of 0-25 mg/L, was categorized as a "high" level of protection. The second range, SSC of 25-80 mg/L, was categorized as a "moderate" level of protection. The third range, SSC of 80-400 mg/L, was categorized as a "Low" level of protection. The fourth range, SSC of >400 mg/L was categorized as a "Very Low" level of protection. As previously mentioned, ADEQ chose 80 mg/L in the upper tier of the "moderate" level of protection.

Effects of excessive suspended sediment can be independently assessed in different biotic communities and trophic levels within a given aquatic ecosystem. Mainly, these levels are represented by photosynthesizing plants (primary producers), macroinvertebrates (secondary producers and first order consumers), and fishes (both low and high level consumers) (Waters 1995). The effects of turbidity on stream biota are related to, but not always clearly distinguished from, the direct effects of suspended sediment (Dieter 1990). Waters (1995) cited the main sources of inorganic sediment as the erosion of uplands, lateral movement of (stream) channels in to streambanks, and the downcutting of streambeds. Due to the interconnected relationship among trophic levels and the subsequent interdependency of these trophic levels to each other and to their physical environment, analysis of the trophic hierarchy would be important in determining effects from sediment.

The photosynthetic community may consist of algae, mostly diatoms, which make up the periphyton on submerged substrate or rooted aquatic plants which sustain the grazing invertebrates (Waters 1995). The potential effects of sediment on aquatic plants include abrasion of periphyton by medium-sized particles such as sand, uprooting of macrophytes by larger particles, smothering of periphyton and rooted plants by heavy fine sediment deposition, and reduction by high turbidity of the light necessary for photosynthesis (Waters 1995). Clay-sized inorganic particles may pervade algal cells in periphyton by adhering to sticky surfaces, thus reducing the inorganic proportion in periphyton. This effectively reduces the food source for grazing invertebrates (Sloane-Richey et al. 1981, Graham 1990). Lloyd et al. (1987) developed a model relating the effects of turbidity to gross primary production that indicated that an increase in turbidity of 5-25 NTU would decrease gross primary productivity by up to 50%.

Effects from excessive sedimentation may also have consequences for amphibian species, such as the threatened Chiricahua leopard frog (*Rana chiricahuensis*). Threats to the Chiricahua leopard frog are known to include disease; drought; floods; degradation and loss of habitat as a result of water diversions and groundwater pumping, poor livestock management, mining, development, and environmental contamination; disruption of metapopulation dynamics; and increased chance of extirpation or extinction resulting from small numbers of populations (USFWS 2002b). Excessive sediment production from logging activities, catastrophic wildfires, prescribed fire, mining, and development can smother egg masses, reduce food availability for frog larvae, and fill-in pool habitats that would otherwise persist.

Some of the most pronounced effects from increased sedimentation of surface water in Arizona are to fish species, in particular Gila trout, Apache trout, spikedace, loach minnow, Little Colorado spinedace, Gila chub, and Sonora chub (Rixon 1905, Rich 1911, Duce 1918, Leopold 1921, Leopold 1924, USFWS 1975, 1979, 1984, 1986a, 1986b, 1986c, 1987b, 1993, 1994a, 1994b, 1994c, 2000, 2002c). The major threat to fish by sediment is to their reproductive success and loss of rearing habitat (Waters 1995). However, several categories of potential effects to fish from suspended sediment have been investigated including 1) avoidance behavior and in-stream distribution limitations; 2) reduced feeding and growth; 3) respiratory impairment; 4) reduced tolerance to disease and toxicants; and 5) physiological stress (Waters 1995). The majority of research allocated to the effects of sediment on fish have been focused on salmonid species. Nonetheless, some conclusions have wide-spread applications to all fish species, including native species of the arid southwestern U.S. ADEQ, in the preamble, cited the EIFAC (1965) paper which cited several ways in which excessive suspended sediment concentrations may adversely effect freshwater fish:

> 1) By acting directly on the fish swimming in water in which solids are suspended, and either killing them or reducing their growth rate, resistence to disease, etc.;
>
> 2) By preventing the successful development of fish eggs and larvae;
>
> 3) By modifying natural movements and migrations of fish; and
>
> 4) By reducing the abundance of food available to the fish.

Some attention should be given to the type of solids which may be in suspension at any one time. For example, basic salts of zinc have properties toxic to fish, and organic solids, oxidized by microorganisms, can reduce the availability of dissolved oxygen in water, effectively suffocating aquatic life (EIFAC 1965). In addition, water temperature may be altered from excessive sediment although this effect was not addressed in the EIFAC (1965) report. In laboratory tests, on acute lethality, Servizi and Martens (1991) observed that smaller fish (Coho salmon) were less tolerant of suspended sediment than were larger fish, and that tolerance to suspended sediment was greatest at some optimum temperature (7°C) than at lower temperatures (1°C) or higher temperatures (18°C). It is likely that sedimentation has similar effects to Arizona's small listed fish species as well. Newcome and Jenson (1996) noted that ill effects from suspended sediment

are greater in warm water than would be the case for the same fishes in seasonally-colder water. They attributed this to the temperature-related patterns of oxygen saturation of the water (cooler water holds more available oxygen than warmer water); and respiration rate and metabolic rate, both of which are higher in warmer water and thus increase the likelihood of gill abrasion from excessive suspended sediment (Newcome and Jenson 1996).

Excessive suspended sediment has an adverse affect to the reproductive capacity of fish by adhering to eggs which prevents adequate gas exchange (Stuart 1953) and by filling in the interstitial spaces in the substrate used by native fish eggs and developing larvae and adults of some species. For instance, loach minnow are bottom-dwelling inhabitants of shallow, swift water over gravel, cobble, and rubble substrates (Rinne 1989, Propst and Bestgen 1991). Loach minnow use the spaces between, and in the lee of, larger substrate for resting and spawning (Propst *et al*. 1988; Rinne 1989). It is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen 1991). Spikedace appear to prefer sand, gravel, and cobble substrates with low to moderate amounts of fine sediment and substrate embeddedness for spawning habitat (USFWS 2000). Gila and Apache trout, consistent with other North American salmonid species, require gravel and coarse sand for redd construction and reproduction (USFWS 1993). Another adverse effect from excessive suspended sediment is the ocular impairment incurred by fish like spikedace and loach minnow, which causes a delay in or prevention of locating mates for reproduction (USFWS 2002a).

Several sublethal effects have been documented to adversely affect fish. High suspended sediment concentrations have a sublethal effect on the growth rates of fish (Waters 1995). Spikedace and loach minnow, for example, suffer from reduced growth rates from the indirect effects of starvation incurred when excessive suspended sediment decreases the abundance, species diversity, and availability of prey as well as reducing visibility and their ability to forage successfully (USFWS 2002a). Waters (1995) also noted that suspended sediment minimizes the visual capability of foraging fish which leads, in turn, to reduced feeding and ultimately to depressed growth rates. Considered one of the more important sublethal effects, behavioral avoidance of fish to stream reaches may lead to long reaches or entire streams devoid of fish (Waters 1995).

To better assess the effects of various suspended sediment concentrations and durations of exposure of these concentrations on fish, Newcome and Jenson (1996) created a quantitative assessment of risk and impact to calculate what they referred to as the “severity of ill” effect (SIE). The SIE ranges on a scale from 0 through 14 and is calculated using the duration of exposure, the suspended sediment concentration, and the quantitative formula’s intercept and slope coefficients (Newcome and Jenson 1996). This SIE scale effectively creates four “decision categories” ranging from no effect through behavioral and sublethal effects to lethal effects (Newcome and Jenson 1996). Six individual equations were derived using a meta-analysis of 80 published and adequately documented fish responses to suspended sediment concentrations in various aquatic ecosystems (Newcome and Jenson 1996). These six derived equations relate to six taxonomic groups of lotic, lentic, and estuarine fishes, the life stages within those groups and, lastly, particle sizes of the suspended sediment (Newcome and Jenson 1996). Newcome and

Jenson (1996) defined these six groups as group 1) juvenile and adult salmonids (particle sizes of 0.5 - 250 µm); group 2) adult salmonids (particle sizes of 0.5 - 250 µm) which is a subset of group 1; group 3) juvenile salmonids (particle sizes of 0.5 - 75 µm) which is also a subset of group 1; group 4) eggs and larvae of salmonids and nonsalmonids (particle sizes of 0.5 - 75 µm); group 5) adult estuarine nonsalmonids (particle sizes of 0.5 - 75 µm) which is not applicable to Arizona surface waters; and group 6) adult freshwater nonsalmonids (particle sizes of 0.5 - 75 µm).

Analysis of the Dose-Response Database in the appendix to the Newcome and Jenson (1996) paper can provide additional insight into the effects of suspended sediment on fish. Fish species in groups 1, 2, 3, 4, and 6 (defined previously), when exposed to suspended sediment concentrations below 100 mg/L, displayed an array of effects (note: the proposed numeric standard for suspended sediment concentration in Arizona is 80 mg/L). These responses are outlined in the following table.

Table 5. Dose-response of fish exposed to suspended sediment (Newcome and Jenson 1996).

Species	Life Stage[1]	Exposure Concentration (mg/L)	Exposure Time (hours)	SIE[1]	Description of Effect	Reference
Trout	A	75	168	7	Reduced quality of rearing habitat	Slaney et al. (1977b)
Brown Trout	A	100	720	11	Population reduced	Scullion and Edwards (1980)
Rainbow Trout	A	66	1	3	Avoidance behavior manifested part of the time	Lawrence and Scherer (1974)
Trout	A	16.5	24	4	Feeding behavior apparently reduced	Townsend (1983): Ott (1984)
Brook Trout	A	4.5	168	3	Fish more active and less dependent on cover	Grandall and Swenson (1982)
Brown Trout	A	18	720	10	Abundance reduced	Peters (1967)
Cutthrout Trout	A	35	2	4	Feeding ceased; fish sought cover	Cordone and Kelly (1961)

[1] A = adult; E = egg; FF = young fry (<30 weeks old); FF* = older fry (>30 weeks old); J = juvenile; Y = approximate yearling

[1] Severity of ill effect (SIE)

Lake Trout	A	3.5	168	3	Fish avoided turbid areas	Swenson (1978)
Rainbow Trout	A	100	0.1	3	Fish avoided turbid water (avoidance behavior)	Suchanek et al. (1984a, 1984b)
Rainbow Trout	A	100	0.25	5	Rate of coughing increased	Hughes (1975)
Rainbow Trout	A	50	960	9	Rate of weight gain reduced	Herbert and Richards (1963)
Rainbow Trout	A	18	720	10	Abundance reduced	Peters (1967)
Rainbow Trout	A	59	2232	10	Habitat damage; reduced porosity	Slaney et al. (1977b)
Brook Trout	FF	12	5880	9	Growth rates declined	Sykora (1972)
Brook Trout	FF	24	5208	9	Growth rate reduced	Sykora (1972)
Brook Trout	FF*	100	1176	9	Test fish weighed 16% of controls	Sykora (1972)
Brook Trout	FF	50	1848	9	Growth rates declined	Sykora (1972)
Rainbow Trout	Y	90	456	10	Mortality rates 0-20%	Herbert and Merkens (1961)
Rainbow Trout	Y	90	456	10	Mortality rates 0-15%	Herbert and Merkens (1961)
Rainbow Trout	E	6.6	1152	11	Mortality rate 40%	Slaney et al. (1977b)
Rainbow Trout	E	57	1488	12	Mortality rate 47% (controls 32%)	Slaney et al. (1977b)
Rainbow Trout	E	20.8	1152	13	Mortality rate 72%	Slaney et al. (1977a)
Rainbow Trout	E	46.6	1152	14	Mortality rate 100%	Slaney et al. (1977b)
Fish (warm water)	A	22	8,760 (1 year)	12	Fish populations destroyed	Menzel et al. (1984)

The above table indicates possible adverse effects to Arizona's native listed fish, in particular Gila and Apache trout (salmonid species), from suspended sediment concentrations which are less than

the proposed standard of 80 mg/L and during much shorter durations of exposure. Given that ADEQ has proposed a numeric standard of 80 mg/L, it is reasonable to assume that harmful suspended sediment concentrations may persist for long periods of time, if not in perpetuity, without triggering the need for corrective action based on a determined exceedance of this proposed standard.

Relatively few suspended sediment concentration data have been collected in Arizona, with even less data collected in Gila and/or Apache trout habitat. Consequently, little is known about what SSC levels exist in Arizona streams and how those levels may be affecting aquatic communities. However, a study conducted by the U.S. Forest Service Rocky Mountain Research Station examined water quality in a livestock grazing allotment monitoring study (Medina and Steed 2002). Medina and Steed (2002) examined various water quality parameters in the assessment of riparian function along three streams (at two sites per stream) in the West Fork Allotment, on the Apache-Sitgreaves National Forest (Medina and Steed 2002). The three streams were Boggy Creek, Centerfire Creek, and Wildcat Creek and all are currently occupied by Apache trout (Medina and Steed 2002). The water quality parameters collected for this study consisted of pH, specific conductance, dissolved oxygen, turbidity, temperature, and suspended sediment concentration. The suspended sediment concentration data was collected from 1994 through 1996 during the spring and summer months of each year with the exception of Wildcat Creek which was only sampled in 1995 and 1996 (Medina and Steed 2002).

A summary of suspended sediment concentration data for the West Fork Allotment was provided in Medina and Steed (2002) (Table 6). Note: Due to the precision of laboratory balances used in 1995 and 1996 for the weighing of filtered sediment, suspended sediment concentrations less than 5 parts per million (ppm) generally could not be quantified and hence were recorded as ‘t’ (trace). Sample collected in 1994 were quantified using a more accurate balance and could be quantified in values less than 5 ppm.

Table 6. Summary of suspended sediment data for Boggy, Centerfire and Wildcat Creeks on the West Fork Allotment: 1994 - 1996. Note: All values are in ppm. Traditional units of value for suspended sediment data is mg/L which is equivalent to ppm.

Sampling Location	1994			1995			1996		
	Mean	Median	Range	Mean	Median	Range	Mean	Median	Range
Boggy Creek (Lower Site)	136	96	0.3 - 1040	118	62	t - 970.0	63	15	t - 244.5
Boggy Creek (Upper Site)	135	41	0.4 - 740	67	28	t - 782.4	31	10	t - 481.5
Centerfire Creek (Lower Site)	61	3	0.2 - 670	58	30	t - 1061.4	33	28	t - 282.5
Centerfire Creek (Upper Site)	82	20	0.2 - 690	70	33	t - 593.5	47	22	t - 359.1
Wildcat Creek (Lower Site)				73	27	t - 237.7	32	10	t - 269.8
Wildcat Creek (Upper Site)				157	28	t - 2241.7	82	69	t - 384.0

Further analysis of suspended sediment concentration data generated by Medina and Steed's (2002) work indicates the proposed suspended sediment concentration standard of 80 mg/L is being exceeded in Apache trout streams, at a minimum. It should be noted that Medina and Steed (2002) used an automated sampler at each sample site to collect two suspended sediment concentration samples daily (March through October, annually) which, in turn, combined them as a single composite sample per day for subsequent analysis. Therefore, individual suspended sediment concentration sample data are not available from this study. However, during baseflow conditions (pre-monsoon and at periods of low flow during Arizona's monsoon) the flow at the time each of the two individual daily samples were collected was consistent. This allows the reasonable inference that a composite sample value is representative of a corresponding individual sample value.

The term "baseflow" has yet to be officially defined by ADEQ for use in regulatory programs but is generally considered to represent the static, low-flow conditions of a given stream which are not under the influence of a precipitation event. Using this concept, periods with baseflow conditions were identified for samples collected in 1995 and 1996 in all three streams referenced immediately above (Medina and Steed 2002). In 1995, a total of 379 composite suspended sediment concentration samples were collected during baseflow conditions which represents the total number of samples at two locations in each of the three streams. Of the 379 samples, 91 samples were identified at values exceeding the proposed standard of 80 mg/L. The sample results that were above the standard ranged considerably, with a maximum baseflow suspended

sediment concentration of 2,241.7 ppm which occurred on June 2, 1995 in Wildcat Creek. In 1996, a total of 471 composite suspended sediment concentration samples were collected during baseflow conditions which represents the total number of samples at two locations in each of the three streams. Of the 471 samples, 106 samples were identified at values exceeding the proposed standard of 80 mg/L. The sample results that were above the standard ranged considerably, with a maximum baseflow suspended sediment concentration of 306.3 ppm which occurred on June 10, 1996, again in Wildcat Creek. Given that land use practices will remain the same, we anticipate similar conditions to continue under the proposed action.

ADEQ has just begun to collect both turbidity and suspended sediment samples simultaneously to determine any correlation between these two parameters. Currently, it is unknown exactly how these two parameters relate to one another which further increases the uncertainty of ADEQ's proposal to replace the turbidity standards with a suspended sediment concentration of 80 mg/L. We support ADEQ's argument that using turbidity as a parameter to assess sediment in surface water may be insufficient; however, we cannot support a WQS change from one method to another without correlative data to show that the new method and/or new standard is protective.

We expect adverse affects to be incurred by non-salmonid fish species listed in Appendix 1, and their critical habitat, as well as the Chiricahua leopard frog. We are reasonably certain that incidental take of Gila and Apache trout will occur, in particular, through a reduction of reproduction and foraging success, increased behavioral stress, injury (from gill abrasion), and potential mortality. Thus, we do not concur with EPA's determination that the proposal for a numeric suspended sediment concentration standard of 80 mg/L may affect, but is not likely to adversely affect the fish species listed in Appendix 1, the Chiricahua leopard frog or their associated critical habitats.

We do, however, concur with EPA's determination that the remaining species (plant species, avian species, amphibian species) listed in Appendix 1 or their critical habitat may be affected, but are not likely to be adversely affected by ADEQ's proposal to repeal the numeric turbidity standards for replacement by a numeric suspended sediment concentration standard of 80 mg/L. Furthermore, we find the proposal for a numeric suspended sediment concentration standard of 80 mg/L is not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub, but will continue the impairment to Gila chub and its proposed critical habitat associated with excessive sedimentation.

R18-11-110. Salinity Standards for the Colorado River

The EPA is proposing to approve ADEQ's proposal to incorporate by reference the Colorado River Basin Salinity Control Forum's plan of implementation to ensure compliance with their own numeric criteria for salinity. These salinity standards, specific to the Colorado River mainstem, provide criteria for three designated monitoring stations along the Colorado River. The EPA believes that such an incorporation by ADEQ will enhance Arizona's salinity control program and, therefore, concluded that this proposal may affect, but is not likely to adversely affect the species

listed in Appendix 1, or adversely modify any critical habitat. We concur with these determinations using the same rationale provided by EPA. Furthermore, we find ADEQ's proposal to incorporate these implementation standards is not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub.

R18-11-112. Unique Waters

ADEQ currently defines a unique water as "a surface water that ADEQ has determined to be an outstanding state resource water" and provides two criteria for which such a water can be designated. These criteria are:

> 1) The surface water is of exceptional recreational or ecological significance because of its unique attributes, including but not limited to attributes related to geology, flora, fauna, water quality, aesthetic values, or wilderness characteristics of the surface water, or
>
> 2) threatened or endangered species are known to be associated with the surface water and the existing quality is essential to the maintenance and propagation of a threatened or endangered species, or the surface water provides critical habitat for a threatened or endangered species.

Once a surface water is designated by ADEQ as unique, it is afforded strict protections under the antidegradation rule, otherwise known as Tier 3 protection. Pursuant to A.R.S. R18-11-107(d), tier 3 protection ensures that "existing water quality shall be maintained that is classified as unique water under R18-11-112. The Director (of ADEQ) shall not allow limited degradation of a unique water under [R18-11-107(c)]". Generally speaking, surface waters are designated as unique by a nomination, review, and decision process conducted by ADEQ. ADEQ is proposing to further clarify what waters can be designated as unique by prescribing more specific eligibility criteria.

Of particular interest in ADEQ's proposed revisions to the unique waters rule is their decision to remove intermittent waters from eligibility as unique waters. This proposal effectively eliminates 9,365 miles of Arizona's intermittent surface waters from ever being considered in future nominations as unique water. This limitation, in conjunction with the other nomination criteria including the requirement for a surface water to be in a "free-flowing condition" (e.g. free from impoundments, diversions, channelization, rip-rapping, or other hydrological modifications within the nominated surface water reach), significantly reduces the candidacy of the vast majority of Arizona's surface waters from being nominated as unique waters.

As stated previously, intermittent waters comprise approximately 73% of Arizona's aquatic and riparian (non-ephemeral) habitats which support a large array of aquatic and riparian associated species. With the exception of Arizona's few currently perennial waters, natural intermittent waters represent the natural, unaltered state of most surface water in Arizona and are critically important as habitat to both federally listed and non-listed species. We believe that the species listed in Appendix 1 (except the Sonora tiger salamander) and the associated critical habitat will

incur adverse effects if intermittent waters are precluded from the additional environmental protections otherwise afforded by unique waters designation and the associated antidegradation rule.

However, in EPA correspondence dated August 22, 2003, EPA officially withdrew this amendment from consultation citing the fact that EPA does not have discretion regarding this proposed amendment. Specifically, the August 22, 2003, letter stated "EPA strongly encourages states to adopt procedures and to designate ONRWs. However, this is neither a statutory nor regulatory requirement. As such, while we (EPA) take action to approve a state's procedures for designating ONWRs, we do not promulgate such requirements if a state fails to do so." In consideration of the above, potential incidental take to federally listed species as a result of this amendment is not included in this biological opinion and incidental take statement.

R18-11-113. Effluent Dependent Waters

Site-specific standard for the Rio de Flag

ADEQ is proposing to adopt a site-specific standard of 36 µg/L of copper for the Rio de Flag using a water effects ratio method approved by EPA. A bioassessment was conducted to assess whether this site-specific standard for copper could bioaccumulate in invertebrate or fish species that may be present in this specific reach (USEPA 2002). Results from this bioassessment concluded that copper was not bioaccumulating in fish or benthic insects. Furthermore, the data suggested that species which may prey on fish or benthic insect species from the Rio de Flag would not ingest more copper than they would otherwise in natural background conditions. Finally, in a letter dated October 5, 1999, we concurred that the National Pollutant Discharge Elimination System permit issued to the Rio de Flag wastewater treatment plant (which included copper limits equivalent to the site-specific standard proposed for copper) may affect, but will not likely adversely affect, federally listed species. For these reasons, we concur with EPA's determination of may affect, not likely to adversely affect, for the listed species listed occurring in Rio de Flag, nor adversely modify their critical habitat.

R18-11-114. Mixing Zones

R18-11-114(B). Deletion of Acute Toxicity Demonstration in Application

ADEQ is proposing to delete language in their mixing zone applications which requires the demonstration that acute toxicity will not result in a mixing zone. As defined in the preamble, a mixing zone is "a limited area or volume of water where initial dilution of a discharge takes place and where numeric water quality criteria may be exceeded in a receiving water." ADEQ believed that previous language suggested that acute toxicity criteria must be met at the "end-of-pipe" and hence, ADEQ would not be able to establish a mixing zone for an acute toxicity criterion. With this amendment, ADEQ will be able to establish a zone of initial dilution (ZID), within a mixing zone, where it is permissible to exceed an acute toxicity standard. This revision is consistent with EPA's guidance on mixing zones and every permit request for a ZID would be reviewed

independently by ADEQ for adherence to the guidance criterion under the recent EPA-authorized Arizona Pollutant Discharge Elimination System Program. The criteria for which mixing zones are allowed includes the following, as written in the Preamble:

1) The mixing zone does not impair the integrity of the surface water as a whole;

2) there is no lethality to organisms passing through a mixing zone; and

3) there are no significant human health risks, considering the likely exposure pathways.

Previously, ADEQ did not authorize mixing zones where concentrations of pollutants within the proposed mixing zone will cause acute toxicity to aquatic life. Essentially, and as stated previously, this meant that pollutant concentrations had to meet the acute toxicity standard at the end of the pipe. The worst case scenario with respect to this rule was a relatively small area of habitat impacted by a given pollutant in concentrations which may exceed the chronic toxicity standard. The emphasis on this scenario is the size of the area affected. ADEQ's previous mixing zone rule provides more environmental protections than ADEQ's proposed alternative.

ADEQ's proposal to allow a ZID for a pollutant which does not meet the chronic toxicity standard nor the acute toxicity standard is less protective for two reasons. First, the ZID will allow a portion of surface water habitat to exceed acute toxicity standards when, under ADEQ's previous rule, the effluent would exceed only chronic toxicity standards at the end of pipe. In the WQS, acute toxicity is defined as "toxicity involving a stimulus severe enough to induce a response rapidly. In aquatic toxicity tests, an effect observed in 96 hours or less is considered acute."

Secondly, the amount of habitat that will exceed chronic toxicity standards will be considerably larger due to the fact that pollutants will be discharged in higher concentrations and that more volumetric area will be required for adequate dilution. This issue is of particular importance. Mixing zones are legally authorized, if approved under permit, in any water that is not classified as ephemeral. This designation implies that mixing zones may be authorized in intermittent waters where flows are much less consistent and are more vulnerable to dewatering from groundwater pumping, diversions, and drought. The net effect of dewatering is a significant reduction in available habitat, regardless of the habitat's condition. Mixing zones, in particular ADEQ's proposal to allow a ZID, further reduces the amount of habitat available to fish and other aquatic species. ADEQ's proposal to allow for a ZID offers less environmental protections than the previous mixing zone rule.

However, and as stated previously, a permit reviewer assesses an application for a mixing zone and ZID independently as conditions vary in different pollutants and receiving waters. At a minimum, the permit reviewer examines the assimilative capacity (physical, chemical, and biological characteristics) of the receiving water and discharge as well as the potential impacts to the aquatic ecosystem, protection of human health, and the receiving water's designated uses.

In consideration of the points addressed above, we believe that adverse effects will be incurred by all species listed in Appendix 1 (except the Sonora tiger salamander) and their associated critical habitat if ADEQ's proposal will allow for a ZID in mixing zones where these species occur. Although we do not know the magnitude, duration, or frequency of mixing zone use, we do know that conditions in the ZID will likely disrupt normal behavior of any organism in the ZID, and may impair long-term health and/or feeding opportunities. We do not believe the affects incurred by this proposal are likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub, although gila chub may be negatively affected if a mixing zone is authorized in its habitat.

R18-11-114(D) Additional Factors to Consider in Reviewing a Mixing Zone Application

ADEQ deleted parts ~~D~~ and ~~E~~ of R18-11-114 and rewrote them as Part D. which added two factors for consideration when ADEQ reviews a mixing zone permit application. These factors include 1) an assessment of the assimilative capacity of the receiving water; and, 2) the location of drinking water plant intakes and public swimming places. These additions effectively strengthen environmental protections; consequently, we concur with EPA's determination that ADEQ's proposed amendment incorporated in Part D. is not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat. We also find that EPA's determination that ADEQ's proposed amendment incorporated in Part D. is not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub.

R18-11-114(E) Reasons for Denial of a Mixing Zone Permit Request

ADEQ is proposing to delete "concentrations of pollutants within the proposed mixing zone will cause acute toxicity to aquatic life" as a reason for mixing zone permit denial. This deletion was proposed by ADEQ to remain consistent with the proposed amendments concerning ZIDs within mixing zones, as previously discussed. We believe that adverse effects will be incurred by all species listed in Appendix 1 (except the Sonora tiger salamander) and their associated critical habitat if the species occurs in a mixing zone, from ADEQ's proposal to dismiss the exceedance of the acute toxicity standard as a reason for denial of a mixing zone permit application. However, we do not believe the affects incurred by this proposal are likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub. (Please see discussion under "R18-11-114(B). Deletion of Acute Toxicity Demonstration in Application", above.)

R18-11-114(K) Prohibition of Persistent Bioaccumulative Pollutants of Concern in Mixing Zones

ADEQ is proposing to add Part K. to the mixing zone rule to prohibit the discharge of bioaccumulative pollutants of concern in mixing zones. Specifically, this amendment prohibits the discharge of chlordane, DDT and its metabolites, dieldrin, endrin, endrin aldehyde, heptachlor,

heptachlor epoxide, lindane, mercury, polychlorinated biphenols (PCBs), dioxin, and toxaphene. Due to the persistent nature of these compounds and their relative toxicity as a bioaccumulant, discharge by dilution is not appropriate and is therefore prohibited in mixing zones.

ADEQ's addition of Part K. to the mixing rule enhances environmental protections for aquatic ecosystems. Therefore, we concur with EPA's determination that ADEQ's proposed addition of Part K. to the mixing zone rule is not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat, as we believe this change will benefit listed species. We also find that EPA's determination that ADEQ's proposed addition of Part K. to the mixing zone rule is not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub.

R18-11-115. Nutrient Waivers

ADEQ is proposing to repeal its nutrient waiver provision due to the functional overlap with the already existing variance provisions which effectively serve the same purpose. Additionally, the variance provisions for nutrients, unlike the nutrient waiver, have requirements that dischargers take corrective action to control the discharge of nutrients even if treatment upgrades are technically and economically feasible. The term "nutrients" collectively implies the constituents nitrogen and phosphorus.

Considering the fact that there is no net reduction in environmental protections concerning the discharge of nutrients into surface waters and that ADEQ is simply eliminating unnecessary overlap within the WQS, we concur with EPA's determination that ADEQ's proposed deletion of the nutrient waiver from the WQS rule is not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat. We also find that EPA's determination that ADEQ's proposed deletion of the nutrient waiver from the WQS rule is not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub.

R18-11-121 Schedules of Compliance

R18-11-121 describes the schedules of compliance for AZPDES dischargers to surface water in meeting new and/or revised water quality standards in AZPDES permits. Specifically, this rule was revised to allow the establishment of a compliance schedule for a new point source discharge and a recommencing point source discharge. ADEQ has described in the preamble the limited conditions when a compliance schedule is allowed. According to the preamble, a "new point source" means "a point source, the construction of which commences after the effective date of a water quality standard". "Commencement of construction" means "that the owner or operator of the point source has obtained the federal, state, and local approvals or permits necessary to begin physical construction of the point source and either 1) an on-site physical construction has begun; or, 2) the owner or operator has entered into a contract for physical construction of the point source and the contract cannot be cancelled or modified without substantial loss". "Substantial

loss" means in excess of 10% of the total cost incurred for physical construction." For new point source discharges, the permit may allow a compliance schedule only when necessary to allow a reasonable opportunity to attain compliance with a new or revised water quality standard that is issued or revised after commencement of construction but less than three years before commencement of the relative discharge. For recommencing point source discharges, the permit may allow a reasonable opportunity to attain compliance with requirements issued or revised less than three years before recommencement of a discharge. Both of these conditions, which allow for a compliance schedule are consistent with EPA regulations.

It is possible that a receiving water may not be attaining its designated uses due to one or more narrative or numeric WQS that are not being met. It is reasonable to assume that this scenario will occur given the potential for various land uses to generate non-point source pollutants which affect Arizona's surface waters. The proposed compliance schedules would exacerbate these deleterious water quality conditions when new point source discharges and recommencing point source discharges are allowed to occur, in non-compliance with WQS, for any period of time. Of additional importance, schedules of compliance may apply to any constituent which has a new or revised standard, whether or not the constituent is bioaccumulative.

In consideration of the points addressed above, we believe the species listed in Appendix 1 (with exception to the Sonora tiger salamander) and their critical habitat will incur adverse affects from the ADEQ's incorporation of a compliance schedule for point source discharges if they are permitted where these species or critical habitat occurs. We do not believe ADEQ's incorporation of a compliance schedule for point source discharges is likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub.

R18-11-122(A)3. and (F)7. Variances

ADEQ's variance provision allows for temporary, pollutant-specific non-compliance from a water quality standard for individual dischargers. ADEQ specifically amended the variance provision to include a factor for consideration when granting a variance to be consistent with Federal regulations under 40 CFR §131, Water Quality Standards. This new factor for consideration applies when "human-caused conditions or sources of pollution prevent attainment of the water quality standard and cannot be remedied within the next five years".

As written in the Preamble, "ADEQ reconsidered one of the grounds for a use attainability analysis (UAA) that ADEQ believes may be used to support a variance. One of the grounds for a UAA is '...human-caused conditions or sources of pollution prevent the attainment of the water quality standard and cannot be remedied, or would cause more environmental damage to correct than leave in place.' There may be situations where human-caused conditions or sources of pollution prevent the attainment of a water quality standard and they cannot be remedied in the short-term (that is, within five years), but the water quality standard may be ultimately attainable. For example, a TMDL strategy may be implemented that is designed to achieve compliance with a water quality standard or implementation of a remediation program may result in attainment.

However, the time line for achieving compliance with the water quality standard may be longer than five years. Under such circumstances, it may be appropriate to grant a variance to a point source discharger."

In consideration of the basic premise of a variance (allowance for pollutant discharge in excess of water quality standards) and the fact that ADEQ is proposing to effectively broaden the scope of applicability (addition of a reason to grant a variance) for variances with this amendment to the WQS, we expect adverse affects to be incurred by those species listed in Appendix 1 and their critical habitat (with the exception for the Sonora tiger salamander). We do not believe this proposal is likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub, although negative impacts to these species may occur if the species occurs in the area where a variance is authorized.

R18-11-123 Prohibition Against Discharge

ADEQ's rules prohibit discharges of wastewater and other human wastes into specific water bodies. ADEQ specifically added a new provision to these rules which prohibits the discharge of human body wastes and wastes into Lake Powell from toilets and other receptacles intended to receive or retain those wastes on a vessel.

Because this revision effectively strengthens environmental protections for Lake Powell, we concur with EPA's determination that ADEQ's proposed prohibition against discharges of these wastes to Lake Powell is not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat and will benefit listed species using Lake Powell. We also find that EPA's determination that ADEQ's proposed prohibition against discharges of these wastes to Lake Powell is not likely to jeopardize the nonessential experimental populations of the California condor or the Colorado pikeminnow, or the proposed Gila chub, or adversely modify proposed critical habitat for the chub.

Appendix B to Water Quality Standards - List of Surface Waters and Designated Uses

Appendix B to ADEQ's surface water quality standards rules lists the designated uses ascribed to each water body identified by ADEQ. Such designated uses include Aquatic and Wildlife cold, warm, effluent-dependent, and ephemeral, Full Body Contact, Partial Body Contact, Domestic Water Source, Fish Consumption, Agricultural Irrigation, and Agricultural Livestock Watering. It has become necessary for ADEQ to amend these use designations for certain water bodies where conditions have changed since the last triennial review or where rule amendments require.

These amendments to Appendix B were necessary to ensure that the appropriate designated uses apply to the appropriate surface water bodies. Designated uses are important in providing environmental protections applicable to Arizona's highly variable surface waters. However, the assignment of designated uses to particular surface water reaches does not include the

consideration of whether listed species are present. The various amendments to Appendix B improve the applicability of designated uses for these waters. We concur with EPA's determination that ADEQ's proposed amendments to Appendix B are not likely to adversely affect the species listed in Appendix 1, or adversely modify their critical habitat, with one exception. This exception applies to surface water bodies that were resegmented based on the 5,000 foot elevation contour and were thus changed from A&Wc to A&Ww. This particular amendment to Appendix B was determined by EPA to have no effect to species listed in Appendix 1 of this document or their critical habitat and thus will not be evaluated further here. For additional discussion of this topic, please see the above discussion under "Definition # 7 'Aquatic and Wildlife cold water fishery' and #10 'Aquatic and Wildlife warm water fishery' ". With respect to the nonessential experimental populations of the California condor or the Colorado pikeminnow, and the proposed Gila chub, we find that EPA's determination that ADEQ's proposed amendments to Appendix B are not likely to jeopardize these species or adversely modify proposed critical habitat for the Gila chub.

Summary

Table 7 summarizes our findings on your various effects determinations.

Table 7. Summary of effects determinations. EPA concluded their approval of ADEQ's proposed amendments to the WQS were not likely to adversely affect species listed in Appendix 1 or adversely modify proposed Gila chub critical habitat. Note: our biological opinion on species we believe will likely be adversely affected is found in the conclusion section below.

ADEQ Rule Amendments	Further Discussion	FWS Effects Evaluation
R18-11-101 Definitions #7 & #10	Page 39	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
R18-11-101 Definition #21	Page 40	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
R18-11-109(E)	Page 41	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
R18-11-109(D)	Page 41	1. Nonsalmonid fish species listed in Appendix 1and Chiricahua leopard frog: **Adverse Effect** 2. Gila Trout / Apache Trout: **Incidental Take** 3. Critical habitat for fish species listed in Appendix 1: **Adverse Effect** 4. Remaining species listed in Appendix 1and their critical habitat not specifically listed in item 1,2, and 3 above: **Concurrence**
R18-11-110	Page 52	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
R18-11-113	Page 54	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**

R18-11-114(B)	Page 54	Species listed in Appendix 1: **Adverse Effect (except Sonora tiger salamander)** Critical Habitat: **Adverse Effect**
R18-11-114(D)	Page 56	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
R18-11-114(E)	Page 56	Species listed in Appendix 1: **Adverse Effect (except Sonora tiger salamander)** Critical Habitat: **Adverse Effect**
R18-11-114(K)	Page 56	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
R18-11-115	Page 57	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
R18-11-121	Page 57	Species listed in Appendix 1: **Adverse Effect (except Sonora tiger salamander)** Critical Habitat: **Adverse Effect**
R18-11-122(A)3. & R18-11-122(F)7.	Page 58	Species listed in Appendix 1: **Adverse Effect (except Sonora tiger salamander)** Critical Habitat: **Adverse Effect**
R18-11-123	Page 59	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**
Appendix B	Page 59	Species listed in Appendix 1: **Concurrence** Critical Habitat: **Concurrence**

For further clarification regarding our analysis of possible adverse affects to the Sonora tiger salamander, we concluded that adverse affects from the proposed action are not expected to occur due to the limited distribution of the species and the type of habitat it currently occupies. Specifically, the Sonoran tiger salamander occurs, with limited distribution, in the San Rafael Valley of extreme south-central Arizona. Additionally, occupied habitat for the species consists of a small number of livestock tanks which are unlikely to be affected by the proposed revisions to the WQS.

Cumulative Effects

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

There are many private, State, and local actions that are reasonably certain to occur in the future which have the potential to affect the species listed in Appendix 1 and their critical habitats. We are concerned that future, non-Federal actions may lead to impacts that will contribute to a continual decline in these species from the current status as dicussed in the Environmental Baseline.

However, there are also many future non-Federal actions which may improve the environmental baseline and, in turn, benefit the species listed in Appendix 1 and their critical habitats. For example, significant ecological benefits have been observed through the implementation of environmental grant awards administered by ADEQ and the Arizona Department of Water Resources (ADWR). Both ADEQ's Water Quality Improvement Grant Program and ADWR's Water Protection Fund grant program provide funding for on-the-ground projects as a benefit to some of Arizona's impacted surface waters. The projects implemented under these grant programs strive to mitigate the specific environmental stressors which impair a particular water body and are important to preserving the ecological integrity of these surface waters.

Conclusion

After reviewing the current status of all the species and critical habitats listed in Appendix 1 which are adjacent to, or dependent on, surface waters in non-tribal lands in Arizona, the environmental baseline for Arizona's non-tribal lands, the effects of the proposed amendments to the water quality standards under the current triennial review, and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the species listed in Appendix 1, and is not likely to destroy or adversely modify designated critical habitat. Experimental nonessential populations, and the proposed Gila chub will not be jeopardized; nor will its proposed critical habitat be destroyed or adversely modified.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is defined (50 CFR §17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR §17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Any measures described below are non-discretionary, and must be implemented by the EPA 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. EPA has a continuing duty to regulate the activity covered by this incidental take statement. If EPA (1) does not 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, and/or (2) does not retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse, as applicable. In order to monitor the impact of incidental take, the EPA must report the progress of the action and its impact on the species to the FWS as specified in the Conservation Measures above.

As stated earlier in this document, we expect adverse effects to the species listed in Appendix 1, with the exception of the Sonora tiger salamander, from the proposed amendments to the WQS concerning the use of mixing zones, schedules of compliance, and variances. However, because of the uncertainty of constituents likely to be involved and where they would be discharged, we can not determine with reasonable certainty that take would occur. We anticipate that protections may result from the implementation of the mutually agreed upon "elevation procedure" under the National MOA (see previous discussion under "Definition # 7 'Aquatic and Wildlife cold water fishery' and #10 'Aquatic and Wildlife warm water fishery'" above), which provides that mixing zone permit applications may be individually consulted upon under section 7 of the Act where federally listed species may be jeopardized. At a minimum, FWS and ADEQ have agreed to early coordination in the permit review process to help minimize potential adverse effects to listed species.

However, due to 1) the significant potential for direct and indirect adverse affects of excessive sedimentation of surface water to aquatic species discussed above (see page 20); 2) the truncated sampling protocols (sampling only during baseflow conditions) proposed for this specific standard; 3) the limited and dated literature used in the development of the 80 mg/L standard with no trial period conducted or proposed; 4) the likely reduction of environmental protections afforded to surface water ecosystems by resource management agencies which are dependent upon suspended sediment data which may no longer be made available; and 5) additional factors described previously in this document, we are reasonably certain that incidental take of Apache trout and Gila trout is likely to occur from the approval and implementation of the proposed numeric suspended sediment concentration of 80 mg/L. Sublethal exposures to suspended sediment concentrations will significantly impair essential behavioral patterns including feeding, sheltering, breeding, or immune response.

Amount or Extent of Take

We anticipate incidental take of Gila and Apache trout will be difficult to detect, particularly when the species are wide-ranging or occur in remote and relatively inaccessible locations. Additionally, finding a dead or impaired specimen is unlikely following lethal or sublethal exposures due to factors such as scavenging and/or rapid decomposition in an aquatic environment. Losses may also be masked by seasonal fluctuations in numbers or other causes, (e.g., oxygen depletions for aquatic species). As a surrogate measure of take, the authorized level of incidental take of Gila and/or Apache trout will be assumed to have been exceeded if the implementation of the SSC standard correlates with observed effects to Gila and/or Apache trout habitat, including increased water temperature or the reduction in pools and channel depth, and/or

results in documented reduced survival or productivity and such effects can be attributed, at least in part, to the effects of the presence of suspended sediment.

If, during the course of the action, the amount or extent of the incidental take anticipated is exceeded, EPA must reinitiate consultation with us immediately to avoid violation of section 9. Actions associated with any additional taking must be stopped in the interim period between the initiation and completion of the new consultation if it is determined that the impact of the additional taking will cause an irreversible and adverse impact on the species, as required by 50 CFR 402.14(i). An explanation of the causes of the taking must be provided to us.

Effect of the Take

In this opinion, we determined this level of anticipated take is not likely to result in jeopardy to any listed species.

Reasonable and Prudent Measures / Terms and Conditions

No reasonable or prudent measures are proposed for this Incidental Take Statement. The Conservation Measures proposed above are believed to adequately minimize the effects of take of Gila and Apache trout from the implementation of the proposed action.

Disposition of Dead or Injured Listed Species

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

CONSERVATION RECOMMENDATIONS

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

1. We recommend that EPA conduct or fund research on the effects of suspended sediment concentration of native fish species of the arid southwestern United States.

2. We recommend that EPA increase its funding for Water Quality Improvement Grants in Arizona and emphasize the award of such grants in reaches occupied by federally listed species or reaches which are proposed or designated as critical habitat.

3. We recommend that EPA continue to encourage and support coordination, early and often, between the State of Arizona, this office, and EPA Region IX for all issues concerning implementation of the CWA and potential effects to listed species under the National MOA and the implicit elevation procedures therein.

REINITIATION NOTICE

This concludes formal consultation on the proposed WQS amendments as outlined in the BE (EPA 2002). As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

We look forward to continuing to work with both EPA and ADEQ in the recovery and conservation of listed species and critical habitat. We believe the triennial review process, in cooperation with EPA and ADEQ, is an important factor in improving both the water quality in Arizona and the coordination efforts among agencies. If we can be of further assistance in this matter, please contact Jeff Servoss (x237) or Debra Bills (x239).

Sincerely,

/s/ Steven L. Spangle
Field Supervisor

cc: Regional Director, U.S. Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
Project Leader, Pinetop Fisheries Office, Pinetop, AZ (Attn: Mary Jo Stegman)
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Bob Broscheid, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
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Chief Conservation Officer, Chemehuevi Tribe, Havasu Lake, AZ

Director, Environmental Office, Cocopa Tribe, Somerton, AZ
Colorado River Indian Tribes, Parker, AZ
Director, Environmental Department, Fort McDowell Yavapai Nation, Fountain Hills, AZ
Ranger, Wildlife Conservation, Fort Mojave Indian Tribe, Needles, CA
Director, Land and Water, Gila River Indian Community, Sacaton, AZ
Director, Natural Resources Department, Havasupai Tribe, Supai, AZ
Director, Department of Natural Resources, Hualapai Nation, Peach Springs, AZ
Manager, Natural Resources Department, Hopi Tribe, Kykotsmovi, AZ
Director, Fish and Wildlife Department, Kaibab Band of the Paiutes, Fredonia, AZ
Director, Fish and Wildlife, Navajo Nation, Window Rock, AZ
Manager, Cultural and Environmental Department, Salt River Pima-Maricopa Indian Tribe, Scottsdale, AZ
Director, Wildlife and Recreation, San Carlos Apache Tribe, San Carlos, AZ
Director, Natural Resources, Tohono O'odham Tribe, Sells, AZ
Planner, Tonto Apache Tribe, Payson, AZ
Wildlife and Outdoor Recreation, White Mountain Apache Tribe, White River, AZ
Director, Environmental Protection Department, Yavapai Apache Tribe, Camp Verde, AZ
Environmental Protection Specialist, Yavapai-Prescott Tribe, Prescott, AZ
Director, Game and Fish Department, Quechan Tribe, Yuma, AZ
Coordinator, Water Rights, San Juan Southern Paiute Tribe, Tuba City, AZ

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Appendix 1: List of federally-listed or federally-proposed species and critical habitat in, adjacent to, or dependent on surface waters in Arizona considered in this biological opinion.

	Status	Common Name	Scientific Name	Critical Habitat	Species Type
1	Endangered	Canelo Hills ladies'-tresses	*Spiranthes delitescens*	No	Plant
2	Endangered	Huachuca water umbel	*Lilaeopsis schaffneriana ssp. recurva*	Yes	Plant
3	Threatened	Navajo sedge	*Carex specuicola*	Yes	Plant
4	Threatened	Apache trout	*Onchorhynchus apache*	No	Fish
5	Threatened	Beautiful shiner	*Cyprinella formosa*	Yes	Fish
6	Endangered	Bonytail chub	*Gila elegans*	Yes	Fish
7	Endangered Section 10(J)	Colorado white salmon (pikeminnow)	*Ptychocheilus lucius*	No	Fish
8	Endangered	Desert pupfish	*Cyprinodon macularius*	Yes	Fish
9	Proposed	Gila chub	*Gila intermedia*	Proposed	Fish
10	Endangered	Gila topminnow	*Poeciliopsis occidentalis occidentalis*	No	Fish
11	Endangered	Gila trout	*Onchorhynchus gilae*	No	Fish
12	Endangered	Humpback chub	*Gila cypha*	Yes	Fish
13	Threatened	Little Colorado spinedace	*Lepidomeda vittata*	Yes	Fish
14	Threatened	Loach minnow	*Tiaroga cobitis*	Yes	Fish
15	Endangered	Razorback sucker	*Xyrauchen texanus*	Yes	Fish
16	Threatened	Sonora chub	*Gila ditaenia*	Yes	Fish
17	Threatened	Spikedace	*Meda fulgida*	Yes	Fish
18	Endangered	Virgin River chub	*Gila robusta seminuda*	Yes	Fish
19	Endangered	Woundfin	*Plagopterus argentissmus*	Yes	Fish
20	Threatened	Yaqui catfish	*Ictalurus pricei*	Yes	Fish
21	Endangered	Yaqui chub	*Gila purpurea*	Yes	Fish
22	Endangered	Yaqui topminnow	*Poeciliopsis occidentalis sonoriensis*	No	Fish
23	Threatened	Bald eagle	*Haliaeetus leucocephalus*	No	Bird

24	Endangered	Brown pelican	*Pelecanus occidentalis californicus*	No	Bird
	Status	**Common Name**	**Scientific Name**	**Critical Habitat**	**Species Type**
25	Endangered	Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	Proposed	Bird
26	Endangered Section 10(J)	California condor	*Gymnogyps californicus*	No	Bird
27	Endangered	Southwestern willow flycatcher	*Empidonax trailli extimus*	No	Bird
28	Endangered	Yuma clapper rail	*Rallus longirostris yumanensis*	No	Bird
29	Threatened	Chiricahua leopard frog	*Rana chiricahuensis*	No	Amphibian
30	Endangered	Sonora tiger salamander	*Ambystoma tigrinum stebbensi*	No	Amphibian

Appendix 2. General Species Information (Current as of August 2003)

1) CANELO HILLS LADIES' TRESSES
(*Spiranthes delitescens*)

STATUS: Endangered (62 FR 665, January 6, 1997) without critical habitat.

SPECIES DESCRIPTION: A slender, erect member of the orchid family (Orchidaceae). Flower stalk is about 50 cm (20 in) tall. Plants have 5-10 linear- lanceolate grass-like leaves, 18 cm (7 in) long and 1.5 cm (0.6 in) wide, which grow basally on the stem. The spike (flower stalk) may contain up to 40 white flowers, borne in a spiral on the stem.

HABITAT: Finely grained, highly organic, saturated soils of cienegas. Plants occur intermixed with tall grasses and sedges at an elevation of approximately 1,524 m (5,000 ft).

RANGE: Current: Known from five sites in the San Pedro River watershed in Cochise and Santa Cruz counties.
Potential: Because most southern Arizona cienegas have been thoroughly searched, the possibility of locating new populations in the state is low. However, habitat in New Mexico and Mexico needs to be surveyed.

REASONS FOR DECLINE/VULNERABILITY: Small number of known populations, a habitat type that is rare and declining, and small population sizes make this species vulnerable to extinction. Threats include livestock grazing, improper fire management, competition with aggressive non-native plants, water impoundments or diversion, and groundwater pumping.

LAND MANAGEMENT/OWNERSHIP: Tonto and Coronado National Forests and private lands.

NOTES: Protected by the Arizona Native Plant Law.

2) HUACHUCA WATER UMBEL
(*Lilaeopsis schaffneriana ssp. recurva*)

STATUS: Endangered (62 FR 3, January 6, 1997) with critical habitat (64 FR 37441, July 12, 1999).

SPECIES DESCRIPTION: A herbaceous semi-aquatic perennial in the parsley family (Umbelliferae) with slender erect leaves that grow from the nodes of creeping rhizomes. The leaves are segmented, hollow cylinders, and are 1-3 mm (0.04-0.12 in) in diameter, but their length can vary from 2.5-22.9 cm (1-9 in), depending on the depth of the water. Tiny 3- to 10-flowered umbels arise from root nodes. The inflorescence is 1.25-5.0 cm (0.5-2.0 in) long and is always shorter than the stems.

HABITAT: Cienegas and associated vegetation within Sonoran desertscrub, grassland or oak woodland, and conifer forest between 1,210-1,970 m (4,000-6,500 ft). L. schaffneriana ssp. recurva seems to require an intermediate level of flooding frequency to keep competition manageable, but populations can be destroyed when floods are too frequent and intense. Plants are found in unshaded or shaded sites. They require perennial water, gentle stream gradients, small to medium-sized drainage areas, and (apparently) mild winters. Usually found in water depth from 5-15 cm (2-6 in), but occasionally in 25 cm (10 in).

RANGE: Current: A number of disjunct localities in Santa Cruz, Cochise, and Pima Counties, Arizona, and Sonora, Mexico.
Potential: Wherever habitat conditions are met in southeastern Arizona or northern Mexico.

REASONS FOR DECLINE/VULNERABILITY: Wetland habitats are rare and declining in the southwest. Threats include watershed degradation due to livestock grazing and development, trampling by livestock, diversion of water and dewatering of habitats, and flash flooding.

LAND MANAGEMENT/OWNERSHIP: Coronado National Forest, San Bernardino National Wildlife Refuge, Bureau of Land Management, Fort Huachuca Military Reservation, and private.

NOTES: Protected by the Arizona Native Plant Law and as a Forest Service Sensitive Species. Critical habitat includes 83.2 kilometers (51.7 miles) of streams or rivers in Cochise and Santa Cruz Counties, Arizona. The following general areas are included in the critical habitat: Sonoita Creek, Santa Cruz River, Scotia Canyon, Sunnyside Canyon, Garden Canyon, Lone Mountain Canyon, Rattlesnake Canyon, Bear Canyon, and 54.2 km (33.7 mi) of the Upper San Pedro River.

3) NAVAJO SEDGE
(*Carex specuicola*)

STATUS: Threatened (50 FR 19370, May 8, 1985) with critical habitat.

SPECIES DESCRIPTION: A member of the sedge family (Cyperaceae), this grass-like plant reaches a height of 25.4-40.6 cm (10-16 in). Numerous stems grow from a rhizome (underground stem), giving each plant a clumped form. Each plant has both male and female flowers, the male flowers occurring only on the ends of stems and the female flowers occurring below the male flowers or in spikes on the sides of stems.

HABITAT: Seep-springs on vertical cliffs of pink-red Navajo sandstone at 1,740-1,830 m (5,700-6,000 ft) elevation. These drainages are spectacular examples of the deep, sheer-walled canyons of the Colorado Plateau geographic region. The plant community inhabiting the vertical seeps includes monkey flower and orchid.

RANGE: Current: Formerly known only from a few localities in the Navajo Creek drainage (Cococino County), recent surveys have documented Navajo sedge in other drainage systems in Apache and Navajo Counties. Navajos living in the Navajo Creek area recall the presence of Navajo sedge in areas where it is not found today. Recently, a population was found in San Juan County, Utah.
Potential: Surveys for this species are incomplete. Navajo sedge might be located in the general regional area of Arizona and Utah, in seep-springs on canyon walls of Navajo sandstone or other similar eolian sandstone formations.

REASONS FOR DECLINE / VULNERABILITY: The specialized and limited available habitat make this species vulnerable to threats, including livestock grazing and trampling (at accessible sites) and the potential for habitat loss due to underground water pumping.

LAND MANAGEMENT / OWNERSHIP: Navajo Nation.

NOTES: Recovery Plan approved 1987. A copy of the recovery plan is available online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/Navajo%20Sedge%20RP.pdf.
Critical habitat is on the Navajo Nation in Cococino County and contains three groups of springs near Inscription House Ruins (see 50 FR 19370 for details).
Protected by the Arizona Native Plant Law and the Navajo Nation.

4) APACHE TROUT
(*Oncorhynchus apache*)

STATUS: Threatened (40 FR 29864, July 19, 1975) without critical habitat.

SPECIES DESCRIPTION: This yellow or yellow-olive cutthroat-like trout has large dark spots on its body. Its dorsal, anal, and caudal fins are edged with white. It has no red lateral band.

HABITAT: Occurs in small, cold, high-gradient streams above 1,524 m (5,000 ft) elevation. These streams have substrates consisting of boulders, rocks, and gravel, with some sand or silt, and flow through mixed conifer forests and mountain meadows.

RANGE: Historic: Headwater streams of the Black, White, San Francisco, and Little Colorado rivers in the White Mountains of eastern Arizona.
Current: Species found in Apache, Gila, Graham, Greenlee, and Navajo counties.
Restricted to streams in the upper Salt, Gila, Blue, and Little Colorado drainages in the White Mountains. Approximately 30 sites are known to support natural or reintroduced populations on the White Mountain Apache Indian Reservation and the Apache-Sitgreaves National Forests. Populations introduced outside the historic range may still exist on the Coronado National Forest and the northern portion of the Kaibab National Forest.

REASONS FOR DECLINE/VULNERABILITY: Hybridization with introduced rainbow and cutthroat trout, predation and competition by introduced fishes, and habitat degradation.

LAND MANAGEMENT/OWNERSHIP: U.S. Forest Service and White Mountain Apache Reservation.
NOTES: Recovery Plan completed in August 1979 and revised in 1983. A second revision is currently in progress.
Originally listed as endangered in 1967.
A breeding stock is maintained at Alchesay Williams Creek National Fish Hatchery near Whiteriver, Arizona.
Genetic purity of some populations is in question.
Special regulations allow Arizona to manage this species as a sport fish.
De-listing of the Apache trout can be proposed when all known natural stocks are replicated and all threats that initiated protection through listing under the Endangered Species Act of 1973 are adequately addressed. Delisting could be initiated as early as 2003 if recovery criteria are met.
Listed as a Species of Special Concern by the State of Arizona.

5) BEAUTIFUL SHINER
(*Cyprinella formosa*)

STATUS: Threatened with critical habitat (49 FR 34490, August 31, 1984) .

SPECIES DESCRIPTION: This fish is a small (6.3 cm (2.5 in) long) shiny minnow and is similar to the common red shiner in appearance. Males are very colorful when exhibiting breeding color (yellow-orange or orange on caudal and lower fins, with a bluish body).

HABITAT: This species occurs mainly in small to medium streams with sand, gravel, and rock bottoms below 1,371 m (4,500 ft) elevation. It is also found in artifical ponds.

RANGE: Historic: The fish occurred in the Rios Yaqui, Casas Grandes, Santa Maria, and Santa Clara drainages in Sonora and Chihuahua, Mexico; the Rio Yaqui (San Bernardino Creek/Black Draw Creek) in Arizona; and the Mimbres River in New Mexico.
Current: Extirpated from the United States in 1968, but is still found in much of its historical range in Mexico. A refugium population was established at San Bernardino National Wildlife Refuge in southeastern Arizona (Cochise County) in 1990.
Potential: The extent of the Mexican populations is poorly documented. Populations may be found in the Bustillos and Bavicora basins in Chihuahua, Mexico.

REASONS FOR DECLINE/VULNERABILITY: This shiner is threatened by habitat destruction and modification and impacts from non-native aquatic species.

LAND MANAGEMENT/OWNERSHIP: Sole reintroduced United States population is on San Bernardino National Wildlife Refuge from stock collected in Mexico.

NOTES: A Recovery Plan was completed in March 1995 and is available online at http://arizonaes.fws.gov/Documents/RecoveryPlans/YaquiFishes.pdf. Critical habitat includes all aquatic habitats (except Leslie Creek) of San Bernardino NWR.
Dexter National Fish Hatchery in Dexter, New Mexico, is currently rearing beautiful shiners in anticipation of future reintroductions into the Mimbres River.
Listed as a Species of Special Concern by the State of Arizona.

6) BONYTAIL CHUB
(*Gila elegans*)

STATUS: Endangered (45 FR 27710, April 23, 1980) with critical habitat (59 FR 13374, March 21, 1994.)

SPECIES DESCRIPTION: This large [averaging 30-36 cm (12-14 in) and achieving 61 cm (24 in) in length] minnow is characterized by a small head, large fins, slightly humped back, and a long, thin caudal peduncle.

HABITAT: Found in slower water habitats in the mainstream such as eddies, pools, side channels, and coves. They are found in streams below 1,219 m (4,000 ft) elevation.

RANGE: Historic: Endemic to the Colorado River basin and found throughout the mainstem rivers and backwaters of the Upper and Lower Basins.
Current: Rarest of the Colorado River fishes and close to extinction. The last natural population is found in Lake Mohave. Hatchery-produced and cove-reared bonytails have been stocked into Lakes Havasu and Mohave (La Paz and Mohave counties, Arizona). Both reservoirs have ongoing reintroduction efforts using Lake Mohave stock.

REASONS FOR DECLINE/VULNERABILITY: Modification of original river conditions by dam construction, flow depletion from irrigation and other uses, hybridization with other Gila species, and the introduction of non-native fishes. Adult populations exist in reservoirs; however, recruitment under these circumstances is not sufficient to sustain the population.

LAND MANAGEMENT/OWNERSHIP: In Arizona: National Park Service, Bureau of Reclamation, U.S. Fish and Wildlife Service, Arizona State University, and private groups.

NOTES: Recovery Plan completed in May, 1984 and revised in September, 1990. A copy of the recovery plan is available online at:
http://arizonaes.fws.gov/Documents/RecoveryPlans/Bonytail%20Chub%201984.pdf
Critical habitat encompasses the Colorado River from Hoover Dam to Davis Dam and another section of the Colorado River from the northern boundary of Havasu National Wildlife Refuge to Parker Dam including Lake Havasu in Mohave County, Arizona. Additional critical habitat is located in Colorado, Utah, Nevada, and California.
Captive populations are currently being reared at Willow Beach and Dexter National Fish

Hatcheries. Bonytails are stocked annually into Lake Mohave and Lake Havasu.
Listed as a Species of Special Concern by the State of Arizona.

7) COLORADO PIKEMINNOW
(*Ptychocheilus lucius*)

STATUS: Endangered (32 FR 4001, March 11, 1967) with critical habitat (59 FR 13374, March 21, 1994). Experimental nonessential populations in Salt and Verde rivers (50 FR 30194; July 24, 1985).

SPECIES DESCRIPTION: The largest American minnow [up to 1.8 m (6 ft) long and 36 kg (80 lbs)]. Dusky-green in color and slender bodied with gold flecks on the dorsal surface. Head is long and slender with a large mouth.

HABITAT: Rivers with high silt content, warm water, turbulence, and variable flow by season under 1,219 m (4,000 ft) in elevation. Adults are migratory and inhabit pools and eddies just outside of the main current, while young are found in backwater areas.

RANGE: Historic: Endemic to the Colorado River and its major tributaries in Arizona, New Mexico, Utah, Colorado, and Wyoming.
Current: Extirpated from the Gila River and Colorado River south of Lake Powell.
The last known naturally occurring specimen from Arizona was collected in 1969. Small populations exist in the Colorado, Green, Yampa, San Juan, and Gunnison rivers in Utah and Colorado. Experimental nonessential populations have been reintroduced into the Verde and Salt rivers in Yavapai and Gila counties, Arizona.

REASONS FOR DECLINE/VULNERABILITY: Alteration of river conditions and loss of habitat caused by dam construction, irrigation dewatering, and channelization; and the introduction of exotic competitive and predatory fish species.

LAND MANAGEMENT/OWNERSHIP: In Arizona: U.S. Forest Service, the State of Arizona, Tribal lands, and private.

NOTES: Formerly known as “Colorado Squawfish.” A Recovery Plan was approved in March 1978 and revised in August 1991. A draft revision is currently available for comment (September, 2001).
Populations are maintained at Dexter National Fish Hatchery and by the Arizona Game and Fish Department at Bubbling Springs State Fish Hatchery.
No critical habitat designated within Arizona.
The species is also known as Colorado white salmon. Formerly known as Colorado squawfish.
Listed as a Species of Special Concern by the State of Arizona.

8) DESERT PUPFISH
(*Cyprinodon macularius*)

STATUS: Endangered (51 FR 10842, March 31, 1986) with critical habitat.

SPECIES DESCRIPTION: A small fish (5 cm (2 in) long) with a smoothly rounded body shape and narrow, vertical dark bars on the sides. Breeding males are blue on the tops and sides, and have yellow fins. Females and juveniles have tan to olive colored backs and silvery sides. Two subspecies are recognized: the desert pupfish (Cyprinodon macularius macularius) and the Quitobaquito pupfish (Cyprinodon macularius eremus), but may be recognized as separate species.

HABITAT: Found in shallow water of desert springs, small streams, and marshes below 1,515 m (5,000 ft) elevation. The species tolerates high salinities and high water temperatures.

RANGE: Historic: Once common in desert springs, marshes, backwaters, and tributaries of the Rio Sonoyta, San Pedro River, Santa Cruz River, lower Gila River, and lower Colorado River drainages in Arizona, California, and Mexico.
Current: Restricted to three natural populations in California and the nonnatural irrigation drains around the Salton Sea. Also found in restricted locations in Sonora and Baja California, Mexico. One natural population still occurs in Quitobaquito Spring and Pond in Pima County and reintroductions have been made in Pima, Pinal, Maricopa, Graham, Cochise, La Paz, and Yavapai counties, Arizona. New introductions continue.

REASONS FOR DECLINE/VULNERABILITY: Impacts include the introduction and spread of exotic predatory and competitive fishes, water impoundment and diversion, water pollution, stream channelization, and habitat modification.

LAND MANAGEMENT/OWNERSHIP: Organ Pipe Cactus National Monument, the States of Arizona and California, the Bureau of Land Management, the U.S. Forest Service, and private.

NOTES: Critical habitat includes Quitobaquito Spring and pond in Pima County, Arizona; and portions of San Felipe Creek, Carrizo Wash, and Fish Creek Wash in Imperial County, California.
A Recovery Plan was completed in September 1993.
A number of populations are maintained in captivity, including one at Dexter National Fish Hatchery in Dexter, New Mexico. Reintroductions are planned for the lower Gila and Colorado River drainages.
Listed as a Species of Special Concern by the State of Arizona.

9) Gila chub
(*Gila intermedia*)

STATUS: Proposed endangered with critical habitat (67 FR 51948, August 9, 2002).

SPECIES DESCRIPTION: The Gila chub is a small-finned, deep-bodied, chubby (chunky) member of the minnow family (Cyprinidae). It is dark colored (sometimes lighter on belly) with diffuse lateral band(s) that are rarely present. Adult males average about 150 mm (6 in) in total length; females can exceed 200 mm (8 in).

HABITAT: Gila chub commonly inhabit pools in smaller streams, cienegas, and artificial impoundments ranging in elevation from 609 to 1,069 m (2,000 to 3,500 ft). Common riparian plants associated with these populations include willow (Salix spp.), tamarisk (Tamarix spp.), cottonwoods (Populus spp.), seep-willow (Baccharis glutinosa), and ash (Fraxinus spp.). Typical aquatic vegetation includes watercress (Nasturtium officianale), horsetail (Equisetum spp.), rushes (Juncus spp.), and speedwell (Veronica anagallis-aquatica). Gila chub are highly secretive, preferring quiet deeper waters, especially pools, or remaining near cover including terrestrial vegetation, boulders, and fallen logs. Adults are often found in deep pools and eddies below areas with swift currents. Young-of-the-year inhabit shallow water among plants or debris, while older juveniles use higher velocity stream areas.

RANGE: Historic: The Gila chub's historic range likely included suitable habitat throughout the entire Gila River basin, except the Salt River drainage above Roosevelt Lake.
Current: Gila chub have been recorded in approximately 30 rivers, streams, and spring-fed tributaries throughout the Gila River basin in New Mexico, northern Sonora, Mexico, and central and southeastern Arizona (Cochise, Coconino, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai counties, Arizona).

REASON FOR DECLINE/VULNERABILITY: Approximately 85-90 percent of the Gila chub's habitat has been degraded or destroyed, and much of it is unrecoverable. Today, much of the remaining Gila chub habitat is still extensively grazed, current mining operations still operate in its watersheds, increased recreation use adds to habitat degradation, and the introduction of nonnatives adds to habitat degradation. Only 29 populations of Gila chub remain; all but one are small, isolated, and threatened.

LAND MANAGEMENT/OWNERSHIP: Fifty-nine percent of the land supporting all of the extant populations occur on Bureau of Land Management and U.S. Forest Service lands. Other ownership includes the San Carlos Apache Indian Tribe, Arizona State Land Department, the Audubon Society, the Nature Conservancy, and multiple private landowners.
Proposed critical habitat encompasses approximately 208 stream miles with the Gila River Basin. Critical habitat includes portions of the Gila, San Francisco, Babocomari, San Pedro, Santa Cruz, Upper Verde, and Agua Fria rivers, and some of their tributaries, in Cochise, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai counties in Arizona. Proposed critical habitat also occurs in New Mexico.

10) GILA TOPMINNOW
(*Poeciliopsis occidentalis occidentalis*)

STATUS: Endangered (32 FR 4001, March 11, 1967) without critical habitat.

SPECIES DESCRIPTION: A small (2.5-5 cm (1-2 in) long), guppy-like, live-bearing fish (which lacks dark spots on its fins). Breeding males are jet black with yellow fins.

HABITAT: Occurs in small streams, springs, and cienegas below 1,350 m (4,500 ft) elevation, primarily in shallow areas with aquatic vegetation and debris for cover. Can tolerate relatively high water temperatures and low dissolved oxygen.

RANGE: Historic: One of the most common fish found throughout the Gila River drainage in Arizona. Also extended into Mexico and New Mexico.
Current: Occurs only in Mexico and Arizona. In Arizona, most of the remaining native populations are in the Santa Cruz River system. Species occurs in small streams, springs, and cienegas in Gila, Pinal, Graham, Yavapai, Santa Cruz, Pima, Maricopa, and La Paz counties.

REASONS FOR DECLINE/VULNERABILITY: Impacts include the introduction and spread of nonindigenous predatory and competitive fishes, water impoundment and diversion, water pollution, groundwater pumping, stream channelization, and habitat modification.

LAND MANAGEMENT/OWNERSHIP: U.S. Forest Service, Bureau of Land Management, the States of Arizona and New Mexico, the San Carlos Apache Indian Reservation, and private.

NOTES: A Recovery Plan was approved in March 1984, with a revision currently in progress. A copy of the recovery plan is available online at http://ifw2es.fws.gov/Library/ListDocs.cfm?Topic=Endangered+Species&Section=EndangeredSpecies
The species is currently being reared at over 100 locations for reestablishment into numerous sites in Arizona. The Gila topminnow has been released at almost 200 locations in efforts to reestablish populations.
Is a subspecies of the Sonoran topminnow.
Listed as a Species of Special Concern by the State of Arizona.

11) GILA TROUT
(*Oncorhynchus gilae*)

STATUS: Endangered (32 FR 4001, March 11, 1967) without critical habitat.

SPECIES DESCRIPTION: A deep-bodied trout with fine, profuse black spotting on its body and dorsal and adipose fins. Adults are golden- to greenish-yellow in color. Dorsal, anal, and pelvic fins are edged in white.

HABITAT: Found in small, high mountain streams at an elevation of approximately 1,524 to 3,048 m (5,000 to 10,000 ft). Feeds on insects and occasionally small fish.

RANGE: Historic: Occurred in the Verde River and its tributaries in Gila and Greenlee counties, Arizona, and in the headwater streams of the Gila and San Francisco rivers in New Mexico. Gila trout was extirpated from Arizona around 1900, but has recently been repatriated. Current: Fish stocked into Dude Creek (Gila County) in September 1999 and Raspberry Creek (Greenlee County) in November 2000. An introduced population previously existed in Gap Creek (Yavapai County) in Prescott National Forest in Arizona, but has also been extirpated. In New Mexico, populations are still found in several creeks.

REASONS FOR DECLINE/VULNERABILITY: Impacts include loss of habitat, hybridization with introduced rainbow trout, and predation by exotic brown trout.

LAND MANAGEMENT/OWNERSHIP: Apache-Sitgreaves and Tonto National Forests (Arizona) and Gila (New Mexico) National Forests.

NOTES: A Recovery Plan was completed in January 1979, revised in January 1984 and December 1993, and is currently being redrafted. A copy of the 1993 Recovery Plan is available online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/Gila%20Trout%201993.pdf Listed as a Species of Special Concern by the State of Arizona.

12) HUMPBACK CHUB
(*Gila cypha*)

STATUS: Endangered (32 FR 4001, March 11, 1967) with critical habitat (59 FR 13374, March 21, 1994)

SPECIES DESCRIPTION: Fairly large (less than 51 cm (20 in) long) minnow characterized by a narrow, flattened head and long fleshy snout, large fins, and a very large hump between the head and the dorsal fin.

HABITAT: Occurs in a variety of riverine habitats, especially canyon areas with fast current, deep pools, and boulder habitat. Generally found in habitats below 1,219 m (4,000 ft) in elevation.

RANGE: Historic: Endemic to the Colorado River Basin from below Lake Mead to Flaming Gorge on the Green River, Wyoming, and the Yampa River, Colorado. Their historic distribution in the Colorado River Basin is uncertain.
Current: The species occurs in the Grand Canyon and Marble Canyon (Coconino County, Arizona) portions of the mainstream Colorado River (Mohave County, Arizona) and in the lower Little Colorado River. It also is found in portions of the Colorado and Green rivers of Utah and Colorado as well as portions of the Yampa River in Colorado.

REASONS FOR DECLINE/VULNERABILITY: Alteration of historic habitat caused by dam construction and operation, water diversion, and channelization; competition with and predation by exotic fishes; and hybridization with other Gila species.

LAND MANAGEMENT/OWNERSHIP: In Arizona: National Park Service, Navajo Reservation, and Hualapai Reservation.

NOTES: A Recovery Plan was approved in August 1979 and revised in May 1984 and September 1990. A copy of the recovery plan can be found online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/Humpback%20Chub%201990.pdf
Critical habitat for the humpback chub is designated for portions of the Colorado, Green, and Yampa Rivers in the Upper Basin and the Colorado and Little Colorado Rivers in the Lower Basin in Colorado, Utah, and Arizona.
Listed as a Species of Special Concern by the State of Arizona.

13) LITTLE COLORADO SPINEDACE
(*Lepidomeda vittata*)

STATUS: Threatened with critical habitat (52 FR 35054, September 16, 1987).

SPECIES DESCRIPTION: A small (less than 10 cm (4 in) long) silvery minnow which is darker on the back than the belly. Feeds on aquatic invertebrates.

HABITAT: Inhabits medium to small streams and is characteristically found in pools with water flowing over fine gravel and silt-mud substrates. Many of the streams are seasonally intermittent, at which times the Little Colorado spinedace persists in the deep pools and spring areas that retain water. During flooding the spinedace redistributes itself throughout the stream. Spawning primarily occurs in early summer, but some spawning continues until early fall. Typical habitat ranges in elevation from 1,219 to 2,438 m (4,000-8,000 ft).

RANGE: Historic: Endemic to the upper portions of the Little Colorado River and its northflowing permanent tributaries on the Mogollon Rim and the northern slopes of the White mountains in eastern Arizona.
Current: Found in East Clear Creek and its tributaries (Coconino County),
Chevelon and Silver Creeks (Navajo County), and Nutrioso Creek and the Little Colorado River (Apache County).

REASONS FOR DECLINE/VULNERABILITY: Habitat destruction from impoundment, dewatering, riparian destruction, and other watershed disturbances; use of fish poisons; and the introduction and spread of exotic predatory and competitive fish species.

LAND MANAGEMENT/OWNERSHIP: Apache-Sitgreaves National Forests, Arizona Game and Fish Department, Bureau of Land Management, Coconino National Forest, Navajo Nation, State of Arizona, and private.

NOTES: A Recovery Plan was finalized in January 1998 and is available online at http://arizonaes.fws.gov/Documents/RecoveryPlans/Spinedace.pdf.
Critical habitat includes eighteen miles (29 km) of East Clear Creek in Coconino County; eight miles (13 km) of Chevelon Creek in Navajo County; and five miles (8 km) of Nutrioso Creek in Apache County.
Listed as a Species of Special Concern by the State of Arizona.

14) LOACH MINNOW
(*Tiaroga cobitis*)

STATUS: Threatened (51 FR 39468, October 28, 1986) with critical habitat (65 FR 24331, April 25, 2000).

SPECIES DESCRIPTION: A small (less than 8 cm (3 in) long), slender, elongated fish. Olive colored, with dull white spots at the base of the dorsal and caudal fins. Breeding males develop vivid red-orange markings.

HABITAT: Bottom dweller of small to large perennial creeks and rivers, typically in shallow turbulent riffles with cobble substrate, swift currents, and filamentous algae. Found below 2,438 m (8,000 ft) elevation. Recurrent flooding is instrumental in maintenance of quality habitat.

RANGE: Historic: Once common throughout much of the Gila River system north of Phoenix, Arizona, including the Gila, Blue, Tularosa, White, Verde, Salt, San Pedro, and San Francisco rivers in Arizona and New Mexico.
Current: Present populations are geographically isolated and inhabit the upstream ends of their historic range. The species persists in Arizona only in limited reaches in White River (Gila County), North and East forks of the White River (Navajo County), Aravaipa Creek (Graham and Pinal counties), San Francisco and Blue rivers and Campbell Blue Creek (Greenlee County). A population was discovered in the Black River in June 1996.
Potential: Undiscovered populations may exist in un-sampled Gila basin streams.

REASONS FOR DECLINE/VULNERABILITY: Habitat destruction due to damming, channel alteration, riparian zone destruction, channel down-cutting, water diversion and groundwater pumping; and the introduction and spread of exotic predatory and competitive fish species.

LAND MANAGEMENT/OWNERSHIP: In Arizona: U.S. Forest Service, White Mountain Apache Indian Tribe, Bureau of Land Management, The Nature Conservancy, and private.

NOTES: A Recovery Plan was completed in September 1991. A copy of the recovery plan is available online at:
http://arizonaes.fws.gov/Documents/RecoveryPlans/Loach%20Minnow%201991.pdf
Critical habitat includes portions of the Gila, San Francisco, Blue, Black, Verde, and San Pedro rivers, and some of their tributaries, in Apache, Cochise, Gila, Graham, Greenlee, Pima, Pinal,

and Yavapai counties in Arizona. Critical habitat rule with maps is available online at: http://arizonaes.fws.gov/Documents/CriticalHabitat/SpikedaceCH.pdf.
Listed as a Species of Special Concern by the State of Arizona.

15) RAZORBACK SUCKER
(*Xyrauchen texanus*)

STATUS: Endangered (56 FR 54957, October 23, 1991) with critical habitat (59 FR 13379, March 21, 1994).

SPECIES DESCRIPTION: The head is flattened on top and the body is stout with olivebrown above to yellowish on the belly. A long, high, sharp-edged keel-like hump is found behind the head. The head and tail are quite dark in breeding males. Can grow to 0.9 m (3 ft) in length and over 2.7 kg (6 lbs.) in weight.

HABITAT: Found in backwaters, flooded bottomlands, pools, side channels and other slower moving habitats under 1,829 m (6,000 ft) elevation. Historically found in areas near strong currents.

RANGE: Historic: Endemic to the Colorado River Basin. Formerly occurred in all major rivers and larger streams in the Basin and was once the most widespread and abundant of the Basin's big-river fishes.
Current: In the Lower Basin, populations isolated to Lakes Mohave, Mead, and the lower Colorado River below Havasu. In the Upper Basin, small remnant populations are found in the Green, Yampa, and mainstream Colorado rivers. Also found in the San Juan River near the New Mexico-Utah border. The species is found in parts of Greenlee, Mohave, Pinal, Yavapai, Yuma, La Paz, Maricopa, Gila, Coconino, and Graham counties Arizona.

REASONS FOR DECLINE/VULNERABILITY: Alteration of river conditions and loss of habitat caused by dam construction, irrigation dewatering and channelization; and introduction of exotic fish species, such as black bullhead, carp, and channel catfish.

LAND MANAGEMENT/OWNERSHIP: NPS, USFWS, Bureau of Reclamation, Colorado River Indian Tribes, Hualapai, Fort Mohave, USFS including Coconino, Prescott and Tonto; tribal owners include Fort Apache and San Carlos; the states of Arizona, California, Nevada, and private landowners.

NOTES: A Recovery Plan was finalized in December 1998 and is available online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/Razorback%20Sucker.pdf. A draft revision is currently available for comment (September, 2001).
Critical habitat includes parts of the Yampa, Greene, Duchesne, White, Colorado, San Juan, Gila, Salt, and Verde rivers. Also includes Lake Mohave and Lake Mead.
Currently, populations are being reared at Willow Beach and Dexter National Fish Hatcheries, and Bubbling Ponds State Fish Hatchery. Reintroductions have been done in the Gila, Salt, and

Verde rivers. The Colorado River Indian Tribe hatchery and the Bureau of Reclamation are important components in an ongoing program to replace the aging population in Lake Mohave, restore the Lake Havasu population, and increase the lower river populations.
Listed as a Species of Special Concern by the State of Arizona.

16) SONORA CHUB
(*Gila ditaenia*)

STATUS: Threatened with critical habitat (51 FR 16042, April 30, 1986).

SPECIES DESCRIPTION: Member of the minnow family (Cyprinidae). A moderately chubby, dark-colored fish less than 12.5 cm (5 in) long, with two prominent black lateral bands on the sides and a dark oval spot at the base of the tail. Breeding males have red lower fins and a somewhat orange belly. Feeds on insects and algae.

HABITAT: Perennial and spatially intermittent small to moderately sized streams. It prefers pools near cliffs, boulders, or other cover in stream channels. Found at an elevation of approximately 1,189 m (3,900 ft).

RANGE: Historic: Same as current.
Current: Found in the Rio de la Concepción drainage, Mexico, and in Sycamore Creek and Peñasco Canyon in the Atascosa Mountains as well as California Gulch in Santa Cruz County, Arizona.

REASONS FOR DECLINE/VULNERABILITY: Loss and modification of habitat, the introduction and spread of exotic predatory and competitive fishes, and hybridization with an undescribed chub in Mexico.

LAND MANAGEMENT/OWNERSHIP: U.S. Forest Service, Coronado National Forest.

NOTES: A Recovery Plan was completed in September 1992 and is available online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/Sonora%20Chub%201992.pdf
Critical habitat is located in Santa Cruz County, Arizona, and includes Sycamore Creek and a 15 m (50 ft) buffer from the United States-Mexico border approximately 8 km (5 miles) upstream; Yanks Spring; the lowermost 2 km (1.25 miles) of Peñasco Creek; and the lowermost 0.4 km (0.25 miles) of an unnamed Sycamore Creek Tributary.
Listed as a Species of Special Concern by the State of Arizona.

17) SPIKEDACE
(*Meda fulgida*)

STATUS: Threatened (51 FR 23769, July 1, 1986) with critical habitat (65 FR 24339, April 25, 2000).

SPECIES DESCRIPTION: A small (7.6 cm (3 in) long), slim fish with silvery sides and a "spine" on the dorsal fin. Breeding males are a brassy golden color.

HABITAT: Found in moderate to large perennial streams, where it inhabits moderate to fast velocity waters over gravel and rubble substrates. Specific habitat consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at downstream riffle edges. Recurrent flooding helps the spikedace maintain its competitive edge over invading exotic species. Typically occupied streams are found under 1,829 m (6,000 ft) in elevation.

RANGE: Historic: Once common throughout much of the Gila River drainage above Phoenix, Arizona, including the Gila, Verde, Agua Fria, Salt, San Pedro, and San Francisco rivers in Arizona.
Current: In Arizona, populations are found in the middle Gila River, lower San Pedro River, Aravaipa Creek, Eagle Creek, and the Verde River within Graham, Pinal, Greenlee, Yavapai, Apache, Cochise, Gila, Navajo, and Pima counties. In New Mexico, the spikedace is found in the lower end of West, East, and Middle forks of the Gila River.
Potential: Undiscovered populations may exist in unsampled Gila basin streams.

REASONS FOR DECLINE/VULNERABILITY: Habitat destruction due to damming, channel alteration, riparian destruction, channel downcutting, water diversion and groundwater pumping; and the introduction and spread of exotic predatory and competitive fish species.

LAND MANAGEMENT/OWNERSHIP: U.S. Forest Service, San Carlos Apache Indian Tribe, Bureau of Land Management, The Nature Conservancy, the State of Arizona, and private.

NOTES: A Recovery Plan was completed in September 1991. A copy of the recovery plan is available online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/Spikedace%201991.pdf
Critical habitat includes portions of the Gila, San Francisco, Blue, Verde, and San Pedro rivers, and some of their tributaries, in Cochise, Gila, Graham, Greenlee, Pima, Pinal, and Yavapai counties in Arizona.
Listed as a Species of Special Concern by the State of Arizona.

18) VIRGIN RIVER CHUB
(*Gila robusta seminuda*)

STATUS: Endangered (54 FR 35305, August 24, 1990) with critical habitat (65 FR 4140, January 26, 2000).

SPECIES DESCRIPTION: A silvery medium-sized minnow averaging 20 cm (8 in) in length, but growing to 45 cm (18 in). It is distinguished from other subspecies by the number of rays (9-10) in the dorsal, anal, and pelvic fins, and the number of gill rakers (24-31). The back, breast, and part of the belly have small, deeply imbedded scales that are difficult to see and may be absent in some individuals.

HABITAT: Most common in deeper areas where waters are swift, but not turbulent, as is generally associated with boulders or other cover. It occurs over sand and gravel substrates in water less than 30˚ C (86˚ F), and is very tolerant of high salinity and turbidity. Found in habitats below 1,372 m (4,500 ft) in elevation.

RANGE: Historic: Endemic to 214 km (134 miles) of the Virgin River in extreme northwestern Arizona, Nevada, and Utah. Also found in the Moapa River in Nevada.
Current: Occurs within the Moapa River and the mainstream Virgin River from Pah Tempe Springs downstream to the Mesquite Diversion in extreme northwestern Arizona (Mohave County).

REASONS FOR DECLINE/VULNERABILITY: Habitat changes (water impoundments and diversions); diseases, such as Asian fish tapeworm; floods; toxic spills; and competition with exotic fishes, specifically the red shiner. Particularly vulnerable to these threats due to its very limited distribution.

LAND MANAGEMENT/OWNERSHIP: Bureau of Land Management (which owns 80-90% of lands along the Virgin River in Arizona), the States of Utah and Arizona, and private.

NOTES: A Recovery Plan for the Virgin River fishes was completed in April 1995 and is available online at:
http://arizonaes.fws.gov/Documents/RecoveryPlans/Virgin%20River%20Fishes%20Recovery%20Plan.pdf
Critical habitat occurs in the 100-year floodplain of the Virgin River from the confluence of Ash and La Verkin Creeks to Halfway Wash (above Lake Mead).
Currently being held at Dexter National Fish Hatchery in Dexter, New Mexico.
Listed as a Species of Special Concern by the State of Arizona.

19) WOUNDFIN
(*Plagopterus argentissimus*)

STATUS: Endangered (35 FR 16047, October 13, 1970) with critical habitat (65 FR 4140, January 26, 2000).

SPECIES DESCRIPTION: Small (10 cm (4 in) long), silver minnow with fairly large fins and a sharp dorsal fin spine.

HABITAT: Inhabits shallow, warm, turbid, fast-flowing water. Tolerates high salinities and relatively warm water temperatures. Found in habitats below 1,372 m (4,500 ft) in elevation.

RANGE: Historic: Occurred in the Lower Colorado River Basin below the Grand Canyon; the Virgin River in Utah, Arizona, and Nevada; and the lower and middle Gila River drainages in Arizona.
Current: The species has been extirpated from almost all of its historical range except

the mainstream Virgin River, from Pah Tempe Springs to Lake Mead in northwestern Arizona (Mohave County).

REASONS FOR DECLINE/VULNERABILITY: Habitat destruction and the introduction of exotic fishes.

LAND MANAGEMENT/OWNERSHIP: Bureau of Land Management, the States of Utah and Arizona, and private.

NOTES: A Recovery Plan was completed in July 1979, revised in March 1985, and incorporated into the Virgin River Fishes Recovery Plan in April 1995. A copy of the recovery plan is available online at:
http://arizonaes.fws.gov/Documents/RecoveryPlans/Virgin%20River%20Fishes%20Recovery%20Plan.pdf
In Arizona, critical habitat encompasses approximately 50.6 km (31.6 mi) of the mainstem Virgin River and its 100-year floodplain in Mohave County, Arizona.
Experimental-nonessential designation in portions of the Verde, Gila, San Francisco, and Hassayampa rivers and Tonto Creek (50 FR 30193, July 24,1985).
Limited introduction attempts into designated experimental-nonessential habitat have been unsuccessful.
Currently being reared at Dexter National Fish Hatchery in Dexter, New Mexico.
Listed as a Species of Special Concern by the State of Arizona.

20) YAQUI CATFISH
(*Ictalurus pricei*)

STATUS: Threatened with critical habitat (49 FR 34490, August 31, 1984).

SPECIES DESCRIPTION: The Yaqui catfish is a medium to large fish of the family Ictaluridae, with lengths of 40 cm (15.7 in) and weights of a kilogram (2.2 lbs) or more common in wild specimens. The species is similar to the channel catfish (I. punctatus) in appearance, except the anal fin base is shorter and the distal margin of the anal fin is broadly rounded with 23 to 25 soft rays. The body is usually profusely speckled.

HABITAT: Inhabits moderate to large streams in areas of medium to slow current over sand/rock bottom. Found in streams between 1,219 to 1,425 m (4,000 to 5,000 ft) in elevation.

RANGE: Historic: Occurred in the Rio Yaqui Drainage in Sonora, Mexico, including San Bernardino Creek (Blackwater Draw) in Cochise County, Arizona.
Current: Found only in the Rio Yaqui Drainage of Sonora, Mexico. Was extirpated from the United States; however, was reintroduced to San Bernardino National Wildlife Refuge and West Turkey Creek in Cochise County, Arizona in November 1997.

REASONS FOR DECLINE/VULNERABILITY: Habitat destruction and dewatering, and

hybridization with channel catfish.

LAND MANAGEMENT/OWNERSHIP: Breeding populations are at Dexter National Fish Hatchery in Dexter, New Mexico, and Uvalde National Fish Hatchery in Uvalde, Texas. Reintroduced populations are on private lands and on San Bernardino National Wildlife Refuge.

NOTES: A Rio Yaqui Fishes Recovery Plan, which included the Yaqui catfish, was completed in March 1995. A copy of the Recovery Plan is available online at:
http://arizonaes.fws.gov/Documents/RecoveryPlans/YaquiFishes.pdf
Critical habitat includes all aquatic habitats of the main portion of San Bernardino National Wildlife Refuge in Cochise County, Arizona.
Listed as a Species of Special Concern by the State of Arizona.

21) YAQUI CHUB
(*Gila purpurea*)

STATUS: Endangered with critical habitat (49 FR 34490, August 31, 1984).

SPECIES DESCRIPTION: Medium-sized minnow (adults rarely exceed 15 cm (6 in) long) that is darkly colored, but usually lighter below. Its most pronounced feature is a dark triangular caudal spot.

HABITAT: Inhabits deeper pools of small streams near undercut banks and debris between 1,219 - 1,828 m (4,000 - 6,000 ft) elevation. Is also found in pools associated with springheads. Also occurs in artificial ponds.

RANGE: Historic: Once found throughout the Rio Yaqui Drainage in Cochise County in extreme southeastern Arizona, including San Bernardino Creek (Blackwater Draw), Whitewater Creek, Black Wash (Astin Wash), and the Morse Canyon portion of the Willcox Playa. It was also found in San Bernardino Creek in Sonora, Mexico.
Current: Extirpated from its historic habitat; however, introduced populations exist in Leslie Canyon in the Swisshelm Mountains, in San Bernardino National Wildlife Refuge, and in ponds and the mainstream of West Turkey Creek in the Chiricahua Mountains, Arizona.

REASONS FOR DECLINE/VULNERABILITY: Habitat destruction and modification and interactions with introduced fish species.

LAND MANAGEMENT/OWNERSHIP: U.S. Fish and Wildlife Service, U.S. Forest Service, private lands.

NOTES: A Rio Yaqui Fishes Recovery Plan, which included the Yaqui chub, was completed in March 1995. A copy of the Recovery Plan is posted online at:
http://arizonaes.fws.gov/Documents/RecoveryPlans/YaquiFishes.pdf
Critical habitat includes all aquatic habitats in the main portion of San Bernardino National

Wildlife Refuge in Cochise County, Arizona.
Listed as a Species of Special Concern by the State of Arizona.

22)YAQUI TOPMINNOW
***(Poeciliopsis occidentalis sonoriensis*)**

STATUS: Endangered (32 FR 4001, March 11, 1967) without critical habitat.

SPECIES DESCRIPTION: A small (5 cm (2 in) long) guppy-like, live-bearing fish (lacking dark spots on fins). Breeding males are jet black with yellow fins.

HABITAT: Inhabits small to moderate-sized streams, springs, and cienegas below 1,360 m (4,500 ft) elevation. It is found primarily in shallow areas with aquatic vegetation or debris. It can tolerate relatively high water temperatures and low dissolved oxygen.

RANGE: Historic: Occurred in the Yaqui, Matape, and Mayo rivers in Sonora, Mexico, and Cochise County, Arizona.
Current: Present in the United States in several natural or introduced populations in the main portion of the San Bernardino National Wildlife Refuge in Cochise County, Arizona. An introduced population is also found in Leslie Canyon in the Swisshelm Mountains, Arizona. Natural populations exist in Mexico in the Yaqui, Mayo, and Matape rivers.

REASONS FOR DECLINE/VULNERABILITY: Endangered as a result of the loss of springs, river backwaters, and small stream habitat. Competition with introduced mosquitofish (Gambusia affinis) in remaining habitats is also a major threat to the survival of this species.

LAND MANAGEMENT/OWNERSHIP: U.S. Fish and Wildlife Service at San Bernardino National Wildlife Refuge.

NOTES: A Recovery Plan for the Sonoran topminnow (Yaqui and Gila subspecies) was completed in March 1984 and revised in the Yaqui Fishes Recovery Plan in March 1995.
Listed as a Species of Special Concern by the State of Arizona.

23) BALD EAGLE
(*Haliaeetus leucocephalus*)

STATUS: Threatened (60 FR 35999, July 12, 1995) without critical habitat.

SPECIES DESCRIPTION: Large, bird of prey that is 0.9 m (3 ft) long and has a 1.8-2.1 m (6-7 ft) wingspan. Adults have a white head, neck, and tail. Body color is a dark brownish-black. Has a

yellow hooked bill and yellow unfeathered legs and feet. Immature bald eagles are mostly dark without the characteristic white head and tail, and may be confused with golden eagles. Feeds primarily on fish, but waterfowl, small mammals, and carrion constitute a portion of the diet.

HABITAT: Usually found along sea coasts, lakes, and rivers. Nesting sites are usually isolated high in trees, on cliffs, or on pinnacles, with a commanding view of the area and in close proximity to water.

RANGE: Historic: Bald eagles ranged throughout the contiguous U.S., Canada, and northern Mexico, but the historic distribution in Arizona and New Mexico is unknown.
Current: Nesting populations are increasing throughout the U.S. The largest populations are found in Alaska and Canada, as well as significant populations in the Pacific Northwest, the Great Lakes States, and the Southeast Coast. A small resident population of approximately 40 pairs nests along the Salt, Verde, Gila, Bill Williams, Agua Fria, San Pedro, and San Francisco rivers and along Tonto and Canyon creeks. Bald eagles winter throughout the state of Arizona, with at least 200 to 300 found each year. The greatest numbers of wintering eagles are found along the Mogollon Rim east though the White Mountains. Found in all fifteen counties of Arizona.

REASONS FOR DECLINE/VULNERABILITY: Threatened (and previously endangered) due to reproductive failure caused by pesticide use, namely DDT; and unrestricted killing by humans. Current threats are habitat loss, human encroachment on nesting sites, entanglement in fishing line, reduction in native fish species, illegal shooting, and heavy metals.

NOTES: A Recovery Plan for the Southwest population was completed in September 1982 and is available online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/SWBaldEagle.pdf
Reclassified from endangered to threatened in July 1995. In July 1999 (64 FR 26453, 07/06 /1999) the
Service proposed to remove the bald eagle from the list of Endangered and Threatened Wildlife in the
lower 48 states of the United States. The recovery is due in part to habitat protection and management
actions. Removal of the bald eagle as a threatened species under the Act will not affect the protection
provided under the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and many
other state laws.
New nest sites may be partially a result of increased search effort as well as actual population increase.
Listed as a Species of Special Concern by the State of Arizona.

24) CALIFORNIA BROWN PELICAN
(*Pelecanus occidentalis californicus*)

STATUS: Endangered (35 FR 16047, October 13, 1970; 35 FR 8495, December 2, 1970) throughout its historic U.S. and foreign range except for the U.S. Atlantic coast, Florida and Alabama, without critical habitat (50 FR 4938-4945, February 4, 1985).

SPECIES DESCRIPTION: Large (up to 3.6 kg (8 lb)), dark gray-brown water bird with webbed feet, a pouch underneath its long bill, and a wingspan of 2.1 m (7 ft). Adults have a white head and neck, a brownish-black breast and belly, and silver-grayish upper parts.

HABITAT: Coastal areas, with nesting occurring on islands. Species found occasionally along Arizona's lakes and rivers.

RANGE: Historic: The subspecies occurred on the Pacific coast from Canada through Mexico. Breeding was only as far north as central California. It was found on the Lower Colorado River as an annual post-breeding wanderer.
Current: Most Arizona records are along the Colorado River including north to Davis Dam and even to Lake Mead (La Paz and Yuma counties), and Gila Valley (Maricopa, Pinal, Mojave and Gila counties) but stragglers reach most of the state (Tolani Lakes, Navajo Indian Reservation, Salt River, and other areas). Populations exist along the California and Mexico coasts.

REASONS FOR DECLINE/VULNERABILITY: Endangered as a result of reproductive failure caused by pesticides.

NOTES: A Recovery Plan was completed in 1983.
Recovery is progressing as a result of reduced pesticide levels.

25) CACTUS FERRUGINOUS PYGMY-OWL
(*Glaucidium brasilianum cactorum*)

STATUS: Distinct vertebrate population in Arizona endangered (62 FR 10730, March 10, 1997) with proposed critical habitat (67 FR 71032, November 27, 2002).

SPECIES DESCRIPTION: A small reddish-brown, or sometimes grayish, bird with a cream-colored belly streaked with reddish-brown. Males average 62 g (2.2 oz) and females average 75 g (2.6 oz). Length is approximately 17 cm (6.75 in), including tail. The eyes are yellow, the crown is lightly streaked, and there are no ear tufts. Paired black spots on the back of head suggest "eyes". The tail is long for an owl and reddish-brown in color with dark bars. The pygmy-owl is nonmigratory throughout its range. Their diet includes other birds, lizards, insects, and small mammals.

HABITAT: The pygmy-owl has been found in riverbottom woodlands, and palo verde cactimixed scrub associations of the Sonoran desert. In central and southern Arizona, the pygmyowl is currently found primarily in Sonoran desertscrub vegetation with some locations in riparian drainages and semi-desert grassland vegetation communities. The cactus ferruginous pygmy-owl nests in cavities, primarily in saguaro cacti, but they will also use tree cavities. Pygmy-owls are found below 1,200 m (4,000 ft) in elevation.

RANGE: Historic: The subspecies is geographically isolated into eastern and western populations. The western population extends from lowland central Arizona south through western Mexico, to the States of Colima and Michoacan, Mexico. The eastern population is distributed from southern Texas south through the States of Tamaulipas and Nuevo Leon, Mexico. The historic range in Arizona extends north from the U.S-Mexico border to New River, to the Gila Box (East) and to the Cabeza Prieta Mountains (West). Historically documented in Maricopa, Yuma, Santa Cruz, Graham, Greenlee, Pima, Pinal, Gila, and Cochise Counties, Arizona.
Current: Since 1993, when formal pygmy-owl surveys using a protocol were initiated, the documented distribution of pygmy-owls has been limited to Pima and Pinal counties.

REASONS FOR DECLINE/VULNERABILITY: The species is threatened by the destruction, modification, and curtailment of its habitat and range; possible competition with introduced bird species for food and nest sites; and potentially inbreeding due to increasingly fragmented and small isolated populations within the state.

LAND MANAGEMENT/OWNERSHIP: In Arizona: U.S. Forest Service, U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, State of Arizona, military and private.

NOTES: Listed as a Species of Special Concern by the State of Arizona.

CURRENT STATUS: In response to a court order, we are re-evaluating critical habitat for this species. Approximately 731,712 acres of critical habitat were designated on July 12, 1999 (U.S. Fish and Wildlife Service 1999 [64 FR 37419]) in areas within Pima, Cochise, Pinal, and Maricopa counties in Arizona. On January 9, 2001, a coalition of plaintiffs filed a lawsuit with the District Court of Arizona challenging the validity of the Service's listing of the Arizona population of the pygmy-owl as an endangered species and the designation of its critical habitat. On September 21, 2001, the Court upheld the listing of the pygmy-owl in Arizona but, at our request, and without otherwise ruling on the critical habitat issues, remanded the designation of critical habitat for preparation of a new analysis of the economic and other effects of the designation (National Association of Home Builders et al. v. Norton, Civ.-00-0903-PHX-SRB). The Court also vacated the critical habitat designation during the remand. We proposed to redesignate critical habitat to the Federal Register on November 27, 2002 (U.S. Fish and Wildlife Service 2002 [67 FR 71032]). The proposal includes approximately 1,208,000 acres in portions of Pima and Pinal counties, Arizona. Based on the Court order, we must issue a final rule by July 31, 2003. The plaintiff's appeal of the listing decision is still pending.

26) CALIFORNIA CONDOR
(*Gymnogyps californianus*)

STATUS: Experimental nonessential population designated for Southwest reintroduction (61 FR 54044, October 16, 19 96). End angered (32 FR 4001, March 11, 1967) with critical habitat in California (41 FR 187, September 24, 1976).

SPECIES DESCRIPTION: One of the largest flying birds in the world. Adults weigh approximately 10 kg (22 lb) and have a wing span of up to 2.9 m (9.6 ft). Adults are black, with white underwing linings and edges. Head and neck are mostly naked gray skin in juveniles and red in adults. Five to six years are required for individuals to attain adult characteristics. Member of the Cathartidae, or New World Vultures, family.

HABITAT: Nesting sites are in various rock formations, including caves, crevices, and potholes in isolated regions of the southwestern U.S. Foraging for carrion occurs over long distances, as a condor can travel 80-160 km (48-96 miles) per day in search of food. Flights follow routes over foothills and mountains. Roosting is usually on rock cliffs, snags, or in live conifer stands. These areas are important for resting, preening, and socializing.

RANGE: Historic: Isolated regions of the California Coast, Sierra Nevada, and Transverse Ranges, western Texas, Arizona, Utah, New Mexico, and Baja California Norte, Mexico. Current: Captive-reared condors have been reintroduced to Hopper Mountain and Bitter Creek National Wildlife Refuges, and Los Padres National Forest in Kern, Ventura, San Luis Obispo, and Santa Barbara Counties, California, and further north in Ventana Wilderness Sanctuary in Monterey County in California. USFWS began reintroducing an experimental nonessential population of California condors in the Vermilion Cliffs area in northern Arizona (Coconino County) and southern Utah in December 1996 and Hurricane Cliffs on the Arizona Strip in December 1998. California condors may be found in Mohave, Coconino, Navajo, and Apache counties, Arizona.

REASONS FOR DECLINE/VULNERABILITY: Little information exists to document the precise causes of mortality to the condor, but they probably have been diverse. Former threats include shooting, egg and quill collection, and ceremonial use. Other threats include collisions with humanmade structures, electrocution on powerlines, and poisoning from lead, DDT, cyanide, and anti-freeze.

NOTES: A Recovery Plan was completed in 1974 and revised in 1979, 1984, and 1996. A copy of the recovery plan is available online at
http://arizonaes.fws.gov/Documents/RecoveryPlans/California%20Condor%201996.pdf
Critical habitat includes nine areas in six California counties encompassing about 230,800 hectares (570,400 acres).
Currently, there are 34 condors in the wild in two areas in California, and 25 free-flying condors in the Grand Canyon area in Arizona. On March 25, 2001, the first egg laid by reintroduced

condors was discovered in the Grand Canyon. That egg was broken by the condors and the nesting attempt failed.
Listed as a Species of Special Concern by the State of Arizona.
Field notes on the Vermilion and Hurricane Cliffs reintroduction are at www.peregrinefund.org.

27) SOUTHWESTERN WILLOW FLYCATCHER
(*Empidonax traillii extimus*)

STATUS: Endangered (60 FR 10694, February 27, 1995) without critical habitat.

SPECIES DESCRIPTION: Small, migratory bird about 15 cm (6 in) long, with grayish-green back and wings, a white throat, a light gray-olive breast, and a pale yellowish belly. Two wingbars are visible and the eye ring is faint or absent.

HABITAT: Occurs in dense riparian habitats along streams, rivers, and other wetlands where cottonwood, willow, boxelder, tamarisk, Russian olive, buttonbush, and arrowweed are present. Nests are found in thickets of trees and shrubs about 4-7 m (13-23 ft) in height, among dense and homogenous foliage. Habitat occurs at elevations below 8,500 ft (2,590 m).

RANGE: Historic: Includes southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, southwestern Colorado, and extreme northwestern Mexico. Current: Extirpated from much of its historic range, with just over 900 breeding pairs currently documented in the Southwest. Remnant populations survive in historic locations. Individuals in Arizona are found on the upper Gila River, Little Colorado River, the middle Salt River, the lower San Pedro River, Colorado River, San Francisco River, Hassayampa River, the upper Verde River, Big Sandy River, Santa Maria River, Tonto Creek, and the Bill Williams River.Most likely winters in Mexico, Central America, and possibly northern South America.

REASONS FOR DECLINE/VULNERABILITY: Endangered primarily due to riparian habitat reduction, degradation, and elimination as a result of agricultural and urban development. Other reasons for the decline/vulnerability of the flycatcher include: the fragmented distribution and low numbers of the current population; predation; brood parasitism by cowbirds; and other events such as fires and floods that are naturally occurring, but have become more frequent and intense as a result of the proliferation of exotic vegetation and degraded watersheds, respectively.

NOTES: A draft recovery plan is available online at: http://arizonaes.fws.gov/
Listed as a Species of Special Concern by the State of Arizona.
Critical habitat (designated July 22, 1997 (62 FR 39129)) was set aside by the 10th Circuit Court of Appeals on May 11, 2001.

28) WHOOPING CRANE
(ROCKY MOUNTAIN POPULATION)
(*Grus americana*)

STATUS: Extirpated from Arizona.

SPECIES DESCRIPTION: The tallest American bird, with males approaching 1.5 m (5 ft). Large, snowy white, and long necked, with long legs that trail behind in flight. Has black primary feathers, a red crown, and a wedge-shaped patch o f black feathers behind the eye. Wingspan can reach 2.1 m (7 ft). They feed on small grain s like corn and wheat, as well as aquatic plants, crustaceans, and small vertebrates.

HABITAT: Marshes, shallow river bottoms, potholes, playas, prairies, and cropland at an elevation of approximately 1,37 2 m (4,500 ft).

RANGE: Historic: Once ranged over most o f North America , but probably never occurred in large numbers. By th e 1800 s, only a few tho usand survived. Birds th at summered in t he northern Rocky Mountain states and western Canada probably passed through New Mexico en route to and from wintering areas in the Mexican highlands and southern Texas. The area around Bosque del Apache National Wildlife Refuge in New Mexico was the wintering area of the experimental Rocky Mountain population of whooping cranes. This experimental nonessential Rocky Mountain whooping crane population is now thought to be extirpated (1975-2002). Before being extirpated, individuals from this experimental nonessential Rocky M ountain population w ould occasionally stray fro m migration routes to southeastern Arizona.
Current: Wild population s occur in the U.S. in south T exas around Aran sas National W ildlife Refuge, with 173 birds in 2002; and in Kissimmee, Florida, and in Wisconsin. There are currently about 90 non-migratory wh ooping cranes in Florida, an d 5 whoopin g cranes in Wiscons in that last year were flown behind an ultralight plane, wintered in Florida an d returned to Wisconsin on their own. Researchers are currently training 17 more who oping cranes in Wisconsin to follow the ultralight this fall. The Texas population summers in Wood Buffalo National Park, Northwest Territory, Canada, while the Florida population is non-migratory.

REASONS FOR DECLINE/VULNERABILITY: Endangered due to destruction of wintering and
breeding habitat, collisions with power lines and fences, shooting, specimen collection, and human disturbance.

NOTES: Endangered (32 F R 4001, M arch 11, 1967) with critical habitat (43 FR 2093 8, May 15, 19 78).
Within the area covered by this listing, this species is known to occur in: Colorado, Idaho, Kansas,
Montana, N orth Dakota, Nebraska , New Mexico, Oklahoma, South Dakota, Texas, Utah, Wyoming.
A Recovery Plan was completed in 1980 and revised in 1986 and 1994. A copy of the recovery

plan can be found online at:
http://arizonaes.fws.gov/Documents/RecoveryPlans/WhoopingCrane.pdf
Intensive captive breeding has been conducted by both the U.S. Fish and Wildlife Service and the Canadian Wildlife Service.

29) YUMA CLAPPER RAIL
(*Rallus longirostris yumanensis*)

STATUS: Endangered (32 FR 4001, March 11, 1967) without critical habitat.

SPECIES DESCRIPTION: A 35.5 centimeter (14 inch) long marsh bird with long legs and a short tail. Its bill is long, slender, and curved downward slightly. Anteriorly, coloration is a mottled brown on a gray background. Its flanks and underside are dark gray with narrow vertical white stripes that produce a barred effect.

HABITAT: Inhabits freshwater or brackish stream-sides and marshlands under 1,372 m (4,500 ft) elevation. It is associated with dense riparian and marsh vegetation. It requires a wet substrate, such as a mudflat, sandbar, or slough bottom that supports cattail and bulrush stands of moderate to high density adjacent to shorelines.

RANGE: Historical: Uncertain. May have occurred in the marshes of the Lower Colorado River and its tributaries in Mexico and the United States. No records in U.S. before 1902 (Yuma County); type specimen taken near Laguna Dam in 1921.
Current: Occurs along the Colorado River (Yuma, La Paz, and Mohave counties, Arizona), from Lake Mead to Mexico; on the Gila and Salt rivers upstream to the area of the Verde confluence (Maricopa and Pinal counties, Arizona); at Picacho Reservoir (Pinal County, Arizona); and on the Tonto Creek arm of Roosevelt Lake (Gila County). May be expanding into other suitable marsh habitats in western and central Arizona.

REASONS FOR DECLINE/VULNERABILITY: Threatened because of habitat destruction due to stream channelization and elimination of marsh habitat.

NOTES: A Recovery Plan was completed in February 1983 and is available online at: http://arizonaes.fws.gov/Documents/RecoveryPlans/YumaClapperRail.pdf . Yuma clapper rail survey protocol is available online at http://arizonaes.fws.gov/.
Listed as a Species of Special Concern by the State of Arizona.

30) CHIRICAHUA LEOPARD FROG
(*Rana chiricahuensis*)

STATUS: Threatened (67 FR 40790, June 13, 2002) without critical habitat.

SPECIES DESCRIPTION: Distinctive pattern on the rear of the thigh consisting of small, raised, creamcolored spots or tubercles on a dark background; dorsolateral folds that are interrupted and

deflected medially; stocky body proportions; relatively rough skin on the back and sides; and often green coloration on the head and back. The species also has a distinctive call consisting of a relatively long snore of 1 to 2 seconds in duration. Snout-vent lengths of adults range from approximately 54 to 139 mm (2.1 to 5.4 in). The Ramsey Canyon leopard frog (Rana subaquavocalis) is similar in appearance to the Chiricahua leopard frog, but it often grows to a larger size and has a distinct call that is typically given under water. Populations on the Mogollon Rim are disjunct from those in southeastern Arizona. The Rim populations may be described as a separate species.

HABITAT: The Chiricahua leopard frog is an inhabitant of cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 1,000 to 2,710 m (3,281 to 8,890 ft) in central and southeastern Arizona (Santa Cruz, Apache, Gila, Pima, Cochise, Greenlee, Graham, Yavapai, Coconino, and Navajo counties, Arizona); west-central and southwestern New Mexico; and in Mexico, northern Sonora, and the Sierra Madre Occidental of Chihuahua, northern Durango and northern Sinaloa. The distribution of the Chiricahua leopard frog in Mexico is unclear.

RANGE: Current: From 1995-2000 the species was observed at 60 localities in Arizona In New Mexico, the species was found at 41 sites from 1994 -1999; 31 of those were verified extant during 1998-1999. The species has been extirpated from about 75 percent of its historic localities in Arizona and NewMexico.
Potential: The species' potential habitat would include all historic localities, and most permanent or nearly permanent aquatic sites within its range. However, many of these sites are probably not restorable due to introduction of nonnative predators, habitat degradation, or other factors.

REASONS FOR DECLINE/VULNERABILITY: Threats to this species include predation by nonnative organisms, especially bullfrogs, fish, and crayfish; disease; drought; floods; degradation and destruction of habitat; water diversions and groundwater pumping; disruption of metapopulation dynamics (relationships between populations of frogs); increased chance of extirpation or extinction resulting from small numbers of populations and individuals; and environmental contamination.

LAND MANAGEMENT/OWNERSHIP: San Bernardino and Buenos Aires N ational Wildlife Refuges; Coconino, Coronado, Gila, Tonto, Apache-Sitgreaves National Forests; Bureau of Land Management; and private land.

NOTES: A special rule is proposed that would exempt take of frogs due to operation and maintenance of livestock tanks on State and private lands.
The species is still extant in all major drainages in Arizona and New Mexico where it occurred historically; however, it has not been found recently in many rivers, valleys, and mountains ranges, including the following in Arizona: White River, East Clear Creek, West Clear Creek, Silver Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, Sonoita Creek, Pinaleno Mountains, Peloncillo Mountains, Sulphur Springs Valley, and Huachuca Mountains. In many of these regions Chiricahua leopard frogs were not found for a decade or more despite repeated surveys.

31) SONORA TIGER SALAMANDER
(*Ambystoma tigrinum stebbinsi*)

STATUS: Endangered (62 FR 665, January 6, 1997) without critical habitat.

SPECIES DESCRIPTION: A large salamander with light-colored blotches or reticulations on a dark background. Metamorphosed individuals are 4.5-15.0 cm (1.8-5.9 inches) in snout to vent length. Larval individuals are aquatic with plume-like gills and well developed tail fins.

HABITAT: Breeds in stock tanks. Terrestrial salamanders probably spend much of the year in rodent burrows, rotted logs, and other moist cover sites. Typical habitat ranges in elevation from 1,219 to 1,920 m (4,000 to 6,300 ft).

RANGE: Historic: The species probably inhabited springs, streams, backwaters, and cienegas containing a permanent or nearly permanent water source in the area of San Rafael Valley, Arizona and Sonora, Mexico.
Current: Breeds at about 50 sites located within a 31 km (19 mile) radius of Lochiel, Arizona. All sites are within the headwaters of the Santa Cruz and San Pedro rivers. These include sites in San Rafael Valley, and the foothills of the Patagonia and Huachuca mountains, located in Santa Cruz and Cochise counties, Arizona, and Sonora, Mexico.

REASONS FOR DECLINE/VULNERABILITY: The species faces a number of threats, including disease and predation by non-native fish, bullfrogs, and crayfish; use as fishing bait; interbreeding with other species of tiger salamander, habitat destruction, and the increased probability of small populations being extirpated due to local random events (such as drought or disease).

LAND MANAGEMENT/OWNERSHIP: U.S. Forest Service at Coronado National Forest, Fort Huachuca, State of Arizona, and private.

NOTES: Listed as a Species of Special Concern by the State of Arizona.
A draft recovery plan is available online at http://arizonaes.fws.gov/Documents/DocumentsBySpecies/SonoraTigerSalamander/Son%20Tiger%20Sal%20RP%20600.pdf
A final recovery plan is expected late 2001.

Appendix 3

NOTICE OF FINAL RULEMAKING
TITLE 18. ENVIRONMENTAL QUALITY
CHAPTER 11. DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY STANDARDS
PREAMBLE

1. **Sections Affected**	**Rulemaking Action**
R18-11-101	Amend
R18-11-102	Amend
R18-11-104	Amend
R18-11-105	Amend
R18-11-106	Amend
R18-11-107	Amend
R18-11-108	Amend
R18-11-109	Amend
R18-11-110	Amend
R18-11-111	Amend
R18-11-112	Amend
R18-11-113	Amend
R18-11-114	Amend
R18-11-115	Repeal
R18-11-118	Amend
R18-11-120	Amend
R18-11-121	Amend
R18-11-122 `	Amend
R18-11-123	Amend
Appendix A	Amend
Appendix B	Amend

Definitions [R18-11-101]

The terms that are used in the surface water quality standards rules are defined in R18-11-101. ADEQ revised the current definitions for "aquatic and wildlife (cold water fishery)," "aquatic and wildlife (warm water fishery)," "ephemeral water," and "effluent dependent water." ADEQ also added new definitions for "perennial surface water," "intermittent surface water," and "pollutant."

Revision of the definitions of aquatic and wildlife (cold water fishery) and aquatic and wildlife (warm water fishery)

ADEQ changed the definitions of "aquatic and wildlife (cold water fishery)"("A&Wc") and "aquatic and wildlife (warm water fishery)" ("A&Ww") to "aquatic and wildlife (cold water)" and "aquatic and wildlife (warm water)" respectively. The current definition of "aquatic and wildlife (cold water fishery) is:

> Aquatic and wildlife (cold water fishery) means the use of a surface water by animals, plants, or other organisms, including salmonids, for habitation, growth, or propagation. [*See* R18-11-101(7)]

The current definition of "aquatic and wildlife (warm water fishery)" is similar:

> Aquatic and wildlife (warm water fishery) means the use of a surface water by animals, plants, or other organisms, excluding salmonids, for habitation, growth, or propagation. [*See* R18-11-101(10)]

Both aquatic life designated uses are defined by the presence or absence of salmonid species (for example, trout). The use of the presence or absence of salmonids to define the A&Wc and A&Ww aquatic life designated uses is problematic for two reasons. First, not all cold surface waters contain salmonids but they do contain aquatic life that should be protected by A&Wc standards. Second, statewide data on the distribution of salmonid species in Arizona surface waters is lacking. ADEQ has relied on data supplied by the Arizona Game and Fish Department, the U.S. Fish and Wildlife Service, or anecdotal data to support the current A&Wc and A&Ww use designations. For many surface waters, it is not known whether salmonids are or are not present.

ADEQ proposes to use the results of this research to refine the A&Wc and A&Ww designated uses in the state. ADEQ believes that the use of macroinvertebrate communities is a more scientifically defensible way to assign the A&Wc and A&Ww designated uses than data on the presence or absence of salmonids. ADEQ proposes to change the name of "aquatic and wildlife (cold water fishery)" to "aquatic and wildlife (cold water)." The purpose of this change is to clarify that the A&Wc designated use applies to surface waters that support fish populations and also to those that do not support fish populations. The proposed rule defines "aquatic and wildlife (cold water)" as follows:

> "Aquatic and wildlife (cold water)" means the use of a surface water by animals, plants, or other cold water organisms, generally occurring at elevations greater than 5000 feet, for habitation, growth, or propagation.

ADEQ made similar changes to the definition of the "aquatic and wildlife (warm water fishery)" designated use. ADEQ changed the name of the designated use to "aquatic and wildlife (warm water)" to clarify that the designated use is not limited to surface waters that support fisheries. The designated use also applies to surface waters that do not support fish populations. ADEQ proposes to define "aquatic and wildlife (warm water)" as follows:

> "Aquatic and wildlife (warm water)" means the use of a surface water by animals, plants, or other warm water organisms, generally occurring at elevations less than 5000 feet, for habitation, growth, or propagation.

b. Revision of the definition of "effluent-dependent water"

ADEQ changed the definition of "effluent-dependent water" (EDW) at R18-11-101(21). The current definition states that an EDW is "a surface water that consists *primarily* of discharges of treated wastewater which has been classified as an effluent dependent water by the Director under R18-11-113." The word, "primarily," in this definition is vague. It is not clear from the definition whether a surface water can be classified as an EDW if more than 50% of the flow in a surface water consists of treated wastewater (that is, the flow consists *primarily* of discharges of treated wastewater). ADEQ revised the definition of "effluent-dependent water" to clarify that an EDW is a surface water whose flow consists of treated wastewater. First, ADEQ removed "primarily" and defined an EDW as a surface water that consists of discharges of treated wastewater. Second, ADEQ added new language to clarify that an EDW is an ephemeral water in the absence of the discharge of treated wastewater. An ephemeral water is defined as a surface water that has a channel that is above the water table at all times and that flows in direct response to precipitation [*See* R18-11-101(22]. An EDW normally consists of discharges of treated wastewater. However, an EDW may sometimes contain flow from storm water runoff that is in direct response to precipitation.

ADEQ wants to clarify that an intermittent or perennial surface water with an existing A&Wc or A&Ww aquatic life designated use cannot be re-classified as A&Wedw through the EDW classification process. A wastewater treatment plant that discharges treated wastewater to an intermittent or perennial surface water with an A&Wc or A&Ww designated use must comply with the applicable water quality standards that apply to the receiving water, even where the resulting flow in the receiving surface water consists "primarily" of treated wastewater. ADEQ wants to clarify that a surface water can be classified as an EDW only when the receiving surface water would be an ephemeral water in the absence of the discharge of treated wastewater. ADEQ proposes to define "effluent-dependent water" as follows:

> 21. "Effluent-dependent water" means a surface water that consists ~~primarily~~ of discharges of treated wastewater ~~which has been~~ that is classified as an effluent-dependent water by the Director under R18-11-113. An effluent-dependent water is a surface water that, without the discharge of treated wastewater, would be an ephemeral water.

The change in the definition of "effluent-dependent water" does not have retroactive effect. The change will have no effect on EDWs classified by the Director before the effective date of the revised definition.

Numeric Water Quality Criteria [R18-11-109]

Temperature [R18-11-109(E)]

R18-11-109(E) prescribes limits on the maximum allowable increase in the temperature of a receiving surface water due to a discharge. The current water quality standard states that a maximum increase of 3.0° C from a discharge is allowed in a receiving water with the A&Ww and A&Wedw designated uses. A maximum increase of 1.0° C due to discharge is allowed to a receiving surface water with the A&Wc designated use.

The water quality standards for temperature are intended to apply to point source discharges to surface waters where the thermal component of the discharge is controllable. The temperature criteria are not intended to apply to discharges to ephemeral waters because the flow in an ephemeral water consists entirely of point and nonpoint source discharges of storm water runoff. The temperature of a storm water discharge is highly variable and uncontrollable. ADEQ revised footnote 4 to clarify that the "maximum increase in temperature" standard does not apply to storm water discharges.

Repeal of the Current Numeric Turbidity Criteria [R18-11-109(F)]

ADEQ repealed the current turbidity criteria at R18-11-109(F). The current turbidity criteria are established to maintain and protect water quality for aquatic life designated uses (A&Wc, A&Ww, and A&Wedw). The current turbidity standards are as follows:

F. The following water quality standards for turbidity, expressed as a maximum concentration in nepholometric turbidity units (NTU) shall not be exceeded:

	A&Ww, A&Wedw	**A&Wc**
Rivers, streams, and	50	10

other flowing waters		
Lakes, reservoirs, tanks, and ponds	25	10

Turbidity is a qualitative measure of water clarity or opacity. Turbidity in water is caused by fine suspended particles such as clay, silt, organic and inorganic matter, plankton, and other microscopic organisms. Turbidity is an expression of the optical property that causes light to be scattered and adsorbed rather than transmitted in straight lines through a water sample. The measurement of turbidity, read in nepholometric turbidity units (NTUs), is an index of light refraction when light strikes suspended particles in the water. As a qualitative measurement, turbidity gives only a relative assessment of particulate loading in a surface water. Turbidity is a surrogate measurement for *estimating* the amount of suspended solids that are in a surface water.

The source of the current turbidity criteria can be traced back to the first water quality standards adopted for surface waters in Arizona [*See* "Water Quality Standards for Surface Waters in Arizona," State Department of Health, Water Quality Control Council (July 18, 1968)]. On July 18, 1968, the Water Quality Control Council (WQCC) adopted the following turbidity criteria to protect surface water quality for domestic and industrial water supply, recreation, and the protection of fish and wildlife:

> Turbidity of the water will be maintained at the lowest practicable values possible, but in no case shall:
> a. Turbidity in the receiving waters due to the discharge of wastes exceed 50 Jackson units in warm water streams or 10 Jackson units in cold water streams.
> b. Discharge to warm water lakes cause turbidities to exceed 25 Jackson units, and discharge to cold water or oligotrophic lakes cause turbidities to exceed 10 Jackson units.

The original water quality standards for turbidity cited appear to be based on recommendations made in Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior (April 1, 1968) (the "Green Book"). The Green Book recommendation states:

> Turbidity in the receiving water due to a discharge should not exceed 50 JTU in warm water streams or 10 JTU in cold-water streams. There should be no discharge to warm-water lakes which will cause turbidities exceeding 25 Jackson Units. The turbidity of cold-water or oligotrophic lakes should not exceed 10 units.

The Green Book recommendations for turbidity were based on research studies dating back to the 1930's. (Ellis, 1937; Smith, 1940; Wallen, 1951; Buck, 1956; Tarzwell, 1957; Wagner 1959; Ziebell, 1960; Herbert and Merkens, 1961). One of the studies cited in the Green Book discussion of turbidity [Buck (1956)] directly supports numeric criteria recommended by the National Technical Advisory Committee. Buck investigated several farm ponds, hatchery ponds, and reservoirs over a 2-year period and observed that the maximum fish yield occurred in farm ponds where the average turbidity of the water was less than 25 Jackson units. Buck observed that fish yields decreased in farm ponds as turbidities increased to between 25 and 100 Jackson units and decreased again when turbidities exceeded 100 Jackson units.

Another possible source for the recommended 25 JTU turbidity criterion for warm water lakes may have been the precision of the method used for measuring turbidity at the time the Green Book recommendations were made. The instrument originally designed for the measurement of turbidity and in use in 1968 when the Green Book turbidity recommendations were made was the Jackson candle turbidimeter. The Jackson candle turbidimeter was a laboratory device that measured a combination of optical parameters such as light scatter,

adsorption, and reflectance using the human eye as the detector. The unit of measurement was called a Jackson candle unit, Jackson candle turbidity number, or Jackson turbidity unit (JTU). According to Standard Methods for the Examination of Water and Wastewater, the lowest turbidity value that could be measured by the Jackson candle turbidimeter was 25 JTUs. More precise instruments for measuring turbidity have since been developed. The newer instruments for measuring turbidity use incandescent light sources instead of a candle and they use automated photocell detectors instead of the human eye. Formazin suspensions were later accepted as the standard for calibration of turbidimeters and the unit of measurement became the formazin turbidity unit, or FTU, which subsequently evolved into the nepholometric turbidity unit (NTU). NTUs are currently used as the unit of measurement for turbidity. A NTU refers to the amount of light that is scattered at 90° when a turbidimeter is calibrated with formazin.

A comparison of the current turbidity criteria and the 1968 criteria shows that the numeric criteria have changed very little in over 30 years. Both sets of turbidity standards distinguish between streams and lakes and cold and warm surface waters. The only substantive change to the turbidity criteria in the last 30 years appears to be to the way that turbidity is measured. The units of measurement changed from Jackson turbidity units (JTUs) to nephelometric turbidity units (NTUs). However, the current numeric criteria for warm and cold water streams and lakes are the same as they were in 1968:

Comparison of 1968 and 1996 Turbidity Criteria

Type of surface water	**1968**	**1996**
Warm water streams	50 Jackson units	50 NTUs
Cold water streams	10 Jackson units	10 NTUs
Warm water lakes	25 Jackson units	25 NTUs
Cold water lakes	10 Jackson units	10 NTUs

ADEQ proposes to repeal the current numeric water quality criteria for turbidity for several reasons:

1. The current numeric turbidity standards appear to be based based upon Green Book criteria recommendations that were made in 1968. The scientific defensibility of the current turbidity criteria is questionable. Current EPA criteria guidance for turbidity no longer includes the Green Book recommendations.

2. The current turbidity criteria are expressed as single sample maximum concentrations. In Arizona, with its variable climate and hydrology, a single sample maximum measurement of turbidity is scientifically indefensible. A single sample maximum does not account for the spatial and temporal variability in Arizona surface waters. Many variables can affect the suspended and settleable solids concentrations in a surface water. These variables include watershed size, land uses, slopes, precipitation intensity and duration, soil types, channel morphology, stream stability, and vegetative cover (to name just a few).

3. A single sample exceedance of the current turbidity standards is not correlated to impairment of aquatic life. There is no evidence that a one-time exceedance of the current turbidity criteria results in impairment of aquatic life designated uses.

4. Turbidity measurements are qualitative and they do not directly relate to the concentration of suspended solids in surface waters.

5. Turbidity data can be unreliable because of quality assurance and quality control problems associated with both field and laboratory measurements of turbidity. The laboratory measurement of turbidity in surface water may be unreliable because of exceedances of recommended sample holding times for turbidity analysis. Standard Methods recommends that water samples be analyzed in the laboratory on the same day that the sample is collected. Field measurements of turbidity are considered to be more reliable, but they may be affected by many variables including air bubbles; the sizes, shapes, and refractive characteristics of the particles that are suspended in the water; and differences in instrumentation. Standard Methods notes that variations of up to five times can result if different turbidimeters, all calibrated against the same standard, are used to measure the turbidity of a surface water.

6. According to Standard Methods, there is no direct relationship between the intensity of light scattered at a 90° angle (as measured in NTUs) and Jackson candle turbidity (JTUs). The absence of a direct relationship calls the current turbidity criteria into question because it appears that the units of measurement changed from JTUs to NTUs while the same numeric criteria that were adopted in 1968 have been maintained. In other words, because of fundamental differences between modern turbidimeters and the Jackson candle turbidimeter, results that are expressed in JTUs may not be equivalent to results expressed in NTUs (that is, 50 NTUs $\neq$ 50 JTUs).

For all of these reasons, ADEQ repealed the current numeric turbidity criteria. Instead, ADEQ will rely on 1) a numeric criterion for suspended sediment concentration to protect fish, and 2) a narrative standard for bottom deposits to maintain and protect water quality for aquatic life.

Numeric suspended sediment concentration criteria to protect aquatic life

While ADEQ no longer supports the current turbidity criteria to protect aquatic life, ADEQ recognizes that the concentration of suspended solids in a surface water is an important water quality parameter because of the effect of suspended solids on light penetration, temperature, and on aquatic life. The importance of fluvial sediment to the quality of aquatic and riparian systems is well established. The U.S. Environmental Protection Agency identifies sediment as the single most widespread cause of impairment of the nation's rivers and streams, lakes, reservoirs, ponds, and estuaries.

Suspended solids can affect several trophic levels and components of an aquatic ecosystem. For example, the EPA Water Quality Criteria 1986 document cites a report by the European Inland Fisheries Advisory Commission (EIFAC) that identifies four adverse effects of excessively high concentrations of suspended solids on fish. Excessively high concentrations of suspended solids:

- Act directly on fish swimming in the water in which solids are suspended, either by killing them or reducing their growth rate and resistance to disease;
- Prevent the successful development of fish eggs and larvae;
- Modify the natural movements and migrations of fish; and
- Reduce the abundance of food available to fish.

With regard to the effects of suspended solids on fisheries, EIFAC goes on to report that:

- There is no evidence that concentrations of suspended solids less than 25 mg / L have any harmful effects on fisheries;
- It should be possible to maintain good or moderate fisheries in surface waters that normally contain 25 to 80 mg / L suspended solids, however, the yield of fish from such waters may be lower than from those surface waters that have suspended solids less than 25 mg / L;
- Waters normally containing from 80 to 400 mg / L suspended solids are unlikely to support good fresh water fisheries, although fisheries may be found at the lower concentrations within this

range; and

- Only poor fisheries are likely to be found in waters that normally contain more than 400 mg / L suspended solids.

[*See* Water Quality Criteria 1972, A Report of the Committee on Water Quality Criteria, Environmental Studies Board, National Academy of Sciences and National Academy of Engineering, Washington, D.C., 1972].

Increases in suspended solids concentrations in a surface water may negatively affect fish populations in other ways. As noted above, high concentrations of suspended solids act directly on fish and cause stress reactions, behavioral modifications, reduce resistance to disease, and clog and abrade gill membranes. High concentrations of suspended solids reduce light penetration in a surface water and this can adversely affect fish reproductive processes. Some fish species have strong visual components to their reproductive behavior. For example, researchers have found that largemouth bass spawning was delayed by as much as 30 days in turbid surface waters as compared to clear surface waters. Studies have shown that smallmouth bass populations shun potential spawning areas that are highly turbid. Reproductive failure among many fish species can be attributed to the direct loss of spawning habitat due to siltation of formerly clean substrates and the loss of vegetation due to reductions in the size of the photic zone. Suspended solids also can impair the ability of sight feeding fish to locate their prey. It also can cause modifications in the natural movements and migrations of fish.

Suspended solids can reduce the size of the photic zone in a surface water and the amount of light available to aquatic plants. A decrease in light penetration reduces photosynthetic activity and can result in a reduction of primary production in a surface water. A decrease in light penetration may affect the depth distribution of vascular plants and algae. Greatly reduced light penetration may shift the algal composition of a surface water from green algae to blue-green algae because the latter are more tolerant of higher levels of ultraviolet light. Zooplankton populations also may be reduced because of decreases in primary productivity. Zooplankton are a major source of food for fish and a reduction in their population can have an adverse effect on fish populations. In 1974, a National Academy of Sciences (NAS) committee recommended that the depth of light penetration in a surface water not be reduced by more than 10 percent and EPA's current recommended criterion for suspended solids appears to be based on this NAS recommendation. EPA's recommended criterion in the Water Quality Criteria 1986 document states:

> Suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life.

ADEQ decided not to propose this recommended criterion as a surface water quality standard because ADEQ does not have reliable data on what the seasonal norms are for the depth of the compensation point for photosynthetic activity in Arizona surface waters. EPA's recommended criterion cannot be implemented without this baseline data. Instead, ADEQ adopted a numeric suspended sediment concentration criterion that is intended to protect fish in surface waters. The proposed standard is based upon earlier EPA criteria guidance for suspended solids recommended in the Water Quality Criteria, 1972 document and U.S. Geological Survey research recommending the use of analytical methods that measure the sedimented sediment concentration. In the 1972 criteria document, EPA states that aquatic communities should be protected if the following maximum concentrations of suspended solids exist:

- High level of protection — 25 mg / L
- Moderate level of protection — 80 mg / L
- Low level of protection — 400 mg / L
- Very low level of protection — Greater than 400 mg / L

The recommended maximum concentrations of suspended solids cited above apply to surface waters that *normally* contain those levels of suspended solids. The EPA guidance document states there is no evidence of harmful effects on fisheries if the concentration of suspended solids in a surface water is usually below 25 mg / L. If the concentration of suspended solids is usually below 80 mg/L, it is possible to maintain good or moderate fisheries. EPA's recommended criteria are intended to apply to rivers and streams at or near base flow (that is, a stream's "normal" flow regime). The EPA criteria document also notes that temporary high concentrations of suspended solids should be prevented in streams where good fisheries are to be maintained but that fish can tolerate high concentrations of suspended solids for short periods of time. Citing a study by Wallen (1951), the criteria document states that short-term behavioral reactions in fish were not observed until concentrations of suspended solids neared 20,000 mg / L and in one species reactions did not occur until suspended solids concentrations reached 100,000 mg / L. Most fish species that were tested endured exposures of more than 100,000 mg / L for a week or longer, but these same fishes finally died at suspended solids concentrations of 175,000 to 200,000 mg / L. Lethal concentrations caused the death of fishes within 15 minutes to two hours. This research suggests an approach to expressing numeric criteria for suspended sediment in Arizona surface waters.

The numeric standard for suspended sediment concentration (SSC) is intended to protect fish populations. Thus, the SSC criteria are derived for the protection of aquatic and wildlife designated uses only. Arizona has four subcategories of aquatic life designated uses: A&Wc, A&Ww, A&Wedw, and A&We. However, ADEQ proposes that the new suspended sediment concentration criteria apply only to the A&Wc and A&Ww designated uses.

The suspended sediment criteria should not apply to ephemeral waters (A&We) for two reasons. First, the proposed criteria are intended to protect fish and ephemeral waters do not support fish populations. Second, the proposed criteria are intended to apply at or near base flow conditions. Ephemeral waters are defined as surface waters that flow only in direct response to precipitation. There is no base flow in an ephemeral water. The "normal" flow regime of an ephemeral water is either no flow or high intensity, short-term flows associated with direct runoff from a precipitation event. An ephemeral water is normally a dry watercourse. Because the proposed criteria are intended to apply during a stream's "normal" flow regime, they do not apply to ephemeral waters that have no flow except in direct response to a precipitation event.

The suspended sediment criteria also should not apply to effluent-dependent waters (EDWs) for two reasons. First, the primary purpose of the proposed suspended sediment criteria is to protect fish populations. In most cases, EDWs either do not have fish populations or they have limited fish populations. Second, and more importantly, EDWs are created by the discharge of treated wastewater from a wastewater treatment plant to an ephemeral water. Point source discharges of treated wastewater from a wastewater treatment plant to an EDW are regulated under the federal secondary treatment regulation [See 40 CFR, Part 133]. The federal secondary treatment regulations establish technology-based effluent limits on the discharge of suspended solids from a wastewater treatment plant. Under 40 CFR § 133.102, the 30-day average of suspended solids cannot exceed 30 mg / L and the seven-day average cannot exceed 45 mg / L. In addition, federal secondary treatment regulations require a wastewater treatment plant to achieve a 30-day average percent removal of suspended solids of 85%. These technology-based requirements are more stringent than the proposed water quality criteria for suspended sediment concentration. ADEQ will rely on the secondary treatment regulations to provide effective control over the discharge of suspended solids to EDWs.

It is clear from EPA's criteria recommendations for suspended solids in the Blue Book that the criteria recommendations are intended to be chronic criteria. The recommended criteria are intended to protect fish from long-term exposures to suspended solids in surface waters. The rationale in the Blue Book supporting EPA's recommended criteria states that fish can withstand much higher acute or short-term exposures to suspended solids. For this reason, ADEQ proposes to express the suspended sediment criteria as an average value (four -sample minimum) that must achieved in a stream at or near base flow conditions. Water that flows in a surface water consists of a base flow fraction made up of ground water that infiltrates into a stream

channel and a direct runoff fraction that enters the drainage system during and soon after a precipitation event. The SSC criterion is intended to apply only at or near base flow in a stream and not during storm events. Sample results that are taken in a stream during or soon after a precipitation event should not be used to determine compliance with the suspended sediment criterion.

Finally, the standard in the final rule is expressed as a suspended sediment concentration (SSC). The SSC analytical method, ASTM D 3977-97, Standard Test Method for Determining Sediment Concentration in Water Samples, is the U. S. Geological Survey (USGS) standard method for determining concentrations of suspended material in surface water samples. This method is used by all USGS sediment laboratories and by cooperating laboratories certified to provide suspended sediment data to USGS. The SSC method is described as the most accurate way to measure the total amount of suspended material in a water sample collected from a surface water. Recent studies on the accuracy of the SCC analytical method by ASTM and the U.S. Geological Survey Branch of Quality Systems (Gordon and others, 2000) have shown that SSC analysis represents a more accurate and reliable measure of the concentration of suspended sediment in a surface water sample. Other measurements, such as total suspended solids and turbidity, may be less expensive to collect or analyze but they result in unacceptably large errors and are fundamentally unreliable.

Differences between total suspended solids (TSS) and suspended sediment concentration analyses were investigated recently by the U.S. Geological Survey [*See* Gray, John R. et. al, Comparability of Suspended Sediment Concentration and Total Suspended Solids Data, Water Resources Investigation Report 00-4191, U. S. Department of the Interior, U.S. Geological Survey, August, 2000]. The USGS investigated differences in the data produced by TSS and SSC analyses by studying 3,235 paired TSS and SSC samples and 14,466 data pairs from the USGS National Water Information System database. The USGS concluded from the statistical analyses of the paired samples that the data produced by the SSC technique is more reliable than data produced by TSS analysis. The conclusions of this USGS study can be summarized as follows:

- TSS analysis is normally performed on an aliquot of the original water sample. The difficulty in withdrawing an aliquot from a sample that truly represents suspended material concentration leads to inherent variability in the measurement. By contrast SSC analysis is performed on an entire water sample, thus measuring the entire sediment mass in the sample. The analytical procedures for SSC and TSS differ and at times produce considerably different results, particularly when sand-size material composes a significant percentage of the sediment in a sample.

- TSS methods and equipment differ among various laboratories whereas SSC methods and equipment used by USGS sediment laboratories are consistent and are quality assured by the National Sediment Laboratory Quality Assurance Program.

- Results of the TSS analytical method tend to produce data that are negatively biased by 25 % to 34 % with respect to SSC analyses collected at the same time and can vary widely at different flows at a given site. The biased TSS data can result in errors in sediment load computations of several orders of magnitude.

For all of the reasons stated above, ADEQ adopted the following water quality standard for suspended sediment concentration:

D. The following water quality standard for suspended sediment concentration, expressed as a geometric mean (four-sample minimum), shall not be exceeded. The standard applies to a surface water that is at or near base flow and does not apply to a surface water during or soon after a precipitation event:

	A&Wc, A&Ww
	80 mg / L

Salinity of the Colorado River [R18-11-110]

R18-11-110 prescribes flow-weighted average annual salinity standards for three control points on the lower Colorado River. R18-11-110 requires that the flow-weighted average annual total dissolved solids concentration be maintained at or below 723 mg/L below Hoover Dam, 747 mg/L below Parker Dam, and 879 mg/L at Imperial Dam. ADEQ retained these salinity standards without change in this triennial review.

Arizona's numeric salinity standards are based upon water quality standards for salinity recommended by the Colorado River Basin Salinity Control Forum (Forum). The Forum conducts its own triennial review of the water quality standards for salinity. On May 27, 1999, the Forum approved the "Report on the 1999 Review, Water Quality Standards for Salinity, Colorado River System (June, 1999)." On October 27, 1999, the Forum approved a Supplemental Report to its 1999 Review. The 1999 Review and the Supplemental Report constitute the Forum's triennial review of the water quality standards for salinity of the Colorado River system. The Forum's final report and supplement were transmitted to Governor Hull by letter dated December 3, 1999 urging prompt state adoption of the Salinity Control Forum's salinity criteria and the plan of implementation by Arizona's water quality control agency.

The Forum recommended no change to the current numeric salinity criteria that have been established for the three control points on the Colorado River at Hoover, Parker, and Imperial dams. These criteria are incorporated into Arizona's surface water quality standards rules in R18-11-110. No change has been made to the numeric salinity criteria since their original adoption by the Forum in 1975. ADEQ reviewed the Forum's 1999 Review and concurs that there is no need to modify the numeric criteria for salinity that are in R18-11-110 in this triennial review.

The Forum's water quality standards for salinity consist of the numeric salinity criteria and a plan of implementation for salinity control for the Colorado River system. The plan of implementation is designed to meet the objective of maintaining the salinity concentrations at or below the numeric criteria at the three stations located on the lower mainstem of the Colorado River. The legal basis for the inclusion of a plan of implementation as an element of the Forum's water quality standards for salinity appears to date back to the Water Quality Act of 1965. Under the Water Quality Act of 1965, water quality standards consisted of three basic elements: 1) a designated use, 2) water quality criteria expressed in numeric or narrative form sufficiently stringent to protect the designated use, and 3) a plan of implementation and enforcement of the water quality criteria [*See* §10(c)(1), 79 Stat. 907, 33 U.S.C. §1160(c)(1)]. The inclusion of a plan of implementation as a required element of water quality standards was deleted in the Clean Water Act of 1972. §303(c) of the Clean Water Act removed the plan of implementation as a required element of water quality standards [*See* EDF v. Costle, 657 F. 2nd 275 (D.C.Cir. 1981)].

While a plan of implementation is no longer a required element of a state water quality standards under §303(c), ADEQ amended R18-11-110 to incorporate by reference the Forum's plan of implementation for salinity control. The plan of implementation includes: 1) completion of Bureau of Reclamation, Bureau of Land Management (BLM), and U.S. Department of Agriculture salinity control measures to the extent that each unit remains viable and cost-effective, 2) implementation of the Forum's recommended policies for effluent limitations, principally under the NPDES permit program. These policies include the following: "Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program,"

"Policy for the Use of Brackish and / or Saline Waters for Industrial Purposes," "Policy for Implementation of the Colorado River Salinity Standards Through the NPDES Permit Program for Intercepted Ground Water," and "Policy for Implementation of the Colorado River Salinity Standards Through the NPDES Permit Program for Fish Hatcheries," and 3) implementation of nonpoint source management plans developed by the states and approved by EPA. The policies are designed to ensure compliance with the numeric criteria for salinity at the control points on the lower Colorado River. During each triennial review of the Forum's water quality standards for salinity, the numeric criteria for salinity are reviewed and the plan of implementation is updated as necessary to ensure compliance with the numeric criteria.

The Colorado River water quality standards for salinity and the approach taken by the basin states to salinity control are unique. Arizona strongly supports the efforts of the Forum and its salinity control activities in the Colorado River basin, including the plan of implementation. For this reason, ADEQ added a subsection (B) to R18-11-110 to adopt the plan of implementation for salinity control:

B. To preserve the basin wide approach to salinity control developed by the Colorado River Basin states and to ensure compliance with the numeric criteria for salinity set forth in subsection (A), the Department adopts the plan of implementation contained in the "1999 Review, Water Quality Standards for Salinity, Colorado River System," Colorado River Basin Salinity Control Forum 106 West 500, Suite 101, Bountiful, Utah 84010-6232 (June, 1999), which is incorporated by reference and on file with the Office of the Secretary of State and the Department. This incorporation by reference contains no future editions or amendments.

Unique Waters [R18-11-112]

R18-11-112 prescribes the rules that govern the state's unique waters program. A unique water is a surface water that ADEQ has determined to be an outstanding state resource water. Currently, there are 10 unique waters in Arizona:

1. West Fork of the Little Colorado River above Government Springs;
2. Oak Creek, including the West Fork of Oak Creek;
3. Peeples Canyon Creek, a tributary to the Santa Maria River;
4. Burro Creek, above its confluence with Boulder Creek;
5. Francis Creek, in Mohave and Yavapai counties;
6. Bonita Creek, a tributary to the upper Gila River;
7. Cienega Creek, from I-10 to the Del Lago Dam in Pima County;
8. Aravaipa Creek, from the confluence with Stowe Gulch to the downstream boundary of the Aravaipa Canyon Wilderness Area;
9. Cave Creek and the South Fork of Cave Creek, in the Chiricahua Mountains; and
10. Buehman Canyon Creek, a tributary to the San Pedro River.

Unique waters are given stringent surface water quality protections under R18-11-107(D), the state antidegradation rule. R18-11-107(D) (as amended by this rule package) states:

> Tier 3: Existing water quality shall be maintained and protected in a surface water that is classified as a unique water under R18-11-112. The Director shall not allow limited degradation of a unique water under [R18-11-107(C)].

Under Arizona's current antidegradation implementation guidelines, any proposed activity that results in a new or expanded discharge of pollutants *directly* to a unique water is prohibited. For example, a new or expanded point source discharge of pollutants (for example, a new wastewater treatment plant) directly to a unique water is prohibited by the state's Tier 3 antidegradation policy. The antidegradation implementation guidelines also prohibit a new or expanded discharge of pollutants upstream of a unique water or to a tributary

to a unique water if the discharge would cause degradation of existing water quality in the downstream unique water.

A unique waters classification also can affect land use activities within a unique waters watershed. Land use activities that cause nonpoint source pollution are not exempt from the provisions of Arizona's Tier 3 antidegradation policy. For example, cattle grazing, mining, timber harvesting, agriculture, and other land uses that result in the nonpoint source discharge of pollutants to a surface water could be affected by a unique waters classification. Once a surface water is classified as a unique water, land use activities in the watershed have to be conducted in a way that prevents the degradation of existing water quality in the unique water. While Arizona does not have a regulatory program to directly control nonpoint sources of pollution, the intention of the Tier 3 antidegradation policy is that best management practices be developed and implemented to prevent the degradation of existing water quality in a unique water.

ADEQ classifies surface waters as unique waters by rulemaking. To classify a surface water as a unique water, ADEQ must go through the rulemaking process to amend R18-11-112 to add a new unique water to the list of 10 unique waters in R18-11-112(E). The legal requirements for the rulemaking process are prescribed in the State Administrative Procedures Act [A.R.S. §41-1001 et.seq.]. Those requirements must be followed to classify a surface water as a unique water [*See* R18-11-112(A)]. Rulemaking to classify a unique water usually takes place as part of the triennial review of the surface water quality standards rules.

Under R18-11-112, any person may nominate a surface water for classification as a unique water. The current rule outlines the nomination process in R18-11-112(C). A person who wants to nominate a surface water for unique waters classification must submit a nomination to ADEQ. The nomination must include: 1) a map and description of the candidate unique water, 2) a written statement in support of the nomination that includes a specific reference to one of the two grounds for unique water classification, 3) supporting evidence that one or more of the grounds for classification is met, and 4) available water quality data relevant to establishing baseline water quality conditions for the proposed unique water.

ADEQ may classify a surface water as a unique water if it meets one of the following criteria:

1. The surface water is of exceptional recreational or ecological significance because of its unique attributes, including but not limited to attributes related to the geology, flora, fauna, water quality, aesthetic values, or wilderness characteristics of the surface water, or

2. Threatened or endangered species are known to be associated with the surface water and the existing water quality is essential to the maintenance and propagation of a threatened or endangered species, or the surface water provides critical habitat for a threatened or endangered species.

The Director has discretion to classify unique waters. R18-11-112(D) states that the Director *may* classify a surface water as a unique water if the Director finds that one or both of the grounds for classification are met. However, ADEQ is not required to classify a nominated surface water as a unique water even if both grounds for unique waters classification stated above are established. There are no guidelines in the current rule to guide the exercise of the agency's discretion in making this decision.

ADEQ decided to prescribe more specific eligibility criteria for a unique waters classification in the final rule. The current grounds for unique water classification are broad and general, especially the ground that provides for unique classification if a surface water is determined to be "of exceptional recreational or ecological significance because of its unique attributes."[*See* R18-11-112(D)(1)]. While the current rule provides examples of the types of unique attributes that may be considered by the ADEQ (that is, geology, flora, fauna, water quality, aesthetic values, or wilderness characteristics), there are no criteria or guidelines in the rule for determining what constitutes *exceptional* recreational or ecological significance.

ADEQ established new requirements for a surface water that must be satisfied before it can be considered eligible for a unique waters classification. The new eligibility requirements are modeled on the eligibility requirements for rivers under the federal Wild and Scenic Rivers Act (Pub. L 90-542 as amended, 16 U.S.C. 1271-1287). The Wild and Scenic Rivers Act appears to be one of the sources for the attributes listed in the "exceptional recreational or ecological significance" ground for unique waters classification. In fact, two of the attributes listed as examples in R18-11-112(D)(1), "wilderness characteristics " and "aesthetic values," are synonyms for "wild and scenic." The statement of intent in the preamble to the Wild and Scenic Rivers Act could serve as a mission statement for the state's current unique waters program. The preamble to the Wild and Scenic Rivers Act states:

> It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, *possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values,* shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.

This language is similar to language used in the "exceptional recreational and ecological significance" ground for unique waters classification at R18-11-112(D)(1). R18-11-112(D)(1) states that a surface water may be classified as a unique water if the Director finds:

> The surface water is of exceptional recreational or ecological significance because of its unique attributes including but not limited to, attributes related to the geology, flora, fauna, water quality, aesthetic values, or the wilderness characteristics of the surface water.

ADEQ added several eligibility requirements to the unique waters rule that are based on the Wild and Scenic Rivers Act. First, the final rule states that a surface water must be perennial to be eligible for a unique waters classification. That is, a surface water must flow continuously throughout the entire year. Ephemeral waters and intermittent surface waters are ineligible for unique waters classification.

Second, a surface water must be "in a free-flowing condition" to be eligible for a unique waters classification. "Free-flowing" means that a nominated surface water does not have impoundments, major diversions, channelization, rip-rapping, or other hydrological modifications *within the nominated surface water reach.* The intent of this requirement is to limit eligibility to surface waters that are essentially natural in character and that have not been significantly modified by man. ADEQ recognizes that Arizona is a state where there has been extensive hydrological modification of rivers and streams. In applying this eligibility criterion, the fact that a nominated surface water flows between impoundments does not necessarily preclude its satisfying the "free-flowing condition" eligibility requirement. Surface waters that flow between impoundments may be considered to be "free-flowing " provided conditions within the nominated reach meet the requirements stated above. For example, the Colorado River flows between several large impoundments in Arizona and the flow of the river is regulated by dams. The Colorado River between Lake Powell and Lake Mead would be considered "free-flowing" and eligible for unique waters classification because there are no impoundments, diversions, channelization, or other hydrological modifications within the reach of the Colorado River between the two lakes. Even though the flow of the river is regulated, it still satisfies the "free-flowing" eligibility requirement. An effluent-dependent water would be ineligible for unique waters classification because ADEQ does not consider an EDW to be "in a free-flowing condition." An EDW is entirely dependent on the continued point source discharge of treated wastewater. An EDW is not essentially natural in character. It is a manmade stream that could be eliminated completely if the source wastewater treatment plant ceased discharging treated wastewater.

Third, ADEQ proposes to require that a surface water have good water quality in order to be eligible for a unique waters classification. Good water quality means that existing water quality meets or is better than

applicable water quality standards that have been established for recreation in and on the water and for the propagation of aquatic life. A surface water that is identified as an impaired surface water under §303(d) of the Clean Water Act is ineligible for unique waters classification under the final rule. It should be noted that the adoption of this requirement will require the collection of water quality data at some point in the unique waters classification process to determine baseline water quality. The current rule requires a nominating party to submit *available* water quality data relevant to establishing the baseline water quality of a proposed unique water. ADEQ retained this requirement in the final rule and did not require that nominating parties collect data on existing water quality and submit that data as part of a nomination. ADEQ recognizes that a requirement to collect water quality data would impose a significant cost on nominating parties. Nonetheless, the collection of data on existing water quality is critically important to providing Tier 3 antidegradation protection and to the practical implementation of the unique waters program. The primary benefit of a unique water classification is the maintenance and protection of existing water quality and the prohibition against degradation under Tier 3 of the antidegradation rule. Tier 3 antidegradation protection cannot be provided without data on existing water quality. If existing water quality data is unavailable for a nominated surface water, then it will have to be collected before a decision can be made on the proposal or the classification of a unique water.

Fourth, it must be shown in a nomination that at least one of the following grounds for unique waters classification is satisfied. A nominating party must provide sufficient information in a nomination that demonstrates either: 1) a federally-listed threatened or endangered species is associated with the surface water and the surface water is essential to the maintenance and propagation of the species, 2) the surface water provides critical habitat for a federally-listed threatened or endangered species, 3) the surface water is of "exceptional recreational ...significance" because of one or more outstanding attributes, or 4) the surface water is of "exceptional... ecological significance" because of one or more outstanding attributes.

Currently, R18-11-112(C) states that any person may nominate a surface water for consideration as a unique water by filing a petition for rule adoption with the Department. The current rule requires a person who nominates a surface water to submit a map and description of the surface water, a written statement in support of the nomination with specific reference to the applicable criteria for unique waters classification, supporting evidence demonstrating that one or more of the applicable criteria are met, and any available water quality data that is relevant to establishing baseline water quality of the proposed unique water.

ADEQ proposes to develop a substantive policy to provide more specific guidance on information requirements for unique waters nominations. A person who wants to nominate a surface water as a unique water will have to provide a map and a specific description of the nominated surface water. The description of the surface water must include information or data demonstrating that basic eligibility requirements are satisfied. First, the description must include information demonstrating that a nominated surface water is perennial. Second, the description of the surface water must include information upon which ADEQ may find that the nominated surface water is "in a free-flowing condition." The description of the nominated surface water should describe any impoundments, diversions, channel modifications, flood control structures, bridges, road crossings, rip-rapping, or other hydrological modifications. Third, the description should include available water quality data that demonstrates that existing water quality meets applicable water quality standards.

A nomination must include a detailed description of the characteristics that make the surface water a worthy addition to the unique waters program. If a surface water is nominated on the ground that threatened or endangered species are known to be associated with the surface water and existing water quality is essential to the maintenance and propagation of the threatened or endangered species, then the nomination must specifically identify the threatened or endangered species that is associated with the surface water and provide documentation that the species is listed as endangered or threatened by the Secretary of the Interior pursuant to §4 of the Endangered Species Act [16 U.S.C. §1533]. The presence of candidate or sensitive species are insufficient to support a unique waters nomination on this ground. A nomination must include information

upon which a finding can be made that a threatened or endangered species is known to occur in the specific area of the nominated surface water. The mere presence of suitable habitat for a threatened or endangered species is insufficient by itself to support a unique waters nomination. If a surface water is nominated on the ground that it provides critical habitat for a threatened or endangered species, the nomination must include documentation that the nominated surface water is located within a specific geographic area designated as critical habitat by the Secretary of the Interior pursuant to §4 of the Endangered Species Act.

If a nomination is based, in whole or in part, on the ground of exceptional recreational significance, the nomination should include information on the estimated level of recreational use and the quality of the recreation experience provided by the nominated surface water. In the preamble to the Notice of Proposed Rulemaking, ADEQ had proposed to require the use of an assessment methodology developed for the Arizona River Assessment Project (ARAP) to evaluate exceptional recreational significance for the unique waters program. ADEQ has reconsidered this proposal and has decided **not** to specifically require the use of ARAP assessment forms. However, ADEQ still intends to use the ARAP methodology as a guide for evaluating surface waters as recreation resources to determine whether they are of "exceptional recreational significance." The ARAP methodology assigns streams into one of five classes for recreation: outstanding, substantial, moderate, limited, or unknown. These ratings are based on an assessment of the surface water's statewide significance as a recreation resource. An outstanding rating means that a surface water is an exceptional recreational resource as compared to other surface waters in the state. An outstanding surface water provides one of the highest quality recreational experiences available within the state due to its unique combination of attributes or one or more specific characteristics that create an exceptional recreation opportunity. A substantial rating means that a surface water is an important recreational resource that represents one of the finer examples in the state in terms of providing a quality recreational experience. A moderate rating means that the surface water may be considered average or standard when compared to the recreational experiences provided by other surface waters within the state. A surface water that is rated moderate for a recreational activity is similar to many other surface waters in the state. A limited rating means that the recreational value of the surface water is limited. A surface water that is limited for a recreational activity either does not permit recreational activities or the surface water does not provide a quality recreational experience as compared to other surface waters in the state. An unknown rating means that information on the quality of the recreational opportunity provided by the surface water is unavailable.

ADEQ thinks that the ARAP methodology and evaluation system is a useful model for ADEQ to follow in making unique water determinations based on "exceptional recreational significance." ADEQ thinks it is appropriate to consider only those surface waters that are outstanding recreation resources as compared to other surface waters in the state for unique waters classification.

ADEQ did not prescribe specific information requirements in the final rule relating to the determination of exceptional recreational significance. However, ADEQ strongly encourages the submittal of information on the types, level of use, and the quality of water-dependent and stream corridor-related recreational activities, including fishing, boating, water play (for example, swimming, wading, tubing, and floating), camping, picnicking, hiking, nature study, and visiting historic or cultural sites when nominations are submitted to ADEQ. Specific and complete information of this type is important if a nominator cites "exceptional recreational significance" as one of the grounds for a unique water nomination. ADEQ can provide recreation resource assessment forms from the ARAP methodology as guidance to persons who may want to nominate a surface water for unique waters classification because it is of "exceptional recreational significance." While submittal of information on the ARAP assessment forms is *not* required, the information provided on the forms will be useful to both the nominator and to ADEQ when ADEQ is asked to make a decision on whether to propose a nominated water as a unique water because it is of "exceptional recreational significance."

If a nomination is based, in whole or in part, on the ground that a surface water is of "exceptional ecological significance," the nomination must include information on the outstanding natural attributes that make the surface water "of exceptional ecological significance." ADEQ hopes to clarify the evaluation criteria that

ADEQ intends to use to determine whether a surface water is of "exceptional ecological significance" in this preamble. Again, ADEQ proposed to use the ARAP methodology to assess whether surface waters are of exceptional ecological significance because of their riparian vegetation, fish, wildlife, stream hydrology, or geology in the Notice of Proposed Rulemaking. While the final rule does not prescribe specific information requirements or require the use of ARAP forms, ADEQ strongly encourages their use.

The following section of the preamble is intended to guide nominators on ADEQ's interpretation of the meaning of the phrase "exceptional ecological significance." This part of the preamble is presented to explain ADEQ's thinking and its approach to making decisions as to whether a stream is of exceptional ecological significance. It is not intended and should not be interpreted as prescribing specific information requirements that must be met by nominators of unique waters.

A surface water may be of exceptional ecological significance because it has an outstanding riparian community associated with it. To make this determination ADEQ will evaluate information about the plant species and plant communities associated with a surface water, the existing and potential extent or coverage of riparian vegetation, and a description of the ecological functions of the riparian corridor. ADEQ will consider the following criteria when assessing whether a surface water is of exceptional ecological significance because it has an outstanding riparian community: the presence of threatened, endangered, and candidate plant species; the estimated length, width, and acreage of the riparian area or riparian community; the dominant vegetation community; species diversity; the relative scarcity of the riparian community within the state, the relative predominance of native vegetation as compared to introduced vegetation, and whether the riparian community is in proper functioning condition.

A surface water may be of exceptional ecological significance because it is an outstanding fishery. If the fishery resource is cited as one of the grounds for a unique waters nomination, ADEQ will evaluate information to make an assessment as to whether the surface water has an outstanding fishery of statewide significance. To make this determination, ADEQ encourages submittal of information about the fish species present; the relative statewide significance of the fish species present; population origin (that is, native, reintroduced native, introduced, stocked), estimated population size and its sustainability; and the overall condition of the fish habitat provided by the nominated surface water. ADEQ will evaluate two broad categories of fish species: native fish and sport fish. Both categories of fish have resource values and should be evaluated independently. ADEQ can provide a checklist of 74 fish species used by the Arizona Game and Fish Department to help nominating parties inventory fish species that are present in a nominated surface water. ADEQ will give relatively greater weight to the presence of native fish species in a nominated surface water. Native fish species significance is based on the presence or absence of threatened, endangered, or candidate fish species in a nominated surface water and the extent of native fish predominance in the overall fish population. Sport fish significance will be evaluated on whether a fish species is rated as preferred, average, or of no value for fishing. ADEQ encourages submittal of available information on the present population size and population trends (increasing, stable, or decreasing) and whether fish populations are naturally-reproducing or hatchery-subsidized. Information that assists ADEQ in making a general assessment of fish habitat based on parameters such as habitat diversity, cover, water quality, and water quantity also would be helpful. ADEQ encourages the submittal of information on any special or unique habitat characteristics of a nominated surface water, such as it provides critical spawning areas; it has exceptional or unusual habitat features such as oxbows, sloughs, backwaters; it has exceptional habitat diversity or a unique combination of habitat types; or the nominated surface water has a critical habitat designation or it is located within a special research or conservation area.

A surface water may be of exceptional ecological significance because it is an outstanding wildlife resource. Again, ADEQ proposes to use the ARAP methodology as a general guide to assessing whether a nominated surface water is of exceptional ecological significance because of its wildlife. Wildlife habitat varies as much as do the animals themselves. ADEQ recognizes that it is impossible to do a detailed assessment of the habitat value of a nominated surface water for each species that may be present. However, a general assessment of a

stream's overall habitat value to wildlife may be performed to determine whether a stream is of exceptional ecological significance.

Wildlife resource assessment criteria include two broad categories: species and habitat. As a first step in assessing wildlife resource values, ADEQ will consider information on the wildlife species for which the stream corridor segment provides significant habitat. A nominating party should focus on wildlife species that are dependent upon the surface water and its riparian corridor, especially the identification of species of special concern that are of statewide significance. For example, the presence of federal or state-listed threatened or endangered species, species that are proposed for listing, candidate species, species identified by state or federal agencies as species of special concern, and species that are of special local importance and that are uncommon throughout the state. In general, wildlife species significance is measured by the relative rarity of the species or its perceived importance. Obviously, federally-listed threatened or endangered species are given the highest statewide significance. Next in significance are species of special local importance and species that are uncommon throughout the rest of the state. Species that are relatively common throughout the state are considered to be less significant. ADEQ will give relatively greater weight to the presence of aquatic species of special concern that are of statewide significance.

Information on habitat characteristics is useful to ADEQ in making a determination whether a stream is of exceptional ecological significance. Information on special habitat characteristics, including: unique wildlife activity areas that are critical to some element of a species' life cycle; unusual or exceptional habitat features; designated critical habitat for federally-listed threatened or endangered species; other critical habitat for threatened, endangered, sensitive, or other species of concern; the presence of designated wildlife areas; and special research areas will help ADEQ in making a decision on whether a nominated surface water merits unique water classification. Information on whether habitat characteristics are improving, stable, or declining and some assessment of the habitat's recovery potential (at or near potential, recovery through natural systems alone, recovery with reasonable management assistance, recovery with intensive assistance, and no recovery potential) is also helpful. An overall habitat value assessment of different habitat types (aquatic, marshes, wetlands, scrub lands, forests and woodlands) and whether the stream contains habitat that is of excellent or high quality, moderate quality, limited or low quality, none, or unknown. Information on habitat uniqueness or rarity also can be used to support a determination of "exceptional ecological significance."

A surface water may be of exceptional ecological significance because of its stream hydrology. Most of Arizona's streams are ephemeral waters that flow in direct response to precipitation or they are intermittent waters that flow seasonally or in wet years. The duration of flow in a stream is a primary concern because of the proposed eligibility requirement that a unique water be perennial. Ephemeral and intermittent waters are ineligible for unique waters classification. To be eligible for a unique waters classification, a nominating party must provide documentation that the nominated surface water flows continuously throughout the year. This can be shown in at least two ways. If empirical data is available from a USGS gaging station or other discharge monitoring, the mean monthly flow in cubic feet per second for each month of the year and the mean annual flow in cubic feet per second can be calculated and provided to ADEQ. If empirical data are unavailable, a nominating party can provide other information that a stream flows throughout the year. In the latter case, information on the amount and quality of the data that supports the assertion that a stream is perennial should be submitted (for example, field observations over a period of record, modeling, or best guess).

ADEQ amended the part of the current rule that states that unique waters nominations are made by petitions for rule adoption [*See* R18-11-112(C)]. ADEQ believes that petitions for rule adoption unnecessarily accelerate the decision-making process and short-circuit the careful study of surface waters nominated for unique waters classification. The unique waters rule should not impose unreasonably short time-frames that result in ADEQ decisions on the eligibility and suitability of nominated surface waters on the basis of limited information. Rather, the nomination of a surface water for unique waters classification should start a careful review process that can be accomplished by ADEQ within the larger time-frame of the triennial review of

surface water quality standards.

Under the final rule, any person may submit a nomination of a surface water for consideration as a unique water. However, the submittal of a nomination does not trigger the immediate initiation of a rulemaking process. Instead, the nomination of a surface water will trigger an evaluation process by ADEQ that may take place outside of the formal rulemaking process. ADEQ will screen nominations for completeness and may solicit more information from nominators or schedule informal public meetings to solicit comment on complete nominations. ADEQ hopes that the end product of this process will be a more structured assessment of the eligibility and suitability of a nominated surface water by ADEQ and a recommendation for non-inclusion or inclusion in the unique waters program through a proposed revision to the unique waters rule.

ADEQ amended the rule to clarify the public participation procedures that are to be used during the unique waters classification process. While the current rule does not require public participation beyond the public participation requirements that apply to rulemaking, it has been ADEQ practice to hold at least one informal public meeting in the area where a nominated unique water is located to present the unique waters nominations to persons in the local community who will be most directly affected by a nomination and tosolicit public comment. ADEQ believes that this element of the informal public participation process for unique waters classification in important and it is included in the final rule.

ADEQ also added language to the rule to clarify that the formal process to classify surface waters as unique waters will take place as part of the triennial review of surface water quality standards. ADEQ is proposing this clarification to conserve agency administrative resources. The formal rulemaking process is resource-intensive and it can take a long time to complete, sometimes years. It is more efficient for ADEQ to formally consider unique waters classifications during the triennial review of the surface water quality rules.

ADEQ amended the rule to require consideration of whether there is an ability to manage a proposed unique water and its watershed to maintain and protect existing water quality. ADEQ believes that a management capability to maintain and protect existing water quality is an important factor in the decision to classify a unique water. The ability to manage for water quality was one of three primary criteria for designation of unique waters under the original unique waters policy for Arizona adopted in the early 1980's. The three primary designation criteria for a unique waters designation in the original policy were:
1) water quality is consistently better than water quality standards, 2) preservation of existing water quality is not in conflict with the present or anticipated necessary or justifiable economic and social uses of the watersheds consistent with appropriate planning such as §208 area wide water quality management plans or county and municipal plans, and 3) *the body of water and its watershed are capable of being managed to maintain the existing high water quality* [*See* "Arizona Water Quality Control Council Unique Waters Policy," April 8, 1981, p. 2]. ADEQ amended R18-11-112 to reinstate management capability as a decision-making factor.

A nomination should include information on the current status of land ownership and existing land uses within 1/4 mile from each bank of the nominated surface water. ADEQ needs information on land ownership and land uses in the riparian corridor to make a judgment regarding whether there is an ability to manage the nominated unique water for water quality purposes. The submittal of this information also will assist ADEQ in making a judgment regarding the social and economic impact of a unique water nomination.

There is a need to more specifically describe the criteria that ADEQ will consider when making decisions on unique waters nominations. Additional decision criteria are needed to guide the exercise of agency discretion in the decision making process. The current rule states only that the Director *may* classify a unique water. At a minimum, a surface water that is nominated for unique waters classification must meet eligibility requirements and at least one of the grounds for unique waters classification. However, once one of the grounds is met, what factors should ADEQ consider before making a decision whether to classify a nominated surface water as a unique water? ADEQ believes that additional decision criteria are necessary to guide the exercise of ADEQ's discretion in the decision-making process.

Decision criteria that the Director may consider include:

- *Social and economic impact of Tier 3 antidegradation protection*: The Director may take into consideration the potential social and economic impact of a unique water classification and the establishment of Tier 3 antidegradation protection, including the:

  a. Impact of a prohibition of new point source discharges and expansion of existing point source discharges, including possible limits on discharges to the tributaries of a proposed unique water and possible impacts on growth and development;

  b. Impact of possible future restrictions on land use activities in a unique waters watershed, including cattle grazing, timber harvesting, mining, recreation, and agriculture;

  c. Impact of stricter requirements for §401 certification of federal permits and licenses, including NPDES and §404 permits;

  d. Impact on private property rights and the potential for regulatory "takings;" and

  e. Ecosystem and preservation values.

  ADEQ is required by law to classify unique waters by rule. One of the requirements of the rulemaking process is the preparation of an economic, small business, and consumer impact statement (EIS). Any rule establishing a new unique water is subject to review by the Governor's Regulatory Review Council (GRRC). The GRRC cannot approve a rule establishing a new unique water unless there is a complete EIS, the EIS is "generally accurate," and the probable benefits of a unique waters classification outweigh the probable costs of the rule. The Director may consider the availability of information to develop an adequate economic impact statement in making a decision on a unique waters nomination. Where information is available on the probable costs and benefits of a unique waters classification, the Director may take that information into account in making a decision whether to go forward with a unique waters proposal. Where probable costs of a unique waters classification outweigh the probable benefits, the Director may deny a nomination.

Public comments in support or opposition to a unique waters classification:

The Director will consider public comments and the degree of support or opposition to a unique waters classification. While a unique waters classification is not subject to majority vote, ADEQ will carefully consider all of the public comments that are submitted on a proposed unique water. ADEQ will carefully consider the comments of the federal and state land management agencies that have primary responsibility for managing public lands where a proposed unique water is located. Such agencies may include the U.S. Forest Service, Bureau of Land Management (BLM), National Park Service, State Land Department, and Arizona State Parks. This decision criterion closely relates to the determination as to whether there is an ability to manage the proposed unique water and it recognizes the need for intergovernmental cooperation between ADEQ's unique water program and federal and state land managers and other natural resource management agencies [for example, U.S. Fish and Wildlife Service and the Arizona Game and Fish Department].

- *Location*: The Director may consider whether the proposed unique water is located within a National or State Park, National Monument, National Recreation Area, Wilderness Area, National Wildlife Refuge, Area of Critical Environmental Concern, Riparian National Conservation Area, or is designated or proposed for designation as a Wild and Scenic River.

- *Agency resource constraints*: A unique waters classification provides Tier 3 antidegradation protection [*See* R18-11-107(D)]. To make Tier 3 antidegradation protection meaningful, a water

quality monitoring program must be implemented to determine existing water quality and whether degradation is occurring. The Director may consider whether there is an ability to monitor water quality in a proposed unique water before classifying it. ADEQ also will consider the potential for cooperative agreements with other agencies (USGS, USFS, BLM) and the availability of volunteer monitoring groups before making a decision to propose a surface water as a unique water.

Unique water nominations

ADEQ received nominations of 37 surface waters for consideration as unique waters in this triennial review. ADEQ held six public meetings in Alpine, Flagstaff, Cascabel, Phoenix, and Globe to discuss the nominations with persons in locally affected communities. All 37 surface waters that were nominated were included in a set of preliminary draft rules that ADEQ distributed for public comment. ADEQ held four additional public meetings to take public comments on the preliminary draft rules, including the unique waters nominations. ADEQ considered all of the public comments that were received on the nominations before making a decision of which surface waters to formally propose for unique waters classification in a Notice of Proposed Rulemaking. ADEQ classified nine surface waters as unique waters:

Little Colorado River watershed
1. Lee Valley Creek (above Lee Valley Lake)

Salt River watershed
2. Bear Wallow Creek
3. North Fork of Bear Wallow Creek
4. South Fork of Bear Wallow Creek
5. Snake Creek
6. Stinky Creek
7. Hay Creek

Santa Cruz River watershed
8. Upper Cienega Creek

Upper Gila River watershed
9. KP Creek

ADEQ decided to **not** propose the following surface waters that were nominated for unique waters classification:

Little Colorado River watershed
1. Dry Lake
2. Coyote Creek
3. Mamie Creek

Salt River watershed
4. Reavis Creek (Superstition Wilderness)
5. Pine Creek (Superstition Wilderness)
6. Tortilla Creek (Superstition Wilderness)
7. Fish Creek (Superstition Wilderness)
8. La Barge Creek (Superstition Wilderness)
9. Pinto Creek
10. Lower Haunted Canyon
11. Conklin Creek (Black River watershed)
12. Corduroy Creek (Black River watershed)

13. Double Cienega Creek (Black River watershed)
14. Fish Creek (Black River watershed)
15. Hannagan Creek (Black River watershed)
16. Boggy Creek (Black River watershed)
17. Centerfire Creek (Black River watershed)
18. Wildcat Creek (Black River watershed)
19. Home Creek (Black River watershed)
20. Reservation Creek (Black River watershed)
21. Soldier Creek (Black River watershed)
22. West Fork of the Black River

Upper Gila watershed
23. Coleman Creek (Blue River watershed)
24. Grant Creek (Blue River watershed)

San Pedro River watershed
25. Hot Springs Canyon
26. Bass Canyon
27. Redfield Canyon
28. Wildcat Canyon Creek

Of the nominations that ADEQ decided not to propose for unique water classifications, two were particularly controversial. They were the nominations of Pinto Creek and Lower Haunted Canyon Creek.

Pinto Creek unique water nomination

In August, 1999, Mr. Tom Sonandres, on behalf of the Friends of Pinto Creek, nominated an 8.8 mile segment of Pinto Creek for unique waters classification. Pinto Creek is a perennial stream that flows through the Sonoran desert in Gila County near Globe, Arizona. The nominated segment of Pinto Creek is located primarily within the Tonto National Forest. Pinto Creek is ephemeral in its upper reaches but it flows perennially in several reaches between its headwaters in the Pinal Mountains and Roosevelt Lake. The nominated segment of Pinto Creek extends from approximately the Pinto Valley Mine weir to the lower end of an area called the Pinto Box.

ADEQ determined that the nominated segment of Pinto Creek is perennial. This description is supported by stream flow or stream discharge information provided by the U.S. Forest Service in a preliminary analysis of Pinto Creek that was done to determine its eligibility for potential inclusion in the Wild and Scenic River system and by U.S. Geological Survey Water Resources Data. The U.S. Forest Service describes the nominated segment as being “mostly perennial” with a median flow over 5-year period of record of 2.1 cubic feet per second (cfs). USGS discharge records from October, 1994 - 1999 obtained from the stream gaging station at the Pinto Valley weir also indicate that the nominated section of Pinto Creek is perennial. The annual mean discharge in cubic feet per second ranges from .38 cfs to 27.3 cfs, the minimum discharge ranges from .01 cfs to 1.3 cfs, and the maximum discharge ranges from 19 cfs to 5010 cfs. Discharge data over the period of record indicate that the nominated segment of Pinto Creek is perennial even though there can be very low flow in the stream in dry years.

Lower Pinto Creek was nominated for consideration as a unique water on the ground that the stream is of exceptional ecological significance because of the presence of perennial water in the Sonoran desert environment; the presence of more than 20 endangered, threatened, or sensitive species; its outstanding cottonwood-willow riparian corridor, and its geological features. Lower Pinto Creek also was nominated for its outstanding scenic values. Pinto Creek supports a cottonwood-willow riparian community. The U.S. Forest Service identified Pinto Creek as having “outstandingly remarkable” ecological values because of its cottonwood-willow riparian community, described as the rarest riparian community on the Tonto National

Forest. The U.S. Forest Service also identified Pinto Creek as having outstandingly remarkable riparian values based on a 1993 evaluation of the stream's riparian condition. The condition of the riparian community was described as "only fair" on the upstream half of the segment of Pinto Creek that was being evaluated for eligibility and classification as a Wild and Scenic River. The condition of the riparian community in the lower half of the segment was described as good where no livestock grazing had occurred in several years. The Tonto National Forest also noted that the riparian area had high value as a benchmark for documenting the recovery of the rare cottonwood-willow riparian community and that the trend for the riparian community was improving. More recent information on the status of the riparian community for Pinto Creek was not included in the nomination other than a brief note reporting personal observations of the nominator that he observed dense thickets of young cottonwoods during a June, 1999 hike.

Pinto Creek was nominated for unique waters classification, in part, because Lower Pinto Creek provides moderate to good riparian habitat for a variety of threatened, endangered, or sensitive species that may be present in the nominated reach. However, the availability of suitable habitat and the assertion that threatened or endangered species *may* be present are insufficient to support a unique waters classification under the current R18-11-112(D)(2). There is insufficient information in the nomination document for ADEQ to make a finding that threatened or endangered species are known to be associated with the surface water and the existing water quality is essential to the maintenance and propagation of a threatened or endangered species.

The federally-listed endangered or threatened species identified in the nomination are the bald eagle, southwestern willow flycatcher, the lesser long-nosed bat, and the Arizona hedgehog cactus (the other identified species are either candidate or Forest Service-sensitive species). The four federally-listed species that are identified are only weakly associated with Pinto Creek and there was no showing that the maintenance and protection of existing water quality in Lower Pinto Creek was essential to the maintenance and propagation of the species. For example, the nomination document states that neither bald eagles or the southwestern willow flycatcher have been observed along Pinto Creek but that bald eagles may fly over lower Pinto Creek in search of prey and the southwestern willow flycatcher may find suitable habitat if willows recover from flooding to form dense thickets. The only information provided in the nomination document regarding the lesser long-nosed bat is a statement that the U.S. Fish & Wildlife Service believes that the bat may be in the area. The Arizona hedgehog cactus is only weakly associated with the Pinto Creek riparian community. Its habitat is described as the ecotone between interior chapparal and madrean evergreen woodlands. It grows on open slopes, in narrow cracks between boulders, and in the understory of shrubs. It is difficult to conclude that a unique waters classification of Pinto Creek is essential to the maintenance and protection of the Arizona hedgehog cactus given these habitat requirements. Moreover, the presence of threatened or endangered species in Pinto Creek is contradicted by conclusions of the final environmental impact statement (EIS) for the Carlota Mine Project. Extensive studies on the presence of threatened or endangered species were done as part of the EIS. The final EIS document concludes that special status wildlife species or other wildlife species of concern "are not located in the vicinity of the Carlota project area and / or suitable habitat is not present" [*See* p. 3-189 of the EIS]. It also should be noted that Pinto Creek has *not* been designated as a critical habitat under the Endangered Species Act for any federally-listed threatened or endangered species. For all of these reasons, ADEQ concluded that Pinto Creek did not qualify for unique water classification on the basis of its known association with threatened or endangered species.

ADEQ determined that Lower Pinto Creek did not qualify for unique water classification on the ground that the stream is of exceptional recreational significance. Public access to the nominated reach of Pinto Creek is limited. There are no developed recreation facilities or trails within the nominated segment. Recreational activities are limited to dispersed recreation activities such as hiking, nature study, picnicking, and horseback riding. In 1993, the Tonto National Forest estimated that only 1,500 recreation visitor days occurred within the area of the nominated segment annually. This level of recreational use does not support a finding that Pinto Creek is one of Arizona's exceptional recreation resources. Finally, the Arizona River Assessment Project, in an independent assessment of Pinto Creek, rated the stream as a limited recreation resource. The Arizona River Assessment Project defines "limited" recreation resource as one where "recreational values are limited, and do not offer as high a quality of recreation experience or uniqueness of experience within the state as the other value classes."

The nomination document notes that Lower Pinto Creek was included in a U.S. Forest Service study of rivers and streams potentially eligible for inclusion in the national Wild & Scenic Rivers System. In January, 1993, the U.S. Forest Service evaluated Pinto Creek in Preliminary Analysis of Eligibility and Classification for Wild / Scenic / Recreational River Designation Report. Resource information for Pinto Creek was published in a report entitled, Resource Information Report, Potential Wild / Scenic / Recreational River Designation, National Forests of Arizona, U.S. Department of Agriculture, U.S. Forest Service, Southwestern Region, September, 1993. Based on this preliminary analysis, the U.S. Forest Service found that Pinto Creek was eligible for inclusion in the national Wild & Scenic Rivers System as a scenic river and that it possessed outstandingly remarkable scenic, riparian, and ecological values. It should be noted that while the U.S. Forest Service made a preliminary determination that Pinto Creek was eligible for inclusion in the Wild and Scenic Rivers system, the stream has not been so designated.

The Pinto Creek watershed contains areas of known natural copper mineralization that have been exploited by past and present mining activities. Pinto Creek flows across the western margin of the historic Globe-Miami mining district, one of the major porphyry copper districts in the Southwest. Mining activities in the Pinto Creek watershed have created point and nonpoint source pollution sources that have contributed copper to Pinto Creek and its tributaries. These mining activities include open pit copper operations, several historic open-pit and underground operations, and hundreds of smaller adits, shafts, and prospects. Pinto Creek has been affected by numerous spills from the Pinto Valley Mine over the past 25 years, the latest resulting from a massive tailings failure in 1998. A remedial action under CERCLA (the federal Superfund program) was initiated against BHP Copper to clean up Pinto Creek.

Pinto Creek is listed by ADEQ under §303(d) of the Clean Water Act as a water quality-limited surface water for non-attainment of the surface water quality standard for dissolved copper. Under §303(d), a total maximum daily load (TMDL) analysis must be developed for all impaired surface waters on the §303(d) list. A draft TMDL for copper in Pinto Creek has been completed [*See* "Total Maximum Daily Load for Copper in Pinto Creek," Arizona, Environmental Protection Agency and Arizona Department of Environmental Quality, Public Review Draft, July, 2000]. The geographic scope of the TMDL includes the entire Pinto Creek watershed from its headwaters to Roosevelt Lake, including the reach of Pinto Creek nominated for classification as a unique water.

ADEQ agrees with the nominators that Pinto Creek has important natural resource values because of the presence of perennial water and the relatively rare cottonwood-willow riparian community that the stream supports. However, ADEQ decided not to propose Pinto Creek for unique waters classification primarily because the stream is water quality-limited for dissolved copper and the stream is listed on Arizona's §303(d) list. ADEQ believes that the listing of a surface water as an impaired water under §303(d) of the Clean Water Act is inconsistent with a unique waters classification. The unique waters program recognizes the state's outstanding state resource waters. ADEQ does not believe that surface waters with impaired water quality can reasonably be considered eligible for recognition as one of Arizona's outstanding state resource waters.

Lower Haunted Canyon unique water nomination

Mr. Tim Flood, on behalf of the Friends of Arizona Rivers, nominated a 0.7 mile segment of Lower Haunted Canyon for classification as a unique water in August, 1999. The nomination states that Lower Haunted Canyon is an outstanding state resource water of exceptional ecological and recreational significance because of its unique attributes, including its regional importance as a perennial stream in the Sonoran desert, its relatively good water quality, its biological uniqueness (particularly its high quality riparian vegetation and the presence of numerous species of insects, amphibians, fish, reptiles, birds and mammals), the stream's geomorphology (especially its relatively high percentage of pool habitat), and its scenic and aesthetic values.

ADEQ agrees that Lower Haunted Canyon is a valuable surface water resource and that it an ecologically significant, perennial, desert stream. However, ADEQ does not agree that the stream possesses the outstandingly remarkable and unique attributes that qualify it as one of Arizona's outstanding state resource waters of exceptional ecological significance. Lower Haunted Canyon may be a significant surface water resource on a local or even a regional scale. However, in ADEQ's best professional judgment, Lower Haunted Canyon does not possess outstanding attributes that set it apart as a surface water of statewide significance. No federally-listed threatened or endangered species are documented to occur in Lower Haunted Canyon, nor is it designated as a critical habitat for a threatened or endangered species. The nomination document notes that both exotic fish species and native fish species are present in Lower Haunted Canyon. ADEQ considered the absence of threatened or endangered species and the presence of non-native fish species in Lower Haunted Canyon (for example, green sunfish) in determining the relative ecological significance of the stream as compared to other surface waters in the state. The nomination of Lower Haunted Canyon states that the stream provides suitable habitat for the Gila topminnow and Gila chub, two federally-listed endangered species. However, a finding that a surface water may provide suitable habitat is not, by itself, enough to support a unique waters classification.

The presence of green sunfish in Lower Haunted Canyon suggests that active fishery management by the Arizona Game and Fish Department (AGFD) may be necessary for Lower Haunted Canyon to achieve its potential as a native fishery for the Gila topminnow or Gila chub. AGFD provided comments to ADEQ on the unique waters nominations and stated their concern that a unique waters designation may impair the AGFD's ability to manage the fishery resource in Lower Haunted Canyon. The AGFD notes in their comments that it is sometimes necessary to alter stream morphology to improve fish habitat (for example, construction of fish barriers, stream bank stabilization, installation of check dams, etc.) or apply piscicides such as rotenone or antimycin to remove non-native fish to aid in the recovery of threatened and endangered species (for example, the eradication of green sunfish). While a unique waters classification does not necessarily preclude such fishery management activities, ADEQ factored the need to conduct such activities into its decision whether to classify Lower Haunted Canyon as a unique water. The case for a unique water classification of Lower Haunted Canyon would be much stronger if the stream was renovated and a native fishery for the Gila topminnow or Gila chub was established.

Lower Haunted Canyon does not qualify for unique waters classification on the ground that it is of exceptional recreational significance. Public use and access to the stream are limited. The nomination document itself notes that Lower Haunted Canyon is only a "lightly used recreational area." Moreover, an independent evaluation of Lower Haunted Canyon conducted as part of the Arizona Rivers Assessment Project described Haunted Canyon as being only a limited recreation resource that does not offer a high quality or unique recreational experience within the state when compared to other surface waters in the state.

Finally, ADEQ considered the comments of the U.S. Forest Service, the primary federal land management agency for the Tonto National Forest where Lower Haunted Canyon is located. The Tonto National Forest opposed the unique waters classification for Lower Haunted Canyon because it may interfere with mitigation measures agreed to by the U.S. Forest Service, the Carlota Copper Company, U.S. Environmental Protection Agency, Arizona Department of Water Resources, U.S. Army Corps of Engineers, and ADEQ in the final Environmental Impact Statement (EIS) for the Carlota Mine Project. One of the mitigation measures (WR-3 in the final EIS) developed by the Tonto National Forest and agreed to by the Carlota Copper Company is a measure to maintain stream flow in Haunted Canyon. The mitigation measure calls for diverting water from a water supply well field and discharging it to Haunted Canyon. Water quality data provided from the water supply well field indicates that the groundwater has a similar water chemistry to surface water in Haunted Canyon. However, some differences in water quality exist that could make it difficult to comply with Tier 3 antidegradation requirements. The classification of Lower Haunted Canyon as a unique water could be counterproductive because it may impair the implementation of the well field mitigation program to preserve existing stream flow in Lower Haunted Canyon. Two of the principal arguments for the nomination of Lower Haunted Canyon as a unique water are it is of exceptional ecological significance because of its outstanding

riparian community and the presence of perennial water in a Sonoran desert environment. The maintenance of stream flow in Lower Haunted Canyon is essential to maintaining its riparian community. A unique waters classification that interferes with the implementation of a strategy to preserve in-stream flows in Haunted Canyon may do more harm than good. For this reason, ADEQ chose not to classify Lower Haunted Canyon as a unique water.

Forest Guardians Nominations

The Forest Guardians White Mountain Conservation League ["Forest Guardians"] nominated all of the Apache trout streams in the Black River, Blue River, and Little Colorado River watersheds for unique water classification. Forest Guardians nominated 22 streams in three watersheds primarily on the ground that the streams support populations of threatened, endangered, and sensitive wildlife species, particularly the Apache trout. Forest Guardians also recommended the 22 streams for unique water classification on the ground that the surface waters provide important recreational opportunities such as hiking, birding, nature study, camping, hunting, fishing, and horseback riding.

ADEQ does not disagree that nominated surface waters have important recreational values, but the nominations provide insufficient information upon which ADEQ could find that the nominated surface waters represent surface waters that present exceptional recreational opportunities of statewide recreational significance.

Forest Guardians recommended the 22 surface waters primarily because of the presence of a number of endangered, threatened, and sensitive species. Many of the species listed in the nomination documents are identified as sensitive bird, terrestrial, or plant species, but there was no information to show that the maintenance of existing water quality in the nominated surface waters was essential to the maintenance and propagation of the endangered, threatened, or sensitive species.

ADEQ considered public comments that were made in support and in opposition to the Forest Guardians nominations. In particular, ADEQ carefully considered the comments of the Apache Sitgreaves National Forest [ASNF], the federal agency with management authority over the public lands where the nominated surface waters are located. In 1994, the U.S. Forest Service conducted biological assessments and evaluations for an Apache Trout Habitat Improvement Project within the ASNF. The biological assessments provided information used to develop the current Apache Trout Recovery Plan for the ASNF.

The ASNF did not support the nominations of Conklin Creek, Corduroy Creek, Double Cienega Creek, Fish Creek, Hannagan Creek, Boggy Creek, Centerfire Creek, Wildcat Creek, Home Creek, Reservation Creek, or Soldier Creek in the Black River watershed. The ASNF did not support the nominations of Coleman Creek and Grant Creek in the Blue River watershed. Finally, the ASNF did not support the nominations of Coyote Creek and Mamie Creek in the Little Colorado River watershed. The reasons ASNF provided for not supporting a nominated surface water are various, but they include the following:
1) The stream does not provide exceptional Apache trout habitat or it only provides limited Apache trout habitat ; 2) the stream is an intermittent stream; 3) The stream is impacted by roads or other nonpoint sources of pollution, and 4) the stream is partly on the Fort Apache Indian Reservation and the state and ASNF have no regulatory or management authority on tribal lands.

The ASNF supported the nominations of the following surface waters for unique waters classification:

1. Bear Wallow Creek (including the North and South Forks) - because it is located within the Bear Wallow Wilderness area and the stream provides high quality Apache trout habitat.

2. Snake Creek - because the stream is currently in good condition and it provides exceptional Apache trout habitat.

3. West Fork of the Black River - (headwaters to West Fork campground) because the headwaters are considered to be in an unaltered watershed condition and it provides high quality Apache trout habitat within the ASNF.

4. Hay Creek - because the stream is currently in good condition and has the potential of becoming exceptional Apache trout habitat. Much of the stream falls within the Hayground Research Natural Area.

5. Stinky Creek - because road closures and exclusionary fencing have improved this stream to good condition.

6. KP Creek - because the stream is currently in good condition and it has the potential of becoming exceptional habitat for Apache trout. Also, the stream has been designated to be a Gila trout recovery stream.

7. Lee Valley Creek - because it currently is in good condition and has the potential of becoming exceptional habitat for Apache trout. Its headwaters are in the Mt. Baldy Wilderness Area and cattle grazing has been eliminated from the reach.

ADEQ did not propose any surface water for unique waters classification that was not supported by the ASNF. ADEQ classified all of the surface waters listed above except the West Fork of the Black River as unique waters in this triennial review because of the presence of the endangered Apache trout or the streams provide exceptional habitat for the Apache trout. Also, each of the above nominations is supported by the ANSF and the Arizona Game and Fish Department. Finally, the nominated surface waters are capable of being managed to maintain existing water quality. ADEQ decided not to classify the West Fork of the Black River because it is currently listed as an impaired water on the state's §303(d) list.

Forest Guardians Superstition Wilderness Nominations

Forest Guardians nominated five streams in the Superstition Wilderness Area for classification as unique waters. The five streams are Reavis Creek, Pine Creek, Tortilla Creek, Fish Creek, and LaBarge Creek. Forest Guardians nominated the five streams because they provide habitat for a variety of wildlife species and because most of the riparian corridors are in a healthy, proper functioning condition. The nomination document does state that some of the riparian areas along these streams show impacts from past overgrazing. For example, Tortilla Creek is described as having been subjected to heavy livestock concentrations in the past. The nomination states that threatened, endangered, and sensitive wildlife are associated with the five streams and that they "rely on the wooded areas supported by the creeks or the creeks themselves, and therefore water quality is crucial for their survival and propagation." While the nomination document states that the five streams provide critical habitat for threatened, endangered and sensitive species, there is no documentation that critical habitat designations under §4 of the Endangered Species Act [16 U.S.C. §1533] include any of the five nominated streams. Also, the only federally-listed threatened and endangered species identified in the nomination document associated with the nominated streams are bird species that are weakly dependent on existing water quality in the nominated streams for their maintenance and survival.

ADEQ does not believe that an adequate case for unique waters classification has been made for the five streams in the Superstition Wilderness Area. This conclusion is shared by the Tonto National Forest, the primary federal land management agency with jurisdiction over the public lands where the five streams are located. Furthermore, as the Tonto National Forest notes in their public comments to ADEQ, unique waters designations are largely unnecessary because of the location of the streams within an established wilderness area that already provides an adequate level of protection for the ecological and recreational values of the nominated streams.

Dry Lake

The Friends of Dry Lake nominated Dry Lake for unique waters classification in July, 1999. Dry Lake is an intermittent wetland in an extinct caldera located west of the city limits of Flagstaff, Arizona. The U.S. Army Corps of Engineers designated approximately 45 acres of Dry Lake as jurisdictional wetland, although the size of the wetland fluctuates considerably with seasonal and precipitation cycles. The wetland lies within the San Francisco Volcanic Field. The only source of water for Dry Lake is drainage from the slopes of the caldera. From the 1940's to the early 1970's, a dairy farm operated within the caldera and a dike was constructed through the bed of Dry Lake. Evidence of this dike and the old dairy farm operations are visible today. At the time of the nomination, Dry Lake and a large part of the caldera were owned by the Flagstaff Ranch Golf Club. At the time the Dry Lake nomination was submitted to ADEQ, a private developer had plans to construct a residential development and golf course within the caldera.

The nomination document states that Dry Lake is an outstanding state resource water because of its rarity. The nomination document states that there are over 600 cinder cones in the San Francisco Volcanic Field and Dry Lake is one of the six cinder cones that contain a wetlands. The nomination states that a natural wetland like Dry Lake, a scarce water resource in northern Arizona, is of exceptional ecological significance because of its local importance to wildlife. The nomination cites the presence of three federally-listed or state-listed endangered or threatened bird species, including the bald eagle, peregrine falcon, and the Mexican spotted owl as qualifying Dry Lake for unique water status under the current R18-11-112(D)(2). Finally, the Friends of Dry Lake state in their nomination that Dry Lake is an outstanding state resource water because of its recreational significance and aesthetic appeal.

ADEQ disagrees that Dry Lake qualifies as one Arizona's outstanding state resource waters when compared to other surface waters statewide. While ADEQ agrees that a wetland within a caldera is relatively rare, ADEQ does not believe that Dry Lake is of exceptional recreational or ecological significance. Dry Lake's recreational significance is limited. At the time of the nomination, most of the caldera was privately-owned and public access to the caldera and Dry Lake was restricted. No water-based recreation is possible at Dry Lake. Recreational activities are limited to nature study, wildlife viewing, and hiking on adjacent public lands.

ADEQ disagrees that Dry Lake is a surface water of exceptional ecological significance for several reasons. First, Dry Lake is an intermittent wetland. Moreover, the Dry Lake bed has been hydrologically modified by the construction of a dike through and dredging activities when the dairy farm operated within the caldera. The caldera and Dry Lake do not exhibit wilderness characteristics because of these hydrologic modifications. The possible presence of the bald eagle, peregrine falcon, and Mexican spotted owl are insufficient to support a unique waters classification for Dry Lake. These bird species are only weakly associated with Dry Lake and the wetland cannot be characterized as *essential* to their maintenance and propagation. Dry Lake has not been designated as critical habitat for any federally-listed threatened or endangered species.

ADEQ also takes note that the Grand Canyon Trust purchased the caldera basin and Dry Lake from the Flagstaff Ranch Country Club and will preserve the area as open space. The purchase will effectively prevent the development of the golf course and residential housing within the caldera. This purchase effectively removes the threat of development and will preserve the aesthetic and recreational values of Dry Lake and the surrounding caldera. For all of these reasons, ADEQ decided not to propose Dry Lake as a unique water.

Forest Guardians Santa Pedro River Watershed Nominations

Forest Guardians nominated four streams in the San Pedro River watershed for unique waters classification. Hot Springs Canyon, Bass Canyon, Redfield Canyon and Wildcat Canyon. These streams are located in Muleshoe Ecosystem located in the Galiuro Mountains in southeastern Arizona. The nomination document

states that this ecosystem encompasses the Muleshoe Cooperative Management Area that is jointly managed by Bureau of Land Management, the U.S. Forest Service, and the Nature Conservancy.

Forest Guardians nominated the four streams for consideration as outstanding state resource waters because of the existence of perennial flow in each stream and because each one provides important recreational opportunities and wildlife resources. The nomination cites the presence of 29 endangered, threatened, candidate, and sensitive species of concern known to be associated with the proposed surface waters, including five native fish species.

ADEQ agreed that the nominated surface waters possess outstanding natural attributes that qualify them for unique waters classification. ADEQ has recognized their ecological significance by establishing biocriteria reference sites at three of the four nominated streams. ADEQ disagrees that the level of recreational use (1,700 - 1,800 visitors a year) supports a finding that the streams are of exceptional recreational significance. None of the nominated streams were rated as outstanding recreation resources by the Arizona River Assessment Project.

While the four streams may qualify as outstanding state resources on the ground that they are of exceptional ecological significance, ADEQ decided not to propose them for unique waters classification. The nominated streams are located in remote areas that are almost entirely within the boundaries of the Muleshoe Preserve. They are already being well managed to protect existing water quality and the outstanding natural attributes of their riparian corridors. A Muleshoe Ecosystem Management Plan is already in place to improve the nominated watersheds. The Muleshoe Ecosystem Management Plan was created in a joint effort with the cooperation of the Nature Conservancy, Bureau of Land Management, U.S. Forest Service, Arizona Game and Fish Department, neighboring ranchers, and private property owners. These parties, including the Nature Conservancy, which is principally responsible for preserving the natural resources and ecological values of the Muleshoe Preserve, oppose unique waters classification for the four nominated streams. The nominations also are opposed by the Redington Natural Resource Conservation District. ADEQ decided that a unique waters classification of the four streams was unnecessary and may limit implementation of some of the management tools that have been shown to be effective in watershed improvement under the Muleshoe Ecosystem Management Plan. In the absence of support for these nominations from the principal land management agencies, ADEQ decided not to propose the nominated streams for unique waters classification.

Peeples Canyon Creek

ADEQ received a request from the Arizona Office of the Bureau of Land Management (BLM) to review the existing classification of Peeples Canyon Creek as a unique water. The current unique waters listing of Peeples Canyon Creek is from its headwaters to its confluence with the Santa Maria River. BLM requested that ADEQ revise the current listing because it is inconsistent with the reach of Peeples Canyon Creek that BLM nominated for unique waters classification in 1985. BLM requested that ADEQ change the unique water listing to be consistent with the original nomination of a 1/4 mile segment of Peeples Canyon Creek associated with South Peeples Spring. This request is strongly opposed by a coalition of 10 environmental organizations who argue that the entire reach of Peeples Canyon Creek, including the headwaters of the creek around Sycamore Spring, deserves protection as a unique water. ADEQ included the BLM request in the preliminary draft rules and the agency solicited public comments on the request to amend the current listing of Peeples Canyon Creek to include only the 1/4 mile segment associated with South Peeples Spring.

ADEQ decided not to propose any changes to the current listing of Peeples Canyon Creek in the proposed rules for the following reasons:

1. Peeples Canyon Creek, from its headwaters to its confluence with the Santa Maria River, is currently listed as a unique water in R18-11-112. The revision of the listing to include only a 1/4 mile segment of the creek around South Peeples Spring would result in the removal of Tier 3

antidegradation protection for most of the stream that currently is protected as a unique water. ADEQ has never "declassified" a unique water and does not believe that a delisting action is consistent with the intent of the state's antidegradation rule. Moreover, ADEQ believes that the declassification of a unique water establishes a bad precedent for the unique waters program as a whole that could lead to additional requests to declassify and remove Tier 3 water quality protection from other established unique waters. As a general policy, unique waters should be maintained and protected for future generations. Once a unique water is established by rule, there should be no possibility of "delisting" it and removing its special status.

2. Restricting the unique waters classification to the area around South Peeples Spring would remove Tier 3 antidegradation protection from the Sycamore Spring area in the headwaters of Peeples Canyon Creek located in the Arrastra Mountain Wilderness Area. The practical result of this action would be to facilitate the use of the Sycamore Spring area of Peeples Canyon Creek as a livestock watering area. ADEQ believes that this would lead to significant degradation of existing water quality in the Sycamore Spring area. This result can and should be avoided by retaining the unique waters classification on the entire stream.

3. The Sycamore Spring area of Peeples Canyon Creek is perennial, has exceptional wilderness values, and meets the criteria for unique waters classification. While the Bureau of Land Management may be technically correct that the current listing of Peeples Canyon Creek is inconsistent with the original nomination documents submitted by BLM in 1985, the entire stream from its headwaters to its confluence with the Santa Maria River has been afforded Tier 3 antidegradation protection since 1992. ADEQ sees no compelling reasons to change the unique waters classification now and provide Tier 3 water quality protection in Peeples Canyon Creek on a limited and piecemeal basis.

Effluent-dependent waters [R18-11-113]

As noted in the preamble discussion of the definition of "effluent-dependent water," ADEQ amended the definition of EDW to clarify that an EDW is a surface water that consists of wastewater discharges. Under the revised definition, an EDW is a surface water that, in the absence of the discharge of treated wastewater, is an ephemeral water. ADEQ also amended the information requirement in R18-11-113(C)(2) to conform it to the proposed amendment to the EDW definition as follows:

C. Any person may submit a petition for rule adoption requesting that the Director classify a surface water as an effluent-dependent water. The petition for rule adoption shall include:
   1. A map and a description of the surface water.
   2. Information that demonstrates that the surface water consists ~~primarily~~ of discharges of treated wastewater.
   3. Information that demonstrates that the receiving surface water is an ephemeral water.

ADEQ considered several specific requests related to EDWs in this triennial review. First, the City of Willcox filed a petition for rule adoption requesting that Lake Cochise be classified as an effluent-dependent water. The City of Willcox has been treating municipal wastewater and reusing treated effluent on a local golf course. Excess treated effluent is stored in a playa depression that is known locally as Lake Cochise. The only source of water for Lake Cochise is treated wastewater. ADEQ added Lake Cochise as an effluent-dependent water and listed it in R18-11-113 and Appendix B.

Second, BHP Copper filed a petition for rule adoption requesting that a segment of Queen Creek from the Superior Mining Division discharge point downstream to the Town of Superior wastewater treatment plant be changed from an effluent-dependent water to an ephemeral water. BHP Copper provided information to

ADEQ in support of its request demonstrating that the segment of Queen Creek that is the subject of this request is an ephemeral water. ADEQ amended R18-11-113(D)(3)(e) as follows:

D. The following surface waters are classified as effluent-dependent waters:
3. In the Middle Gila River Basin:
e. Queen Creek from ~~Superior Mining Division discharge~~ the Town of Superior WWTP outfall to its confluence with Potts Canyon

ADEQ also amended the listing of Queen Creek in Appendix B to indicate that it is an ephemeral water from its headwaters to the Town of Superior WWTP discharge outfall.

Third, the Pima County Wastewater Management Department requested that ADEQ classify two additional surface waters within the Santa Cruz River basin as EDWs. The two surface waters are currently identified as ephemeral waters. Proposed discharges of treated wastewater from the Green Valley Wastewater Treatment Facility to the Santa Cruz River and for the Kino Wetlands Project for a discharge to the Ajo Detention Basin in Julian Wash in the Tucson metropolitan area will create effluent-dependent waters. Pima County Wastewater Management Department submitted documentation demonstrating that the proposed EDW reaches will consist of discharges of treated wastewater and that the receiving waters are ephemeral waters. However, on the advice of the Governor's Regulatory Review Council (GRRC), ADEQ decided not add the EDWs to R18-11-113. The GRRC staff pointed out that the proposed EDWs had not been included in the Notice of Proposed Rulemaking and that adding the new EDWs to the Notice of Final Rulemaking may constitute a substantial change to the rules that would violate A.R.S. §41-1025. Consequently, ADEQ will defer action on this request to a future rulemaking.

Finally, ADEQ adopted a site-specific standard of 36 µg / L for the reach of the Rio de Flag from the Rio de Flag wastewater treatment plant discharge point to the confluence of Wildcat Canyon. The site-specific standard addresses high copper concentrations in the influent to the wastewater treatment plant due to naturally elevated copper concentrations in well water. A water effects ratio (WER) study was performed with effluent from the EDW portion of the Rio de Flag in Flagstaff, Arizona. The WER procedure is an EPA-approved procedure for developing site-specific standards for metals. The scientific basis for the WER procedure is as follows. EPA's ambient water quality criteria for metals are derived from the results of acute and chronic laboratory toxicity tests done in clean laboratory water. Laboratory water contains very low concentrations of substances, such as dissolved organic carbon and suspended solids, or other substances that may sorb or form complexes with metals and reduce their bioavailability or toxicity. Also, EPA's water quality criteria for metals are based on measurements of total recoverable metal, which EPA acknowledges may overestimate the toxicity of metals to aquatic life. The WER procedure was developed to modify criteria for metals to adjust for site-specific effects on metal toxicity in ambient surface waters.

In the WER procedure, two sets of acute or chronic toxicity tests with a metal are done side-by-side. One is done in laboratory water and the other is performed using water taken from the surface water being evaluated. Toxicity endpoints from the two sets of toxicity tests and the ratio between toxicity endpoints are calculated. This is the water effects ratio. To develop a site-specific standard for the surface water, the national or state water quality criterion for the metal is multiplied by the water effects ratio. Two studies for the Rio de Flag were done to develop a site-specific standard for copper. A screening level study wasdone in June, 1996 and a definitive study done in August, 1996. These WER studies were done by ENSR Toxicology of Fort Collins, Colorado.

The results from the WER studies indicate that copper in the Rio de Flag is at least 6.9 times less toxic than in laboratory water used to derive EPA's ambient water quality criterion for copper. Based on these results, the current chronic water quality standard for copper could be increased 6.9 times without compromising the protection of sensitive aquatic species in the Rio de Flag. Although the results of the WER studies support such an increase, the City of Flagstaff requested that the copper standard be increasedonly by a factor of two.

The proposed site-specific standard of 36 µg/L for copper in the Rio de Flag incorporates this additional margin of safety.

ADEQ adopted the following site-specific standard for dissolved copper in the Rio de Flag:

F. The site-specific standard of 36 µg / L for dissolved copper for the aquatic and wildlife (effluent-dependent water) designated use applies to the Rio de Flag from the City of Flagstaff WWTP outfall to its confluence with the San Francisco Wash .

Revision of the mixing zone rule [R18-11-114]

States may, at their discretion, adopt policies in their rules that affect the application and implementation of water quality standards, such as a mixing zone policy. State mixing zone policies are subject to EPA review and approval [*See* 40 CFR §131.13]. EPA recommends that states have a definitive statement in their water quality standards regulations on whether or not mixing zones are allowed. Arizona has a definitive statement in R18-11-114, the rule that authorizes mixing zones.

A mixing zone is a limited area or volume of water where initial dilution of a discharge takes place and where numeric water quality criteria may be exceeded in a receiving surface water. Mixing zones are based on the understanding that it is not always necessary to meet all water quality criteria at the point of discharge to protect the biological, chemical, and physical integrity of a surface water as a whole. Sometimes it is appropriate to allow a pollutant to be discharged in a concentration that exceeds the applicable water quality standard in the immediate area of an outfall. These areas are called mixing zones.

Mixing zones may be allowed provided: 1) the mixing zone does not impair the integrity of the surface water as a whole, 2) there is no lethality to organisms passing through a mixing zone, and 3) there are no significant human health risks, considering the likely exposure pathways. Fundamental to the theory of using mixing zones is the belief that by mixing with the receiving water within the zone, the discharge will become sufficiently diluted to meet applicable water quality criteria beyond the borders of the mixing zone.

Mixing zone characteristics are defined on a case-by-case basis after it is determined that there is assimilative capacity in a receiving surface water to safely accommodate the discharge of a pollutant. A mixing zone analysis should take into consideration the physical, chemical, and biological characteristics of the receiving surface water and the discharge, the potential impacts on the aquatic ecosystem, the protection of human health, and the designated uses of the receiving water.

EPA provides extensive guidance on mixing zones in the *Water Quality Standards Handbook, 2nd Edition* and the *Technical Support Document for Water Quality-Based Toxics Control* (USEPA, 1991, Sections 2.2, 4.3, and 4.4). These EPA guidance documents discuss mixing zone methodologies; the location, size and shape of mixing zones; in-zone water quality; the prevention of lethality to organisms passing through a mixing zone; mixing zone analyses; outfall designs that maximize initial dilution in a mixing zone; critical design periods for mixing zone analyses; and methods to analyze and model near-field and far-field mixing. ADEQ amended R18-11-114 to be more consistent with current EPA guidance on mixing zones and to clarify the administrative procedures that apply to the establishment of a mixing zone.

R18-11-114 should specifically prescribe water quality requirements within mixing zones. Because a mixing zone is an allocated impact zone where dilution of a discharge is in progress, ADEQ understands that acute and chronic water quality criteria may be exceeded within different boundaries in a mixing zone. ADEQ wants to clarify statements in the current rule at R18-11-114(F), which states that "the Director shall deny the request to establish a mixing zone...if concentrations of pollutants within the proposed mixing zone will cause acute toxicity to aquatic life." This statement incorrectly suggests that acute toxicity criteria to protect aquatic life always must be met at the "end-of-the-pipe" and that ADEQ cannot establish a mixing zone for an acute

toxicity criterion. ADEQ amended the statement in R18-11-114(F) in order to allow ADEQ to establish a zone of initial dilution (ZID) in a mixing zone where it is permissible to exceed an acute toxicity criterion provided certain conditions are met. In a ZID immediately surrounding an outfall, neither acute or chronic toxicity criteria are met. The acute criterion must be met at the boundary of the ZID. In the outer mixing zone, the acute criterion, but not the chronic criterion must be met. The chronic criterion must be met at the boundary of the outer mixing zone. This amendment is consistent with current EPA guidance on mixing zones [*See Water Quality Standards Handbook, Second Edition*, Figure 5-1, p. 5-4, and *Technical Support Document for Water Quality-based Toxics Control*, Section 2.2.2, p. 33]. Current EPA guidance does not completely prohibit mixing zones for acute toxicity criteria. Rather, EPA guidance prohibits concentrations of pollutants in a mixing zone that are acutely lethal to aquatic organisms passing through a mixing zone. The zone of initial dilution in the mixing zone is sized to prevent lethality to passing organisms.

Lethality is a function of the magnitude of pollutant concentrations and the duration an organism is exposed to those concentrations. An acute toxicity criterion describes the condition under which lethality will not occur if the duration of exposure at the acute toxicity concentration is less than one hour. Thus, the areal extent and concentration isopleths of a mixing zone must be such that the one-hour average exposure of organisms passing through the mixing zone is less than the acute toxicity criterion. An organism must be able to pass through a zone of initial dilution or escape the high concentration area. Lethality to passing organisms can be prevented in a mixing zone in several ways. First, ADEQ can continue the approach articulated in the current rule which prohibits ZIDs, and require that acute toxicity criteria be met at the "end-of-the-pipe." This conservative approach ensures the prevention of acute toxicity in a receiving water. The second approach is to require that an acute toxicity criterion be met at the boundary of an appropriately-sized ZID that is designed to prevent lethality to passing organisms. In the second approach, an acute toxicity criterion may be exceeded within a ZID. Hydraulic investigations and calculations would have to be provided to ADEQ to demonstrate that the acute toxicity criterion will be met at the boundary of the ZID during critical design flow conditions. *The Water Quality Standards Handbook, Second Edition*, Section 5.1.2, provides specific guidance on methods that can be used to prevent lethality.

Mixing zones should be denied for persistent, bioaccumulative pollutants of concern (BCCs). The potential for a pollutant to bioaccumulate in living organisms is a function of the bioaccumulation factor (BAF) or bioconcentration factor (BCF) for the pollutant, the duration of exposure, and the concentration of the pollutant. While any BCF greater than one indicates that bioaccumulation potential exists, bioaccumulation potential is generally not considered to be of concern unless the BAF or BCF exceeds 1000 or more. The proposed mixing zone prohibition is limited to the following persistent BCCs: chlordane, DDT and its metabolites (DDE and DDT), dieldrin, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, lindane, mercury, PCBs, dioxin, and toxaphene.

Mixing zones for persistent BCCs should be prohibited to the greatest extent technically and economically possible. This is because BCCs, due to their persistent and bioaccumulative nature, are incompatible with mixing zones. By definition, BCCs are chemicals that do not degrade over time. These chemicals accumulate in organisms living in surface waters and they become more concentrated as they move up the food chain - from biota to fish and wildlife to humans. Because the effects of these chemicals are not mitigated by dilution, using a mixing zone to dilute the discharge of a BCC is inappropriate. Dilution and dispersion are not appropriate control strategies for BCCs and a mixing zone is an inadequate substitute to the removal and treatment of a BCC at the source before it is discharged to a surface water.

Finally, ADEQ made some procedural changes to R18-11-114 relating to how mixing zones are established. R18-11-114(A) states that the Director may establish a mixing zone by order. ADEQ amended R18-11-114(A) to clarify that a mixing zone is established as part of the NPDES permit issuance process and not by administrative order.

Nutrient Waivers [R18-11-115]

R18-11-115 authorizes a waiver from water quality standards for total phosphorus and total nitrogen that apply to ephemeral waters by operation of the tributary rule. Nutrient waivers are available on a discharger-specific basis. Typically, they are issued to the operators of wastewater treatment plants that discharge to ephemeral tributaries to surface waters to which numeric nutrient standards apply. Under R18-11-115, a discharger must apply for a nutrient waiver. A discharger may obtain a nutrient waiver by demonstrating that the discharge of wastewater to an ephemeral tributary will not cause a violation of the nutrient standards that apply to the downstream surface water.

Currently, both the nutrient waiver rule at R18-11-115 and the variance rule at R18-11-122 provide mechanisms for a point source discharger to discharge wastewater containing concentrations of nitrogen or phosphorus that exceed surface water quality standards. In effect, a nutrient waiver is a type of variance from water quality standards. While different information requirements and conditions apply to nutrient waivers and variances, they are similar in many respects. Nutrient waivers and variances have the following similarities:

- Both authorize a temporary exceedance of a water quality standard.
- Both are discharger-specific.
- Both are pollutant-specific (for example, total nitrogen or total phosphorus)
- Both have five-year terms.
- Both are re-evaluated upon the issuance, reissuance, or modification of the NPDES permit for the discharge.
- The same public participation processes apply to variances and nutrient waivers.
- The same administrative appeal processes apply to both.
- Variances and nutrient waivers are both subject to EPA review and approval.

There are three major differences between a variance and a nutrient waiver. First, the grounds for obtaining a variance are different from the grounds for obtaining a nutrient waiver. To obtain a variance, a discharger must demonstrate that treatment more advanced than applicable technology-based requirements of the Clean Water Act are necessary to comply with a water quality standard and either: 1) it is not technically feasible to achieve compliance within five years, or 2) the cost of treatment to achieve compliance would result in "substantial and widespread economic and social impact." For example, a wastewater treatment plant operator who wants to obtain a variance from a nutrient standard would have to demonstrate: 1) that treatment beyond secondary treatment requirements is necessary to achieve compliance with the nutrient standard, and 2) that it is either not technically feasible to install nutrient control treatment technology at the wastewater treatment plant within five years or the cost of installing the treatment technology would have a substantial and widespread economic and social impact in the community. These technology requirements do not apply to nutrient waivers. To obtain a nutrient waiver, the operator of the wastewater treatment plant must demonstrate that the receiving water is an ephemeral water and that the discharge of wastewater to the ephemeral water will not cause a violation of applicable nutrient standards in the nearest downstream surface water. There are no requirements to demonstrate that it is technically or economically infeasible to install nutrient control technology at the wastewater treatment plant to obtain a nutrient waiver.

Second, to renew a variance a discharger must demonstrate that a discharging facility is making "reasonable progress" towards achieving compliance with the applicable standard over the term of the variance [*See* R18-11-122(D)]. In effect, R18-11-122(D) is a technology-forcing provision that requires a periodic review to see if it is feasible to achieve compliance with water quality standards. In the example provided in the previous paragraph, R18-11-122(D) would require that the wastewater treatment plant operator control the discharge of nutrients to the maximum extent practicable with existing treatment technology. The rule would require a wastewater treatment plant operator to install a treatment upgrade to control the excessive concentration of

nutrients in a discharge. The "reasonable progress" requirement is not found in the current nutrient waiver provision. There is nothing in the current nutrient waiver rule that requires a discharger to take any steps at all to control the discharge of nutrients once a nutrient waiver is obtained. Wastewater treatment plant operators who have obtained nutrient waivers for their facilities typically reapply and renew them every five years. There is nothing in the rule that requires a review to determine whether it is feasible to install nutrient control technologies. Consequently, the rule permits wastewater treatment plants to continue operation over consecutive five-year nutrient waiver cycles without ever having to address the excessive discharge of nutrients to the receiving water.

Finally, the current variance provision requires the proposal of interim discharge limitations that represent the highest level of treatment that is achievable by a point source discharge during the term of the variance. A nutrient waiver does not require the proposal of interim discharge limitations to control the discharge of nutrients. Instead, the nutrient waiver provision waives the applicable surface water quality standards for total nitrogen or total phosphorus. In doing so, a nutrient waiver removes the legal basis for the establishment of any water quality-based discharge limitations in an NPDES permit to control the discharge of nutrients to the receiving water. There are no regulatory requirements to improve the performance of the wastewater treatment plant.

ADEQ repealed the nutrient waiver provision at R18-11-115 for two reasons. First, the variance provision serves the same function as the nutrient waiver provision. A variance can be obtained from water quality standards for total phosphorus or total nitrogen. Second, ADEQ believes that the surface water quality standards rules should require a discharger to take steps to upgrade treatment to control the discharge of nutrients if it is technically and economically feasible to do so. At a minimum, the rule should require the implementation of measures to control the discharge of nutrients to the maximum extent practicable (that is, through imposition of interim discharge limitations). Unlike the variance rule, the nutrient waiver rule has no requirements to take corrective action to control the discharge of nutrients even if treatment upgrades are technically and economically feasible. The nutrient waiver rule authorizes the continued discharge of wastewater that exceeds applicable nutrient standards without any consideration of available treatment alternatives to control nutrients in that discharge. There are no incentives in the nutrient waiver rule for achieving compliance with water quality standards.

The repeal of the nutrient waiver provision is opposed by some members of the regulated community who are concerned that the current variance provision is so restricted that it is effectively unavailable to dischargers. The regulated community has argued that the current nutrient waiver provision should be retained because it is limited in its scope. They argue that the nutrient waiver rule is limited in scope because: 1) it applies only to two pollutants, nitrogen and phosphorus, neither of which are toxic pollutants, and 2) it applies only to discharges to ephemeral waters that are tributary to surface waters for which nutrient standards have been established. Finally, it is argued that the nutrient waiver provision should be retained because it provides a significant benefit to small wastewater treatment plants that may not have the financial capability to upgrade treatment processes.

ADEQ disagrees that variances are effectively unavailable to dischargers. A variance for nutrients can be obtained on grounds that it is not economically feasible to install nutrient control technologies at a wastewater treatment plant. Second, ADEQ disagrees that wastewater treatment plants should not be required to control nutrients in discharges to ephemeral tributaries of surface waters for which nutrient standards have been established. The discharge of treated wastewater to an ephemeral water creates an effluent-dependent water. The effective control of nutrients in the treated wastewater that creates the EDW will improve water quality in EDWs and help prevent accelerated eutrophication and the nuisance growth of algae. Finally, less than 10 wastewater treatment plants in the state currently operate under nutrient waivers. Small wastewater treatment plants operators who are financially incapable of upgrading treatment processes to control the discharge of nutrients should be able to obtain a variance on economic grounds.

Schedules of compliance [R18-11-121]

ADEQ amended R18-11-121 to allow compliance schedules for new and recommencing point sources, similar to EPA's schedule of compliance provision for NPDES permits at 40 CFR § 122.47.

R18-11-121(B) states that a schedule of compliance shall not be established in a NPDES permit for a new point source. The rule defines a new point source as follows:

> [A] new point source means a point source, the construction of which commences after the effective date of a water quality standard. Commencement of construction means that the owner or operator of the point source has obtained the federal, state, and local approvals or permits necessary to begin physical construction of the point source and either:
> 1. On-site physical construction program has begun; or
> 2. The owner or operator has entered into a contract for physical construction of the point source and the contract cannot be cancelled or modified without substantial loss. For purposes of this subsection, "substantial loss" means in excess of 10% of the total cost incurred for physical construction.

The federal NPDES permit rules include a schedule of compliance provision for new sources at 40 CFR §122.47(a)(2). The federal NPDES permit regulations do not prohibit schedules of compliance for new sources or new dischargers. The federal rule permits a schedule of compliance for a new source, but only when necessary to allow a reasonable opportunity to attain compliance with requirements that are issued or revised after commencement of construction but less than three years before commencement of the relevant discharge. The federal rule also permits schedules of compliance for recommencing dischargers to allow a reasonable opportunity to attain compliance with requirements issued or revised less than three years before recommencement of a discharge. ADEQ amended R18-11-121(B) to make it consistent with the federal regulation that addresses schedules of compliance for new and recommencing dischargers.

Variances [R18-11-122]

In the last triennial review, ADEQ adopted R18-11-122, which establishes a procedure for granting a variance from a water quality standard. The adoption of R18-11-122 is consistent with EPA guidance, which states that variances from state-adopted water quality standards are allowed [*See Water Quality Standards Handbook, 2nd Edition*, § 5.3 (August, 1994)].

According to EPA guidance, a variance from water quality standards involves the same substantive and procedural requirements that apply to the removal of a designated use through the use attainability process, except that variances are discharger-specific, pollutant-specific, limited in duration, and do not result in a change to a designated use. A variance is viewed as an alternative to a permanent downgrade of a water quality standard. A variance is typically used where a state believes that a water quality standard can ultimately be attained. By maintaining the water quality standard as a goal for the surface water and granting a variance, the state can assure that reasonable progress is made towards improving water quality. With a variance, a NPDES permit may be written to ensure that reasonable progress is made toward attaining the water quality standard without violating §402(a)(1) of the Clean Water Act [33 U.S.C. §1342(a)(1)] which requires that NPDES permits ensure compliance with water quality standards.

R18-11-122 authorizes a variance where a point source discharger demonstrates that it is not technologically feasible to immediately comply with an applicable water quality standard or where compliance with a water quality standard will cause substantial and widespread economic and social impact. The variance procedure

allows temporary non-compliance with a water quality standard while maintaining that standard as a water quality goal for a surface water.

In the 1992 triennial review, Arizona adopted a comprehensive set of numeric water quality standards for toxic pollutants. The numeric water quality criteria were derived using methodologies that did not take the economic or technical feasibility of achieving compliance into consideration. The water quality criteria were established at concentrations deemed necessary to protect the various designated uses. In the last triennial review, ADEQ acknowledged that a variance procedure should be included in the water quality standards rules to provide regulatory flexibility when it is not technically or economically feasible for a point source discharger to achieve compliance with a water quality standard. Situations can and do arise where a point source discharger cannot comply with a water quality standard because the treatment technology is unavailable or the cost of treatment is too high. In such cases, a variance procedure provides a mechanism for maintaining the water quality standard as the ultimate water quality goal for a surface water while providing short-term relief from the water quality standard for a specific discharge. The grant of a variance does not modify a water quality standard, but it does provide the legal basis for the establishment of alternative discharge limitations in a NPDES permit. The allowance of a variance on a discharger-specific, pollutant-specific, short-term basis is preferable to a permanent downgrade of the water quality standards for a surface water through the use attainability process.

Under R18-11-122, a variance may be granted on a discharger-specific basis for a period of up to five years. A variance is implemented through a NPDES permit for a specific point source discharge. A point source discharger must document that treatment more advanced than that required by technology-based effluent limitations prescribed by the Clean Water Act is necessary to achieve compliance with the water quality standard and that alternative discharge control strategies to achieve compliance with the water quality standard have been evaluated. The point source discharger must document that it is not technically feasible to install and operate any of the available discharge control technologies to achieve compliance with the water quality standard or that the installation and operation of the treatment technology would cause substantial and widespread social and economic impact. An applicant for a variance also must demonstrate that the discharge of the pollutant for which a variance is sought is reduced to the maximum extent practicable through implementation of a local pretreatment program, source reduction, or waste minimization. Finally, an applicant for a variance must propose interim discharge limitations that represent the highest level of treatment achievable by the point source discharge during the term of the variance.

A variance may be renewed, but a point source discharger who seeks renewal must demonstrate that reasonable progress towards achieving compliance with the water quality has been made during the term of the variance.

R18-11-122 includes public participation procedures and provides a right of appeal to any person who may be adversely affected by a decision to grant or deny a variance from a water quality standard. The rule also clarifies that all variances are subject to EPA review and approval.

ADEQ received a request that ADEQ reconsider a number of issues related to variances that were raised in the last triennial review. These issues include: 1) the suggestion to modify the variance procedure to permit temporary suspensions of a water quality standard while one or more dischargers work under ADEQ supervision to correct a water quality problem, 2) a request to amend the variance procedure to include all six use attainability factors identified by EPA in 40 CFR §131.10(g), 3) a request to extend the variance provision to cover nonpoint source discharges, and 4) a request to allow variances for specific surface waters or segments of surface waters. ADEQ specifically responded to several of these issues in the last triennial review and those comment responses reflect ADEQ current thinking on these issues.

ADEQ disagrees that R18-11-122 should be amended to authorize variances for nonpoint source discharges. While EPA has approved variance procedures for nonpoint source discharges in a few states like Colorado,

such states are in the minority. In the National Assessment of State Variance Procedures published in November, 1990, EPA reported that 32 of the 57 states and territories have authority to grant variances from water quality standards. Of these states, 22 allowed variances from water quality standardsfor individual dischargers and only seven states specifically authorized variances for nonpoint source runoff.

A significant concern with authorizing variances from water quality standards for nonpoint sources is that the grant of a variance may undermine the implementation of best management practices [BMPs] through nonpoint source management control programs. A nonpoint source discharger may seek a variance rather than identifying and implementing BMPs that could be used to achieve compliance with water quality standards.

ADEQ also is concerned about how to administer and implement a variance for a nonpoint source discharge. A variance from a water quality standard may be issued only on a discharger-specific basis under the current rule. The grant of a variance does not modify a water quality standard in a surface water. Other point source discharges to the surface water are required to comply with the applicable water quality standards, including the water quality standard for which a variance has been granted to a specific discharger. A variance for a nonpoint source discharge would be fundamentally different. It would not be possible to grant a variance for a nonpoint source discharge on a discharger-specific basis. The only way to grant a variance for a nonpoint source discharge would be to temporarily modify the water quality standard for the surface water. A temporary modification of a water quality standard would affect all point source and nonpoint source discharges to the surface water. Moreover, under Arizona law, rulemaking would be required to modify a water quality standard in this way.

As adopted by ADEQ, a variance is clearly tied to the NPDES permitting program. Variances are for terms of up to five years and they are re-evaluated when a NPDES permit for a point source discharge is reissued. There is no similar regulatory program through which a variance for a nonpoint source discharge could be administered.

Finally, the intent of the variance provision is to ensure the highest level of water quality achievable while a variance is in effect. The final rule achieves this by requiring a demonstration by a point source discharger that the discharger has reduced, to the maximum extent practicable, the discharge of the pollutant for which a variance is sought. The discharger also is required to propose interim discharge limitations that represent the highest level of treatment achievable during the term of the variance. It is not clear how to ensure the highest level of water quality achievable when a variance is requested for a nonpoint source discharge.

ADEQ also disagrees that variances should be permitted for all of the grounds that support a use attainability analysis. While EPA guidance on variances indicates that a variance from a water quality standard may be based upon any of the six grounds for removing a designated use prescribed in 40 CFR §131.10(g), ADEQ does not believe that four of the grounds cited in 40 CFR §131.10(g) are appropriate for a discharger-specific variance. These grounds are:

1. Naturally occurring pollutant concentrations prevent the attainment of the water quality standard;

2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the water quality standard, unless these conditions may be compensated by the discharge of a sufficient volume of effluent to enable the water quality standard to be met without violating state water conservation requirements;

3. Dams, diversions or other types of hydrologic modifications preclude the attainment of the water quality standard, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the water quality standard; and

4. Physical conditions related to the natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles and the like, unrelated to chemical water quality, preclude the attainment of the water quality standard.

While the four grounds cited above may support the removal or downgrade of a designated use of a surface water, they do not support a temporary variance for a specific point source discharger. For example, it is not clear how "[n]aturally-occurring pollutant concentrations that prevent attainment of the water quality standard" may be applied to support a variance for an individual point source discharge. While there may be situations where it is not possible to comply with a water quality standard because of naturally-occurring pollutant concentrations in a surface water, it is difficult to see why a specific point source discharge should be granted a variance from a water quality standard on this ground. If it is impossible to attain compliance with a water quality standard because of naturally-occurring pollutant concentrations, then the appropriate remedy is to conduct a use attainability analysis to modify the water quality standard for the surface water. A variance is premised on the belief that the conditions which prevent attainment of a water quality standard are temporary in nature and that compliance with the water quality standard ultimately can be achieved. When a naturally-occurring concentration of a pollutant prevents the attainment of a water quality standard, it is unlikely that compliance with the water quality standard will ever be achieved. Naturally-occurring pollutant concentrations in a surface water are permanent in nature. Similarly, when natural, ephemeral, intermittent or low-flow conditions prevent attainment; or dams, diversions, or other types of hydrologic modifications prevent attainment; or physical conditions related to the natural features of a surface water prevent attainment of a water quality standard, then the appropriate regulatory response is a use attainability analysis [UAA], not a variance. When such conditions exist, they are permanent in nature and it is unlikely that such conditions will change in the future.

When ADEQ adopted the variance provision in 1996, ADEQ stated its position that only one element in 40 CFR §131.10(g) may be applied on a discharger-specific basis because it was related to a discharger's capability to install and operate discharge control technology to attain designated uses. 40 CFR §131.10(g)(6) allows the removal of a designated use if it can be demonstrated that attaining the designated use is not feasible because "controls more stringent than those required by §301(b) and §306 of the Act would result in substantial and widespread economic and social impact."

When EPA first indicated the allowability of state water quality variance provisions in the federal water quality standards regulations at 40 CFR §131.13, EPA stated in the preamble that state-adopted variances could be approved if they were based upon a demonstration that meeting a water quality standard would cause "substantial and widespread economic and social impact" [*See* 48 Federal Register 51403]. This conclusion was based upon Decision of the General Counsel No. 58 [44 Federal Register 39508 (March 29, 1977)]. In that decision, EPA stated:

> [V]ariances can be granted by States only when achieving the standard is unattainable. In demonstrating that meeting the standard is unattainable, the State must demonstrate that treatment in excess of that required by §301(b)(2)(A) and (B) of the CWA is necessary to meet the standard and also must demonstrate that requiring such treatment will result in substantial and widespread economic and social impact....

Subsequent EPA guidance elaborated federal variance policy. On March 15, 1985, EPA issued a memorandum reinterpreting the factors that could be considered when granting variances. The memorandum explained that variances could be based on any of the grounds outlined in 40 CFR §131.10(g) for removing a designated use. This interpretation was based on EPA's reading of §510 of the Clean Water Act [33 U.S.C. 1370] which says that states have the right to establish more stringent standards than those suggested by EPA. EPA concluded that as long as any temporary water quality standards variance conformed to the requirements

established in 40 CR §131.10(g) for removal of a designated use, it would be more stringent than the federal requirements because it would be a temporary rather than a permanent downgrade in use.

EPA has stated in guidance that although the March 15, 1985 memorandum broadened the factors that could be considered for granting a variance, *it continued to interpret variances as being limited to individual dischargers*. EPA has acknowledged that while the legal rationale for broadening the factors may seem reasonable, the practical impact of limiting variances to individual dischargers is that the only factor that actually can be used is the "substantial and widespread economic and social impact" factor.

The variance provision at R18-11-122 is intended to apply on a discharger-specific basis. ADEQ recognizes that situations can and do arise where technological limitations or substantial economic hardship for a specific discharger make short-term compliance with standards impossible. In such cases, a variance from the water quality standard may be justified. In ADEQ's view in 1996, the only ground that could be practically applied to support a request for a variance in such situations was the "widespread and substantial economic and social impact" factor.

In comments on the preliminary draft rules and the proposed surface water quality standards rules, the Arizona Mining Association renewed a request to expand the grounds for variances and to allow variances for specific surface waters or segments of surface waters. ADEQ continues to disagree that variances should be allowed for specific surface waters. Variances should be allowed on a discharger-specific basis only. This is consistent with current EPA policy that variances are discharger and pollutant-specific and limited in duration. A "waterbody variance" is essentially a modification of a water quality standard that can be done in Arizona only through the rulemaking process.

The suggestion by the Arizona Mining Association to allow for a "waterbody variance" is consistent with an approach to variances that EPA solicited comment on in the Advanced Notice of Proposed Rulemaking (ANPR) on the federal water quality standards regulation. EPA stated in the ANPR that it was considering the approach of dividing variances into two categories: waterbody variances [to which the first five designated use removal elements in 40 CFR §131.10(g) would apply] and discharger-specific variances [to which the "substantial and widespread economic and social impact" factor would apply]. While ADEQ recognition of a "waterbody variance" would be consistent with EPA's approach, ADEQ does not believe that the grounds that support a "waterbody variance" are distinguishable from the factors that support the downgrade or removal of a designated use through the use attainability process. For example, if naturally-occurring pollutant concentrations in a surface water prevent the attainment of a designated use, then the appropriate regulatory response is the removal of the designated use, not the issuance of a variance that is limited in duration. In general, variances should be used only where the state believes that a water quality standard can ultimately be attained. ADEQ believes that four of the five grounds in 40 CFR §131.10(g) [other than "widespread and substantial economic and social impact" and “human-caused sources of pollution”] that are cited by EPA as supporting a "waterbody variance" are essentially permanent in character. It is unlikely that where such conditions exist in a surface water, that the conditions will change so that the water quality standard ultimately may be attained. Where a water quality standard cannot be attained because of naturally occurring pollutant concentrations; low flow conditions; the existence of dams, diversions, or other hydrological modifications; or physical conditions related to the natural features of a surface water, it is unlikely that the water quality standard will ever be attained, even in the long term. Where such conditions exist, a UAA should be conducted to remove or permanently downgrade the designated use. Finally, it should be noted that while EPA stated that it was consideringwater body variances in the ANPR, EPA has not proposed this type of variance in any revisions to the federal water quality regulations.

ADEQ reconsidered one of the grounds for a UAA that ADEQ believes may be used to support a variance. One of the grounds for a UAA is “...human-caused conditions or sources of pollution prevent the attainment of the water quality standard and cannot be remedied, or would cause more environmental damage to correct

than leave in place." There may be situations where human-caused conditions or sources of pollution prevent the attainment of a water quality standard and they cannot be remedied in the short-term (that is, within five years), but the water quality standard may be ultimately attainable. For example, a TMDL strategy may be implemented that is designed to achieve compliance with a water quality standard or implementation of a remediation program may result in attainment. However, the time line for achieving compliance with the water quality standard may be longer than five years. Under such circumstances, it may be appropriate to grant a variance to a point source discharger.

Prohibitions against discharge [R18-11-123]

ADEQ prohibited the discharge of sewage from vessels to Lake Powell in R18-11-123. This prohibition is based upon §312(f)(1)(B)(3) of the Clean Water Act [33 U.S.C. §1322(f)(1)(B)(3)] which addresses the regulation of marine sanitation devices. It states, in relevant part:

> [I]f any State determines that the protection and enhancement of the quality of some or all of the waters within such State require greater environmental protection, such State may completely prohibit the discharge from all vessels of any sewage, whether treated or not, into such waters, except that no such prohibition shall apply until the Administrator determines that adequate facilities for the safe and sanitary removal and treatment of sewage from all vessels are reasonably available for such water to which such prohibition would apply.

The States of Utah and Arizona applied to EPA to prohibit the discharge of sewage to Lake Powell. ADEQ determined that the protection and enhancement of Lake Powell water quality requires greater environmental protection by prohibiting discharges of sewage from vessels. Moreover, ADEQ believes that adequate facilities for the safe and sanitary removal and treatment of sewage from all vessels are reasonably available at Lake Powell. Consequently, ADEQ added the prohibition against the discharge of sewage from vessels to Lake Powell in R18-11-123.

Table 1. Constituents affected by revisions to R18-11-101 and R18-11-105 of Arizona's Water Quality Standards (Final Rule 01/16/02)[1].

Constituent (CAS No.)[1]	$A\&W_{cold}$ Numeric Standard (µg/L) Acute	$A\&W_{cold}$ Numeric Standard (µg/L) Chronic	$A\&W_{warm}$ Numeric Standard (µg/L) Acute	$A\&W_{warm}$ Numeric Standard (µg/L) Chronic	Addressed in National Consultation?[1]
Chlordane (CAS No. 57-74-9)	2.4	0.0004	2.4	0.21	No
Cyanide (CAS No. 57-12-5)	22	5.2	41	9.7	Yes
1,2-Dichlorobenzene (CAS No. 95-50-1)	790	300	1200	470	No
1,4-Dichlorobenzene (CAS No. 106-46-7)	560	210	2000	780	No
p.p'-Dichlorodiphenyldichloroethane (DDD) (CAS No. 72-54-8)	1.1	0.001	1.1	0.02	No
p.p'-Dichlorodiphenyldichloroethylene (DDE) (CAS No. 72-55-9)	1.1	0.001	1.1	0.02	No
Endrin (CAS No. 72-20-8)	0.18	0.002	0.2	0.08	Yes
Endrin Aldehyde (CAS No. 7421-93-3)	0.18	0.002	0.2	0.08	No

[1] Scope of revision defines Aquatic and Wildlife (A&W) cold or warm water designation for surface waters on an elevation basis; above or below 5000 feet elevation. Elevation distinction of 5000 feet was proven significant based upon statistically defensible variation in macroinvertebrate communities.

[1] Chemical Abstract System (CAS) identifies physical and chemical properties of individual constituents or mixtures thereof.

[1] The "Memorandum of Agreement Between the Environmental Protection Agency, Fish and Wildlife Service, and National Marine Fisheries Service Regarding Enhanced Coordination Under the Clean Water Act and Endangered Species Act" [66 FR 36 (11201 - 11217)] commits the U.S. Environmental Protection Agency and the Fish and Wildlife Service to national consultation on Clean Water Act 304(a) criteria and is currently proceeding as of December 02, 2002.

Hexachlorobenzene (CAS No. 118-74-1)	6.0	3.7	No Numeric Std.	No Numeric Std.	No

Table 1. (cont.) Constituents affected by revisions to R18-11-101 and R18-11-105 of Arizona's Water Quality Standards (Final Rule 01/16/02).

Constituent (CAS No.)	$A\&W_{cold}$ Numeric Standard (µg/L) Acute	$A\&W_{cold}$ Numeric Standard (µg/L) Chronic	$A\&W_{warm}$ Numeric Standard (µg/L) Acute	$A\&W_{warm}$ Numeric Standard (µg/L) Chronic	Addressed in National Consultation?
Hexachlorocyclohexane gamma (Lindane) (CAS No. 58-89-9)	2.0	0.08	3.4	0.28	Yes
Napthalene (CAS No. 91-20-3)	1100	210	3200	580	No
Phenol (CAS No. 108-95-2)	5100	730	7000	1000	No
Polychloronatedbiphenyls (PCBs) (CAS No. 1336-36-3)	2.0	0.01	2.0	0.02	Yes
Tetrachloroethylene (PERC) (CAS No. 127-18-4)	2600	280	6500	680	No
Toxaphene (CAS No. 8001-35-2)	0.73	0.0002	0.73	0.02	Yes
1,2,4-Trichlorobenzene (CAS No. 120-82-1)	750	130	1700	300	No

Table 2. Surface water reaches affected by revisions to R18-11-101 and R18-11-105 of Arizona's Water Quality Standards (Final Rule 01/16/02)[1].

Basin[1]	Segment	Location Description	Previous Designated Use	New Designated Use
CM	Agate Canyon Creek	Grand Canyon, tributary to the Colorado River at Lat. 36°08'38" Long. 112°16'48"	A&Wc	A&Ww
CM	Boucher Creek	Grand Canyon, tributary to the Colorado River at Lat. 36°06'54" Long. 112°13'44"	A&Wc	A&Ww
CM	Chuar Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Clear Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Crystal Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Deer Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Bright Angle Creek	Below confluence with soaring spring canyon.	A&Wc	A&Ww
CM	Garden Creek	Grand Canyon, tributary to Pipe Creek at Lat. 36°05'35" Long. 112°06'40"	A&Wc	A&Ww

[1] Scope of revision defines Aquatic and Wildlife (A&W) cold or warm water designation for surface waters on an elevation basis; above or below 5000 feet elevation. Elevation distinction of 5000 feet was proven significant based upon statistically defensible variation in macroinvertebrate communities.

[1] Colorado Mainstem (CM); Rios de Mexico (includes Rio Magdalena, Rio Sonoita, and Rio Yaqui Basins) (RM); Santa Cruz (SC); San Pedro (SP); Salt River (includes Salt River and tributaries above Granite Reef Dam) (SR); Upper Gila (includes Gila River and tributaries above San Carlos Indian Reservation) (UG); Verde River (VR); Wilcox Playa (WP)

Basin	Segment	Location Description	Previous Designated Use	New Designated Use
CM	Grapevine Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°03'29" Long. 112°00'00"	A&Wc	A&Ww
CM	Hakatai Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°14'42" Long. 112°22'59"	A&Wc	A&Ww
CM	Hance Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°02'46" Long. 111°57'07"	A&Wc	A&Ww
CM	Hermit Creek	Below Hermit Pack Trail crossing.	A&Wc	A&Ww
CM	Horn Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°05'56" Long. 112°07'59"	A&Wc	A&Ww
CM	Kwagnut Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Matkatamiba Creek	Below Havasupai Indian Reservation; tributary to the Colorado River at Lat. 36°20'38" Long. 112°40'19"	A&Wc	A&Ww
CM	Nankoweap Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	National Canyon Creek	Grand Canyon; those reaches not located on the Hualapai Indian Reservation	A&Wc	A&Ww
CM	North Canyon Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Phantom Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Pipe Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°05'56" Long. 112°06'36"	A&Wc	A&Ww
CM	Royal Arch Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°11'53" Long. 112°26'56"	A&Wc	A&Ww
CM	Ruby Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°11'24" Long. 112°18'54"	A&Wc	A&Ww

Basin	Segment	Location Description	Previous Designated Use	New Designated Use
CM	Saddle Canyon Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Sapphire Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°08'49" Long. 112°17'28"	A&Wc	A&Ww
CM	Serpentine Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°12'22" Long. 112°19'37"	A&Wc	A&Ww
CM	Shinumo Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
CM	Spring Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°01'08" Long. 113°21'00"	A&Wc	A&Ww
CM	Stone Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°20'49" Long. 112°27'14"	A&Wc	A&Ww
CM	Trail Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 35°50'20" Long. 113°19'37"	A&Wc	A&Ww
CM	Travertine Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°06'11" Long. 112°13'05"	A&Wc	A&Ww
CM	Turquoise Canyon Creek	Grand Canyon; tributary to the Colorado River at Lat. 36°09'14" Long. 112°18'07"	A&Wc	A&Ww
RM	Ash Creek	Chiricahua Mountains	A&Wc	A&Ww
SC	Lemmon Canyon Creek	Below unnamed tributary.	A&Wc	A&Ww
SC	Romero Canyon Creek	Below unnamed tributary.	A&Wc	A&Ww
SC	Sabino Canyon Creek	Below unnamed tributary.	A&Wc	A&Ww
SP	Carr Canyon Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
SP	Ramsey Canyon Creek	Below Forest Service Road #110.	A&Wc	A&Ww

Basin	Segment	Location Description	Previous Designated Use	New Designated Use
SR	Cherry Creek	Below unnamed tributary.	A&Wc	A&Ww
SR	Cold Spring Canyon Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
SR	Coon Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
SR	Del Shay Creek	Tributary to Gun Creek at Lat. 34°00'22" Long. 111°15'43"	A&Wc	A&Ww
SR	Devils Chasm Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
SR	Haigler Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
SR	Horse Camp Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
SR	P B Creek	Below Forest Service Road #203	A&Wc	A&Ww
SR	Salome Creek	Tributary to the Salt River at Lat. 33°41'56" Long. 111°05'46"	A&Wc	A&Ww
SR	Spring Creek	Tributary to Tonto Creek at Lat. 34°09'54" Long. 111°10'08"	A&Wc	A&Ww
SR	Tonto Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
SR	Workman Creek	Below confluence with Reynolds Creek.	A&Wc	A&Ww
UG	Blue River	Below confluence with Strayhorse Creek.	A&Wc	A&Ww
UG	Cave Creek	Below Coronado NF Boundary	A&Wc	A&Ww
UG	Deadman Canyon Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
UG	Eagle Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww

Basin	Segment	Location Description	Previous Designated Use	New Designated Use
UG	Frye Canyon Creek	Below Frye Mesa Reservior.	A&W	A&Ww
UG	Marijilda Creek	Below confluence with Gibson Creek.	A&Wc	A&Ww
VR	Beaver Creek	Tributary to the Verde River at Lat. 34°34'26" Long. 111°51'14"	A&Wc	A&Ww
VR	East Verde River	Below confluence with Ellison Creek.	A&Wc	A&Ww
VR	Gap Creek	Below Government Spring.	A&Wc	A&Ww
VR	Oak Creek (Unique Water)	Below confluence with unnamed tributary.	A&Wc	A&Ww
VR	Pine Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
VR	Sycamore Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
VR	West Clear Creek	Below confluence with Meadow Canyon.	A&Wc	A&Ww
VR	Wet Beaver Creek	Below unnamed springs.	A&Wc	A&Ww
WP	Grant Creek	Below confluence with unnamed tributary.	A&Wc	A&Ww
WP	Turkey Creek	Below confluence with Rock Creek.	A&Wc	A&Ww