265A for Channel 265C3 at Lebanon, Kentucky, reallotment of Channel 265A to Springfield, Kentucky, and modification of the Station WLSK license to specify operation on Channel 265A at Springfield. The coordinates for the Channel 294C3 allotment at Millersville, Tennessee, would be 36–26–24 and 86–37–39; the coordinates for Channel 293A allotment at Horse Cave, Kentucky, would be 37–13–57 and 85–52–06; the coordinates for the Channel 297A allotment at Hodgenville, Kentucky, would be 37–40–34 and 85–40–57; the coordinates for the Channel 257A allotment at Lebanon Junction, Kentucky, would be 37–44–37 and 85–38–52; the coordinates for the Channel 246C2 allotment at Belle Meade, Tennessee, would be 36–17–50 and 86–45–11; the coordinates for the Channel 221A allotment at Goodlettsville, Tennessee, would be 36–17–50 and 86–45–11; the coordinates for the Channel 259C0 allotment at Hendersonville, Tennessee, would be 35–49–03 and 86–31–24; the coordinates for the Channel 274 allotment at New Haven, Kentucky, would be 37–46–07 and 85–35–57; the coordinates for the Channel 265A allotment at Springfield, Kentucky, would be 37–38–50 and 85–11–50.

DATES: Comments must be filed on or before May 22, 2006, and reply comments on or before June 7, 2006.

ADDRESSES: Secretary, Federal Communications Commission, Washington, DC 20554. In addition to filing comments with the FCC, interested parties should serve the petitioner's counsel, as follows: Mark N. Lipp, c/o Vinson & Elkins 1455 Pennsylvania Ave., NW., Suite 600, Washington, DC 20004. John F. Garziglia, c/o Womble, Carlyle, Sandridge & Rice, 1401 Eye Street, NW., Washington, DC 20006.

FOR FURTHER INFORMATION CONTACT: Robert Hayne, Media Bureau. (202) 418–2177.

SUPPLEMENTARY INFORMATION: This is a synopsis of the Commission's *Notice of Proposed Rule Making* in MB Docket No. 06–77; adopted April 5, 2006, and released April 7, 2006. The full text of this Commission action is available for inspection and copying during normal business hours in the FCC Reference Information Center at Portals II, CY–A257, 445 12th Street, SW., Washington, DC. The complete text of this action may also be purchased from the Commission's copy contractor, Best Copy and Printing, Inc., 445 12th Street, SW., Room CY–B402, Washington, DC 20554, telephone 1–800–378–3160 or *http://www.BCPIWEB.com.* This document does not contain proposed information collection requirements subject to the Paperwork Reduction Act of 1995, Public Law 104–13. In addition, therefore, it does not contain any proposed information collection burden ''for small business concerns with fewer than 25 employees,'' pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107–198, *see* 44 U.S.C. 3506(c)(4). Provisions of the Regulatory Flexibility Act of 1980 do not apply to this proceeding. Members of the public should note that from the time a Notice of Proposed Rule Making is issued until the matter is no longer subject to Commission consideration or court review, all *ex parte* contacts are prohibited in Commission proceedings, such as this one, which involve channel allotments. See 47 CFR 1.1204(b) for rules governing permissible *ex parte* contacts.

For information regarding proper filing procedures for comments, see 47 CFR 1.415 and 1.420.

List of Subjects in 47 CFR Part 73

Radio, Radio Broadcasting.

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR Part 73 as follows:

PART 73—RADIO BROADCAST SERVICES

1. The authority citation for part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 334, 336.

§ 73.202 [Amended]

2. Section 73.202(b), the Table of FM Allotments under Kentucky, is amended by removing Channel 292A and by adding Channel 297A at Hodgenville, removing Channel 294A and by adding Channel 293A at Horse Cave, removing Lebanon, Channel 265A, removing Channel 297A and adding Channel 257A at Lebanon Junction, adding New Haven, Channel 274A, and removing Channel 274A and adding Channel 265A at Springfield.

3. Section 73.202(b), the Table of FM Allotments under Tennessee, is amended by removing Channel 294A and adding Channel 246C2 at Belle Meade, removing Channel 246C2 and adding Channel 221A at Goodlettsville, removing Channel 221A and adding Channel 259C0 at Hendersonville, removing Manchester, Channel 259C, and by adding Millersville, Channel 294C3.

Federal Communications Commission.

John A. Karousos,

Assistant Chief, Audio Division, Media Bureau.

[FR Doc. E6–6679 Filed 5–2–06; 8:45 am]

BILLING CODE 6712–01–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List a Distinct Population Segment of the Roundtail Chub in the Lower Colorado River Basin and To List the Headwater Chub as Endangered or Threatened With Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list a distinct population segment (DPS) of the roundtail chub (*Gila robusta*) in the lower Colorado River basin, and to list the headwater chub (*G. nigra*) as endangered or threatened under the Endangered Species Act of 1973, as amended (Act). The petition also asked the Service to designate critical habitat. After review of all available scientific and commercial information, we find that the petitioned action is not warranted for a DPS of the roundtail chub in the lower Colorado River basin, as explained below, but that listing is warranted for the headwater chub. Currently, however, listing of the headwater chub is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Upon publication of this 12-month petition finding, the headwater chub will be added to our candidate species list. We will develop a proposed rule to list the headwater chub as our priorities allow. Any determinations on critical habitat will be made during development of the proposed rule.

DATES: The finding announced in this document was made on April 27, 2006.

ADDRESSES: The complete file for this finding is available for inspection, by appointment, during normal business hours at the Arizona Ecological Services Office, 2321 West Royal Palm Road, Suite 103, Phoenix, AZ 85021–4951. Please submit any new information, materials, comments, or questions

concerning this species or this finding to the above address.

FOR FURTHER INFORMATION CONTACT: Field Supervisor, Arizona Ecological Services Office, at the address above (602–242–0210).

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the List of Threatened and Endangered Species that contains substantial scientific and commercial information that listing may be warranted, we make a finding within 12 months of the date of receipt of the petition on whether the petitioned action is (a) not warranted, (b) warranted, or (c) warranted, but that the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether any species is threatened or endangered, and expeditious progress is being made to add or remove qualified species from the Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that a petition for which the requested action is found to be warranted but precluded be treated as though resubmitted on the date of such finding, *i.e.*, requiring a subsequent finding to be made within 12 months. Each subsequent 12-month finding will be published in the **Federal Register.**

On April 14, 2003, we received a petition dated April 2, 2003, requesting that we list a distinct population segment (DPS) of the roundtail chub in the lower Colorado River basin as endangered or threatened, that we list the headwater chub as endangered or threatened, and that we designate critical habitat concurrently with the listing for both species. The petition, submitted by the Center for Biological Diversity (Center), was clearly identified as a petition for a listing rule, and it contained the names, signatures, and addresses of the requesting parties. Included in the petition was supporting information regarding the species' taxonomy and ecology, historical and current distribution, present status, and potential causes of decline. We acknowledged the receipt of the petition in a letter to Mr. Noah Greenwald, dated June 4, 2003. In that letter, we also advised the petitioners that, due to funding constraints in fiscal year 2003, we would not be able to begin processing the petition in a timely manner.

On May 18, 2004, the Center sent a Notice of Intent to sue, contending that the Service had violated the Act by failing to make a timely 90-day finding on the petition to list a DPS of the roundtail chub in the lower Colorado River basin, and the headwater chub. On September 20, 2004, the Center filed a complaint against the Secretary of the Interior and the Service for failure to make a 90-day petition finding under section 4 of the Act. In a stipulated settlement agreement we agreed to submit a 90-day finding to the **Federal Register** by June 30, 2005 (*Center for Biological Diversity* v. *Norton*, CV–04–496–TUC–CKJ (D. AZ)). The settlement agreement was approved by the District Court for the District of Arizona on May 5, 2005. On June 30, 2005, we made our 90-day finding that the petition presented substantial scientific information indicating that listing the roundtail chub as a DPS in the lower Colorado River basin, and the headwater chub throughout its range, may be warranted. The finding and our initiation of a status review was published in the **Federal Register** on July 12, 2005 (70 FR 39981). We are required, pursuant to the court-approved stipulated settlement agreement, to make our 12-month finding pursuant to the Act (16 U.S.C. 1533(b)(3)(B)) on or before April 6, 2006. This notice constitutes our 12-month finding for the petition to list a DPS of the roundtail chub in the lower Colorado River basin, and to list the headwater chub, as endangered or threatened.

Biology

The roundtail and headwater chubs are both cyprinid fish (members of Cyprinidae, the minnow family) with streamlined body shapes. Color in roundtail chub is usually olive-gray to silvery, with the belly lighter, and sometimes with dark blotches on the sides; headwater chub color is usually dark gray to brown overall, with silvery sides that often have faded lateral stripes. Roundtail chub are generally 25 to 35 centimeters (cm) (9 to 14 inches (in)) in length, but can reach 50 cm (20 in). Headwater chub are quite similar in appearance to roundtail chub, although they are generally smaller, likely due to the smaller streams in which they occur (Minckley 1973; Sublette *et al.* 1990; Propst 1999; Minckley and Demaris 2000; Voeltz 2002).

Baird and Girard (1852) first described roundtail chub from specimens collected from the Zuni River in northeastern Arizona and northwestern New Mexico. Headwater chub was first described from Ash Creek and the San Carlos River in east-central Arizona in 1874 (Cope and Yarrow 1875). Since the 1800s, both roundtail and headwater chub have been recognized as distinct entities, although at varying taxonomic levels (Miller 1945; Holden 1968; Rinne 1969; Holden and Stalnaker 1970; Rinne 1976; Smith *et al.* 1979; DeMarais 1986; Rosenfeld and Wilkinson 1989; DeMarais 1992; Dowling and DeMarais 1993; Douglas *et al.* 1998; Minckley and DeMarais 2000; Gerber *et al.* 2001). At present, both are recognized as distinct species, based on discrete occurrences of specific morphology (Minckley and DeMarais 2000). Both roundtail and headwater chub are recognized as species on the American Fisheries Society's most recent list of accepted common and scientific names of fishes (Nelson *et al.* 2004).

Roundtail Chub Distinct Population Segment

In the petition to list these species, we were asked to consider designating a DPS for the roundtail chub in the lower Colorado River basin. Under the Act, we must consider for listing any species, subspecies, or, DPSs of vertebrate species/subspecies, if information is sufficient to indicate that such action may be warranted. To implement the measures prescribed by the Act and its Congressional guidance, we developed a joint policy with the National Oceanic and Atmospheric Administration (NOAA) Fisheries entitled Policy Regarding the Recognition of Distinct Vertebrate Population (DPS Policy) to clarify our interpretation of the phrase ''distinct population segment of any species of vertebrate fish or wildlife'' for the purposes of listing, delisting, and reclassifying species under the Act (61 FR 4721; February 7, 1996). Under our DPS policy, we consider three elements in a decision regarding the status of a possible DPS as endangered or threatened under the Act. The elements are: (1) The population segment's discreteness from the remainder of the taxon to which it belongs; (2) the population segment's significance to the taxon to which it belongs; and (3) the population segment's conservation status in relation to the Act's standards for listing (*i.e.*, when treated as if it were a species, is the population segment endangered or threatened?). Our policy further recognizes it may be appropriate to assign different classifications (*i.e.*, threatened or endangered) to different DPSs of the same vertebrate taxon (61 FR 4721; February 7, 1996).

Discreteness

The DPS policy's standard for discreteness requires an entity given DPS status under the Act to be

adequately defined and described in some way that distinguishes it from other populations of the species. The historical range of the roundtail chub included both the upper and lower Colorado River basins in the States of Wyoming, Utah, Colorado, New Mexico, Arizona, and likely Nevada and Baja California and Sonora, Mexico (Propst 1999; Bezzerides and Bestgen 2002; Voeltz 2002). In recent times, the upper and lower basin populations of the roundtail chub have been physically separated by the Glen Canyon Dam. Results from comparisons of genetic information of roundtail chubs between the lower and upper basins of the Colorado River were based on small sample sizes and provided inconclusive results (DeMarais 1992; Dowling and DeMarais 1993; Minckley and DeMarais 2000; Gerber *et al.* 2001). Therefore, the best available scientific data are not conclusive on the question of whether the lower basin populations of the roundtail chub are discrete from the upper basin populations. However, because we determine in the following section that the lower basin populations are not significant to the taxon as a whole, we need not address further the ''discreteness'' test of the DPS policy.

Significance

Under our DPS policy, a population segment must be significant to the taxon to which it belongs. The evaluation of ''significance'' may address, but is not limited to, (1) Evidence of the persistence of the discrete population segment in an ecological setting that is unique for the taxon; (2) evidence that loss of the population segment would result in a significant gap in the range of the taxon; (3) evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; and (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Ecological Setting. Based on our review of the available information, we found that there are some differences in various ecoregion variables between the upper and lower Colorado River basins. For example, McNabb and Avers (1994) and Bailey (1995) delineated ecoregions and sections of the United States based on a combination of climate, vegetation, geology, and other factors. Populations of roundtail chub in the lower basin are primarily found in the Tonto Transition and Painted Desert Sections of the Colorado Plateau Semi-Desert Province in the Dry Domain, and the White Mountain-San Francisco Peaks-Mogollon Rim Section of the Arizona-New Mexico Mountains Semi-Desert-Open Woodland-Coniferous Forest Province Dry Domain. Populations of roundtail chub in the upper basin are primarily found in the Northern Canyonlands and Uinta Basin Sections of the Intermountain Semi-Desert and Desert Province in the Dry Domain, and the Tavaputs Plateau and Utah High Plateaus and Mountains Sections of the Nevada-Utah Mountains Semi-Desert-Coniferous Forest Province in the Dry Domain (McNabb and Avers 1994; Bailey 1995). These ecoregion differences result in differences in hydrograph, sediment, substrate, nutrient flow, cover, water chemistry, and other habitat variables of roundtail chub. Also, there are differences in type, timing, and amount of precipitation between the two basins, with the upper basin (3–65 inches/year (Sims 1968)) somewhat less arid than the lower (5–25 inches/year (Green and Sellers 1964)).

The type and timing of precipitation, which are major factors in determining the pattern of streamflow, and which when plotted as the amount of runoff or discharge against time are known as a hydrograph (Dunne and Leopold 1978), also appear to be somewhat different between the two basins. The hydrograph of a stream is a major factor in determining habitat characteristics and their variability over space and time. Habitats of roundtail chub in the lower basin have a monsoon hydrograph or a mixed monsoon-snowmelt hydrograph. A monsoon hydrograph results from distinctly bimodal annual precipitation, which creates large, abrupt, and highly variable flow events in late summer and large, longer, and less variable flow events in the winter (Burkham 1970; Sellers 1974; Minckley and Rinne 1991). Monsoon hydrographs are characterized by high variability, including rapid rise and fall of flow levels with flood peaks of one or more orders of magnitude greater than base, or ''normal low'' flow (Burkham 1970).

In the upper basin, roundtail chub habitats have strong snowmelt hydrographs, with some summer/fall/winter precipitation, but with the majority of major flow events in spring and early summer (Bailey 1995; Carlson and Muth 1989; Miller and Hubert 1990). Snowmelt hydrographs are characterized by low variability, long, slow rises and falls in flow and peak flow events that are less than an order of magnitude greater than the base flow.

The lower basin has lower stream flows and warmer temperatures in late spring and early summer; whereas this is typically the wettest period in the upper basin. Sediment loads vary substantially between streams in both basins, but are generally lesser in the upper basin than the lower (Carlson and Muth 1989), and patterning of sediment movement differs substantially because of the different hydrographs. In general, roundtail chub habitat in the lower Colorado River basin is of lower gradient, smaller average substrate size, higher water temperatures, higher salinity, smaller base flows, higher flood peaks, lesser channel stability and higher erosion, and substantially different hydrographs than the habitat in the upper Colorado River basin.

Measurable hydrographic differences between the two basins are evident, as are differences in landscape level roundtail chub habitats between the upper and lower basins; these differences, however, do not appear to result in significant disparities in life history of roundtail chubs between the two basins. Roundtail chub in the upper and lower basins have basically the same life history and occupy similar in-stream habitats (Besserides and Bestgen 2002; Voeltz 2002). Furthermore, loss of the lower basin roundtail chub would not result in a loss of a form of the species that occurs in a setting unique from that found in the upper basin.

Gap in the Range and Marked Differences in Genetic Characteristics. Roundtail chub in the lower Colorado River basin is at the southern portion of the historic and current distribution of the species. Although the species may have occurred in Mexico, there are no records to support this. Within the distribution of every species there exists a peripheral population, an isolate or subpopulation of a species at the edge of the taxon's range. Long-term geographic isolation and loss of gene flow between populations is the foundation of genetic changes in population resulting from natural selection or change. Evidence of changes in these populations may include genetic, behavioral, and/or morphological differences from populations in the rest of the species' range. While the available genetic information is sparse, it indicates that roundtail chubs sampled from Chevelon Creek in the Little Colorado River drainage of the lower Colorado River basin share the same mtDNA haplotype with upper basin roundtail chubs (Gerber *et al.* 2001; as discussed above under ''Discreteness''). Therefore, based on the genetic information currently available, roundtail chub in the lower Colorado River basin should not be considered biologically or ecologically significant based simply on genetic characteristics. We also considered

information regarding morphological and behavioral differences with regard to adaptations that may be occurring in the lower Colorado River basin roundtail chub and found no evidence of any differences. Biological and ecological significance under the DPS policy is always considered in light of Congressional guidance (see Senate Report 151, 96th Congress, 1st Session) that the authority to list DPS's be used ''sparingly'' while encouraging the conservation of genetic diversity.

Whether the Population Represents the Only Surviving Natural Occurrence of the Taxon. As part of a determination of significance, our DPS policy suggests that we consider whether there is evidence that the population represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range. The roundtail chub in the lower Colorado River basin is not the only surviving natural occurrence of the species. Consequently, this factor is not applicable to our determination regarding significance.

Conclusion

Following a review of the available information, we conclude that the roundtail chub populations in the lower Colorado River basin are not significant to the remainder of the taxon. We made this determination based on the best available information, which does not demonstrate that (1) these populations persist in an ecological setting that is unique for the taxon; (2) the loss of these populations would result in a significant gap in the range of the taxon; and (3) these populations differ markedly from populations of roundtail chub in the upper basin in their genetic characteristics, or in other considerations that might demonstrate significance. Further, available information does not demonstrate that the life history and behavioral characteristics of roundtail chub in the lower basin are unique to the species. Therefore, on the basis of the best scientific and commercial information available, we find that proposing to list a DPS for the lower Colorado River basin populations of roundtail chub is not warranted; these populations do not meet our definition of a distinct population segment.

Headwater Chub

Distribution

The historical distribution of headwater chub in the lower Colorado River basin is poorly documented, due to the paucity of early collections and the widespread anthropogenic (manmade) changes (*i.e.*, habitat alteration and nonnative species introductions (Girmendonk and Young 1997)) to aquatic ecosystems beginning in the mid 19th century. The headwater chub was historically considered common throughout its range (Minckley 1973; Holden and Stalnaker 1975; Propst 1999). Voeltz (2002), estimating historical distribution based on museum collection records, agency database searches, literature searches, and discussion with biologists, found that headwater chub likely occurred in a number of tributaries of the Verde River, most of the Tonto Creek drainage, much of the San Carlos River drainage, and parts of the upper Gila River in New Mexico (Voeltz 2002). Voeltz (2002) estimated that headwater chub historically occupied approximately 500 km (312 mi) in Arizona and New Mexico. The species currently occurs in the same areas, but has a smaller distribution. In Arizona, four tributaries of the Verde River (Fossil Creek, the East Verde River, Wet Bottom Creek, and Deadman Creek), and Tonto Creek and eight of its tributaries (Buzzard Roost, Gordon, Gun, Haigler, Horton, Marsh, Rock, Spring, and Turkey Creeks), are currently occupied; and in New Mexico, in the upper East Fork, lower Middle Fork, and lower West Forks of the Gila River (Voeltz 2002; S. Stefferud *in litt.* 2005) support headwater chub. Headwater chub may still occur in parts of the San Carlos River basin; however recent survey information for these streams is unavailable (Minckley and DeMarais 2000, Voeltz 2002).

Headwater chub occur in the middle to upper reaches of moderately-sized streams (Minckley and Demaris 2000). Bestgen and Propst (1989) examined status and life history in the Gila River drainage in New Mexico and found that headwater chubs occupied tributary and mainstem habitats in the upper Gila River at elevations of 1,325 meters (m) (4,347 feet (ft)) to 2,000 m (6,562 ft). Maximum water temperatures of headwater chub habitat varied between 20 to 27 °C, and minimum water temperatures were around 7 °C (Bestgen and Propst 1989; Barrett and Maughan 1995). Typical adult microhabitat consists of nearshore pools adjacent to swifter riffles and runs over sand and gravel substrate, with young of the year and juvenile headwater chub using smaller pools and areas with undercut banks and low current (Anderson and Turner 1978; Bestgen and Propst 1989). Spawning in Fossil Creek occurred in spring and was observed in March in pool-riffle areas with sandy-rocky substrates (Neve 1976). Neve (1976) reported that the diet of headwater chub included aquatic insects, ostracods (small crustaceans), and plant material.

Previous Federal Actions

We placed the roundtail chub (as *G. r. grahami*, which then included headwater chub) on the list of candidate species as a category 2 species on December 30, 1982 (47 FR 58454) and on January 6, 1989 (54 FR 554). Category 2 species were those for which existing information indicated that listing was possibly appropriate, but for which substantial supporting biological data were lacking. On November 21, 1991 (56 FR 58804), we continued to list headwater chub (now referred to as *G. robusta*, which included headwater and roundtail chub) as a category 2 species. Due to lack of funding to gather existing information on these fishes, they remained in category 2 through the 1994 (59 FR 58982; November 15, 1994) Candidate Notices of Review. In the 1996 Candidate Notice of Review (61 FR 7596; February 28, 1996), category 2 was eliminated, and roundtail and headwater chub were no longer recognized as candidates for listing. Following receipt of the 2002 petition, and pursuant to a stipulated settlement agreement, we published a 90-day finding on July 12, 2005 (70 FR 39981), in which we found that the petitioners had provided sufficient information to indicate that listing of the roundtail and headwater chubs may be warranted. In order to ensure we had the best scientific and commercial information available to determine whether listing of these species was indeed warranted, we opened a 60-day public comment period, ending September 12, 2005, and commenced a status review.

Status of the Headwater Chub

Headwater chub (as *G. robusta grahami*) was considered a threatened species by the American Fisheries Society on its list of fishes receiving legal protection and of special concern in 1987 (Johnson 1987). Since that time, declines of the headwater chub have been further noted both in the scientific peer reviewed literature (Bestgen and Propst 1989) and in State agency reports (Girmendonk and Young 1997; Brouder *et al.* 2000; Bezzerides and Bestgen 2002; Voeltz 2002).

The most comprehensive and recent of the status reports concerning headwater chub was completed by the Arizona Game and Fish Department in 2002, and peer-reviewed by Federal agency personnel, university researchers, and experts on the headwater chub (AGFD; Voeltz 2002).

Stream-specific distribution and status information for roundtail and headwater chub populations in the lower Colorado River basin was gathered from published literature; unpublished agency reports, records, manuscripts, and files; scientific collecting permit reports; personal communications with knowledgeable biologists; and academic databases. Based on this comprehensive information on all available current and historical survey records, AGFD estimated historical and current ranges of the headwater chub and found that the species had declined significantly from historical levels. The AGFD report also used a classification system, as described below in Table 1, to report status and threat information, which defined populations based on the abundance and recruitment of the population and presence or absence of obvious threats.

TABLE 1.—DEFINITIONS OF STATUS DESCRIPTION CATEGORIES USED TO DESCRIBE THE STATUS OF HEADWATER CHUB POPULATIONS

[From Voeltz 2002]

Status	Definition
Stable-Secure	Chubs are abundant or common, data over the past 5–10 years shows a stable, reproducing population with successful recruitment; no impacts from nonnative aquatic species exist; and no current or future habitat altering land or water uses were identified.
Stable-Threatened	Chubs are abundant or common, data over the past 5–10 years shows a reproducing population, although recruitment may be limited; predatory or competitive threats from nonnative aquatic species exist; and/or some current or future habitat altering land or water uses were identified.
Unstable-Threatened	Chubs are uncommon or rare with a limited distribution; data over the past 5–10 years shows a declining population with limited recruitment; predatory or competitive threats from nonnative aquatic species exist; and/or serious current or future habitat altering land or water uses were identified.
Extirpated	Chubs are no longer believed to occur in the system.
Unknown	Lack of data precludes determination of status.

Voeltz (2002) reviewed the 19 currently known populations of headwater chub and found that one was stable-secure, six were stable-threatened, six were unstable-threatened, three were extirpated, and three were unknown. Deadman Creek, the one population that Voeltz considered stable-secure, has since been invaded by nonnative green sunfish (*Lepomis cyanella*) (Voeltz, Arizona Game and Fish Department, pers. comm. 2003), and should now be considered stable-threatened. Headwater chub are known to occupy only 40 percent of their former range, and have an unknown distribution on another 10 percent of their former range. Based on the best available scientific information, the headwater chub occurs in 16 of 19 known populations, which now occur in fragmented and isolated stream segments and represent only 40 to 50 percent of the species' former range (approximately 200 km (125 mi) of 500 km (312 mi)) in Arizona and New Mexico (Voeltz 2002).

Populations of headwater chub are found in four separate drainage basins that are isolated from one another (the Verde River, Tonto Creek, San Carlos River, and upper Gila River). Within these four basins, there is further fragmentation and isolation of some populations. We consider a particular basin to be at risk of extirpation if there are fewer than a minimum of two stable-secure populations because any single population can be eliminated by stochastic events or catastrophic disturbance, such as fire (see Meffe and Carroll 1994). According to information in Voeltz (2002), and survey information collected since that time (as described above), headwater chub cannot be considered secure in any drainage because there are no stable-secure populations in any drainage in which they occur.

In summary, the data show that the status of headwater chub is poor and declining. It has been extirpated from approximately 50 percent of its historical range; all 16 known populations are experiencing threats (see ''Summary of Factors Affecting the Headwater Chub'' discussion and Table 2 below); and it is no longer considered secure in any part of its historical range (Voeltz 2002; Voeltz, Arizona Game and Fish Department, pers. comm. 2003). Although 6 of the 16 extant populations are considered ''stable'' based on abundance and evidence of recruitment, we believe all six of these populations have a high likelihood of becoming extirpated in the foreseeable future, primarily because at least one, and in most cases several, nonnative aquatic species that have been implicated in the decline of headwater chub are present in these streams (Voeltz 2002).

Summary of Factors Affecting the Headwater Chub

Section 4 of the Act (16 U.S.C. 1533), and implementing regulations at 50 CFR 424, set forth procedures for adding species to the Federal List of Endangered and Threatened Species. Under section 4(a) of the Act, we may list a species on the basis of any of five factors, as follows: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or man-made factors affecting its continued existence. In making this finding, information regarding the status of, and threats to, the headwater chub in relation to the five factors provided in section 4(a)(1) of the Act is discussed below and summarized in Table 2 below.

TABLE 2.—SUMMARY OF HEADWATER CHUB STATUS AND THREATS BY STREAM REACH

[Voeltz 2002; Voetlz, AGFD, pers. comm. 2003]

Stream reach	Status	Threats
Christopher Creek	E	Considered extirpated by nonnative species.
Horton Creek	E	Considered extirpated by nonnative species.
Rye Creek	E	Considered extirpated by nonnative species.

TABLE 2.—SUMMARY OF HEADWATER CHUB STATUS AND THREATS BY STREAM REACH—Continued

[Voeltz 2002; Voetlz, AGFD, pers. comm. 2003]

Stream reach	Status	Threats
Deadman Creek	ST	Nonnatives, grazing, recreation.
Buzzard Roost Creek	ST	Roads, channelization, grazing, mining, nonnatives, recreation, logging, water use, fire.
Gordon Creek	ST	Roads, grazing, nonnatives, recreation, logging, fire.
Haigler Creek	ST	Roads, grazing, nonnatives, recreation, logging, fire.
Marsh Creek	ST	Roads, grazing, nonnatives, recreation, logging, fire.
Rock Creek	ST	Roads, grazing, mining, nonnatives, recreation, logging, fire.
Spring Creek	ST	Roads, grazing, mining, nonnatives, recreation, logging, fire.
Ash Creek	U	Roads, grazing, nonnatives, recreation, fire.
Wet Bottom Creek	U	Roads, grazing, nonnatives, recreation, fire.
San Carlos River	U	Roads, channelization, grazing, nonnatives, recreation, water use.
Upper Gila River	UT	Roads, channelization, development, grazing, mining, nonnatives, recreation, logging, water use, fire.
Gun Creek	UT	Roads, channelization, grazing, mining, nonnatives, recreation, logging, fire.
Tonto Creek	UT	Roads, channelization, development, grazing, mining, nonnatives, recreation, logging, water use, fire.
East Verde River	UT	Roads, channelization, development, grazing, nonnatives, recreation, logging, water use, fire.
Fossil Creek	UT	Roads, channelization, development, grazing, nonnatives, recreation, logging, water use, fire.
Webber Creek	UT	Roads, channelization, development, grazing, nonnatives, recreation, logging, water use, fire.

E=extirpated; ST=stable, threatened; U=unknown; UT=unstable, threatened.

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Within the historical range of the headwater chub, much of the stream habitat has been destroyed or degraded, and loss of this habitat continues today (Minckley 1973; Tellman *et al.* 1997; Propst 1999; Voeltz 2002). At certain locations, activities such as groundwater pumping, surface water diversions, impoundments, dams, channelization (straightening of the natural watercourse, typically for flood control purposes), improperly managed livestock grazing, wildfire, agriculture, mining, roads, logging, residential development, and recreation all contribute to riparian and cienega (wetland) habitat loss and degradation in Arizona and New Mexico (Minckley and Deacon 1991; Tellman *et al.* 1997; Propst 1999; Voeltz 2002). These activities and their effects on headwater chub are discussed in further detail below.

Water withdrawal. Headwater chub has been eliminated from much of its historical range because many areas formerly occupied are now unsuitable due to dewatering (Miller 1961; Miller 1972; Minckley 1973; Deacon *et al.* 1979; Williams *et al.* 1987; Bestgen and Propst 1989; Girmendonk and Young 1997; Bezzerides and Bestgen 2002; Voeltz 2002). Habitat for these fishes is likely eliminated once surface flow drops below 0.3 cubic meters per second (10 cubic feet per second) because the stream lacks the depth and habitat features, such as deep pools, that the species requires (U.S. Fish and Wildlife Service 1989). The upper Gila River, in the vicinities of Cliff, Redrock, and Virden, New Mexico, has been entirely dewatered on occasion by diversions for agriculture (Bestgen 1985). In addition, the communities of Strawberry, Pine, and Payson, Arizona, are exploring means of securing municipal water from Fossil Creek, which could substantially reduce flows in that stream (Voeltz 2002; J. Nystedt, U.S. Fish and Wildlife Service, pers. comm. 2004). Groundwater pumping in Tonto Creek regularly eliminates surface flows during parts of the year (Abarca and Weedman 1993). Groundwater pumping in the East Verde River eliminates the flow in many parts of the stream, especially when interbasin water transfers from Blue Ridge Reservoir are not occurring (Girmendonk and Young 1997). Groundwater pumping in Webber Creek for municipal use, as well as at least one diversion for agricultural use, reduces flows in that stream (Voeltz 2002). Groundwater pumping and surface water withdrawal directly eliminate headwater chub habitat because they remove water. Obviously, without water, there is no fish habitat, but flowing water also helps to create the habitat diversity that headwater chub require. Lack of flow often results in only pool habitat remaining, which can concentrate headwater chub with nonnative species and increase predation pressure of nonnative fishes on headwater chub, which has been documented in Marsh Creek and the East Verde River (Voeltz 2002). Water withdrawal is a threat in at least 6 of the 16 extant populations of headwater chub (Bestgen and Propst 1989; Girmendonk and Young 1997; Propst 1999; Voeltz 2002).

Livestock grazing. Poorly managed livestock grazing has been documented to negatively impact headwater chub habitat. Poor livestock-grazing management is often cited as one of the most significant factors contributing to regional stream channel downcutting (the entrenchment of stream channels and creation of arroyos) in the late 1800s; profound effects from this period occurred throughout the watershed of Tonto Creek, which contains 70 percent of all extant headwater chub populations, and these effects are still evident today and compounded by ongoing grazing (Croxen 1926; Ganda 1997). Poorly managed livestock grazing destabilizes stream channels and disturbs riparian ecosystem functions (Herefore 1992; Tellman *et al.* 1997). Poorly managed livestock grazing negatively affects headwater chub habitat through removal of riparian vegetation (Clary and Webster 1989; Clary and Medin 1990; Schulz and Leininger 1990; Armour *et al.* 1991; Fleishner 1994), which results in reduced bank stability, fewer pools, and higher water temperatures, creating habitats that are too extreme to support headwater chub (Meehan 1991; Kauffman and Krueger 1984; Swanson *et al.* 1982; Minckley and Rinne 1985; Fleishner 1994; Belsky *et al.* 1999). Poorly managed livestock grazing also

causes increased sediment in the stream channel, due to streambank trampling and riparian vegetation loss (Weltz and Wood 1986; Waters 1995; Pearce *et al.* 1998). Livestock physically alter streambanks through trampling and shearing, leading to bank erosion (Platts and Nelson 1989; Trimble and Mendel 1995). In combination, loss of riparian vegetation and bank erosion alters channel morphology, including increased erosion and deposition, downcutting, and an increased width/depth ratio, all of which lead to a loss of deep pool habitats required by the headwater chub, and loss of shallow side and backwater habitats used by larval chub (Trimble and Mendel 1995; Belsky *et al.* 1999).

Poorly managed livestock grazing causes the structure and diversity of the fish community to shift due to changes in availability and suitability of habitat types (Rahel and Hubert 1991). This loss of aquatic habitat complexity reduces the diversity of habitat types available to fish communities (Gorman and Karr 1978). In the arid west, this loss of habitat complexity has been found to accelerate the displacement of native fish species by nonnatives (Minckley and Rinne 1991; Baltz and Moyle 1993; Lawler *et al.* 1999). Livestock grazing also contributes significantly to the introduction and spread of nonnative aquatic species through the proliferation of ponded water in stock tanks (U.S. Fish and Wildlife Service 2001). The U.S. Forest Service found that livestock grazing ''may affect [headwater chub] and eventually trend the species toward federal listing'' on allotments on the Tonto National Forest (Biological Evaluation and Assessment for the Green Valley Complex, Tonto National Forest 2002). Though largely a past threat, Voeltz (2002) found that livestock grazing occurs in every drainage in which headwater chub occur.

Stream channelization and irrigation. Sections of many Gila Basin rivers and streams have been and continue to be channelized for flood control, which disrupts natural channel dynamics and promotes the loss of riparian plant communities. Channelization changes the gradient of the stream above and below the channel. It increases streamflow in the channelized section, which results in increased rates of erosion of the stream and its tributaries, accompanied by gradual deposits of sediment in downstream reaches that increase the risk of flooding (Emerson 1971; Simpson *et al.* 1982). Channelization has affected headwater chub habitat by reducing its complexity, eliminating cover, reducing nutrient input, improving habitat for nonnative species, changing sediment transport, altering substrate size, and reducing the length of the stream (and therefore the amount of aquatic habitat available) (Gorman and Karr 1978; Simpson 1982; Schmetterling *et al.* 2001). Channelization occurs within at least 50 percent of extant populations (Voeltz 2002).

Irrigation directly from streams reduces or eliminates water in existing fish habitat. Fish can be carried into irrigation ditches, where they may die following desiccation (drying). Irrigation dams prevent movement of fish between populations, resulting in genetic isolation within species; small populations are subject to genetic threats, such as inbreeding depression (reduced health due to elevated levels of inbreeding) and to genetic drift (a reduction in gene flow within the species that can increase the probability of unhealthy traits; Meffe and Carrol 1994). There are numerous surface water diversions in headwater chub habitats, including the upper Gila River, East Verde River, and Tonto Creek. Larger dams may also prevent movement of fish between populations, and dramatically alter the flow regime of streams through the impoundment of water behind and below (Ligon *et al.* 1995).

Mining activities. Mining activities were more widespread historically and likely constituted a greater threat in the past; however, the continued mining of sand, gravel, iron, gold, copper, or other materials remains a potential threat to the habitat of headwater chub. The effects of mining activities on populations include adverse effects to water quality and lowered flow rates due to dewatering of nearby streams needed for mining operations (ADEQ 1993). Ongoing sand and gravel mining in Tonto Creek is eliminating headwater chub habitat (Abarca and Weedman 1993; Voeltz 2002). Sand and gravel mining removes riparian vegetation and destabilizes streambanks, which results in habitat loss for the headwater chub (Brown *et al.* 1998). Mining occurs within at least 6 of the 16 extant populations (Voeltz 2002).

Roads and Logging. Roads have adversely affected headwater chub habitat by destroying riparian vegetation and by increasing surface runoff, sedimentation, and erosion (Burns 1971; Eaglin and Hubert 1993). Roads require instream structures, such as culverts and bridges, that remove aquatic habitat and can act as barriers to fish movement (Barrett *et al.* 1992; Warren and Pardew 1998). All of these activities negatively impact headwater chub by lowering water quality and reducing the quality and quantity of pools, by filling pools with sediments, by reducing the quantity of large woody-debris necessary to form pools, and by imposing barriers to movement. The end result is deterioration of habitat for the headwater chub (Burns 1971; Eaglin and Hubert 1993). Roads are found within every drainage containing extant populations of headwater chub (Voeltz 2002).

Vehicular use of roads in creek bottoms, as has been documented in Tonto Creek (Voeltz 2002), degrades headwater chub habitat and can result in headwater chub mortality. Such use inhibits riparian plant growth, breaks down banks, causes erosion and sedimentation, and increases turbidity in the stream, particularly where vehicles drive through the stream and immediately downstream of the vehicular activity. These effects result in wider and shallower stream channels (Meehan 1991). This causes progressive adjustments in other variables of hydraulic geometry and results in changes to the configuration of pools, runs, riffles, and backwaters; levels of fine sediments and substrate embeddedness; availability of instream cover; and other fish habitat factors in the vicinity of vehicle crossings (Rosgen 1994). Resultant changes to the stream channels alter the way in which flood flows interact with the stream channel and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation. The breaking down of stream banks by vehicles reduces undercut banks and overhanging vegetation that chub use as cover. Fish fry and eggs could also be killed or injured if vehicles are driven through stream segments where these life stages occur. Vehicles driven rapidly through the stream could splash young fish or eggs onto the bank where they may desiccate. Larger fish are likely to swim away and avoid death or injury. Public vehicular use is also often associated with an elevated risk of human-caused fire.

Adverse effects of stream sedimentation to fish and fish habitat have been extensively documented (Murphy *et al.* 1981; Newcombe and MacDonald 1991; Barrett *et al.* 1992). Excessive sedimentation causes channel changes that are adverse to headwater chub habitat. These activities have direct impacts on headwater chub habitat because excessive sediment can fill backwaters and deep pools used by headwater chub, and sediment deposition in the main channel can cause a tendency toward stream braiding (*e.g.*, the stream becomes wider, shallower, and has numerous

channels as opposed to one channel), which reduces adult chub habitat. Excessive sediment will smother invertebrates (Newcombe and MacDonald 1991), thereby reducing chub food production and availability, and related turbidity reduces the chub's ability to see and capture food (Barrett *et al.* 1992).

Although logging is a landuse in the watersheds of 13 of the remaining 16 streams known to contain headwater chub populations (Voeltz 2002), logging is largely a threat of the past, resulting from previous management practices no longer in place. The alteration of watersheds resulting from road-building and logging is deleterious to fish and other aquatic life forms (*e.g.*, Burns 1971; Eaglin and Hubert 1993). Roads and logging increase surface runoff, sedimentation, and mudslides, and destroy riparian vegetation (Lewis 1998; Jones *et al.* 2000).

Recreation. Recreation was noted as a land-use in all of the watersheds containing headwater chub (Voeltz 2002). The impacts of recreation are highly dependant on the type of activity, with activities such as birdwatching having little to no impact and activities such as off-road vehicle use potentially having severe impacts on aquatic habitats. Specific problems with recreation were noted in the Upper Gila River, and Tonto and Webber Creeks (Voeltz 2002). For example, Voeltz (2002) noted that in-channel vehicular traffic was a threat to headwater chubs in Tonto Creek (also discussed above under *Roads*). Much of the current range of the headwater chub occurs on public lands administered by the U.S. Forest Service, and public use of these lands is high; such use creates an elevated risk of human-caused impacts such as off-road vehicle use.

Development activities. Headwater chub habitat is also threatened increasingly from urban and suburban development (Tellman *et al.* 1997). Urban and suburban development affects headwater chub and its habitat in a number of ways, such as direct alteration of streambanks and floodplains from construction of buildings, gardens, pastures, and roads (Tellman *et al.* 1997), or as mentioned above, diversion of water, both from streams and connected groundwater (Glennon 1995). On a broader scale, urban and suburban development alters the watershed, which changes the hydrology, sediment regimes, and pollution input (Dunne and Leopold 1978; Horak 1989; Medina 1990; Reid 1993; Waters 1995). In addition, it has been documented that the introduction of nonnative plants and animals, such as releases from home aquariums, that can adversely affect headwater chub become more likely as nearby human populations increase (Aquatic Nuisance Species Task Force 1994).

Suburban and urban development have degraded and eliminated headwater chub habitat. The Phoenix metropolitan area, founded in part due to its proximity to the Salt and Gila Rivers, is a population center of 3.5 million people. Communities in the middle and upper Verde River watershed, such as the Prescott-Chino Valley, the Cottonwood-Clarkdale-Camp Verde communities, Strawberry, Pine, and Payson, are all seeing rapid population growth. Many of these communities are near headwater chub populations, and 25 percent of known headwater chub populations occur in areas of urban and commercial development (Voeltz 2002). On a broader scale, as of 2005, Arizona was listed as the second fastest in Statewide population growth in the nation, and Arizona is projected to grow by 109 percent by the year 2030 (U.S. Census Bureau 2005).

Human activities in the watershed have had substantial adverse impacts to headwater chub habitat. Watershed alteration is a cumulative result of many human uses, including timber harvest, livestock grazing, roads, recreation, channelization, and residential development. The combined effect of all of these actions results in a substantial loss and degradation of habitat (Burns 1971; Reid 1993). For example, in Williamson Valley Wash, human uses (*e.g.*, recreational use of off-road vehicles) in the highly erodible upper watershed have resulted in increased erosion and high loads of sediment. In 1993, flooding in Williamson Valley Wash carried enough sediment that the isolated pool where Gila chub (*Gila intermedia*), a related species to the headwater chub, were previously collected became completely filled with sand and gravel (Weedman *et al.* 1996).

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We do not believe that overutilization is a threat to headwater chub in Arizona because angler catch is considered light (J. Warnecke, Arizona Game and Fish Department, pers. comm. 2004). However, in the upper Gila River in New Mexico, there are reports of anglers purposefully discarding chub species, which may be having a negative effect on populations of headwater chub locally (Voeltz 2002).

Factor C: Disease or Predation

Nonnative fish that prey on and/or compete with headwater chub are a serious and persistent threat to the continued existence of this species. Direct predation by nonnative fishes on, and competition of nonnative fishes with, the headwater chub has resulted in rangewide population declines and local extirpations (*e.g.*, Christopher Creek, Rye Creek, and Horton Creek). Nonnative aquatic organisms negatively affect native fish through predation, aggression and harassment, resource competition, habitat alteration, aquatic community disruption, introduction of diseases and parasites, and hybridization (numerous citations; see U.S. Fish and Wildlife Service (2001)). Based on survey information, nonnative species occur in every known population of headwater chub (Voeltz 2002).

Headwater chub evolved in a fish community with low species diversity and where few predators existed, and as a result developed few or no mechanisms to deal with predation (Carlson and Muth 1989). In its habitats, the headwater chub was probably the most predatory fish and experienced little or no competition. Nonnative fishes known from within the historical range of headwater chub in the Gila River basin include channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), red shiner (*Cyprinella lutrensis*), fathead minnow (*Pimephales promelas*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), rainbow trout (*Oncorynchus mykiss*), western mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpo*), warmouth (*Lepomis gulosus*), bluegill (*Lepomis macrochiris*), yellow bullhead (*Ameiurus natalis*), black bullhead (*Ameiurus melas*), and goldfish (*Carassius auratus*) (Arizona Game and Fish Department Heritage Data Management System, U.S. Fish and Wildlife Service 2001).

The introduction and spread of nonnative species has long been identified as one of the major factors in the continuing decline of native fishes throughout North America and particularly in the southwest (Miller 1961; Lachner *et al.* 1970; Ono *et al.* 1983; Minckley and Deacon 1991; Carlson and Muth 1989; Cohen and Carlton 1995; Fuller *et al.* 1999). In the American southwest, Miller *et al.* (1989) concluded that introduced nonnatives were a causal factor in 68 percent of the fish extinctions in North America in the last 100 years. For 70 percent of those

fish still extant, but considered to be endangered or threatened, introduced nonnative species are a primary cause of the decline (Aquatic Nuisance Species Task Force 1994; Lassuy 1995). In Arizona, release or dispersal of new nonnative aquatic organisms is a continuing phenomenon (Rosen *et al.* 1995; U.S. Fish and Wildlife Service 2001). Introduction of nonnative species has also been consistently cited as a threat to the native fish fauna of the Colorado River, and is listed as a factor in the listing rules of nine other fish species with historical ranges that overlap with headwater chub (bonytail (*Gila elegans*) (45 FR 27710), humpback chub (*Gila cypha*) (32 FR 4001), Gila chub (67 FR 51948), Colorado pikeminnow (*Ptychocheilus lucius*) (32 FR 4001), spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*),(51 FR 23769), razorback sucker (*Xyrauchen texanus*) (56 FR 54957), desert pupfish (*Cyprinodon macularius*) (61 FR 10842), and Gila topminnow (*Poecilopsis occidentalis*) (32 FR 4001)). In the Gila River basin, introduction of nonnatives is considered a major factor in the decline of all native fish species (Minckley 1985; Williams *et al.* 1985; Minckley and Deacon 1991).

Aquatic nonnative species are introduced and spread into new areas through a variety of mechanisms, both intentional and accidental, and authorized and unauthorized. Mechanisms for nonnative dispersal in the southwestern United States include inter-basin water transfer, sport stocking, aquaculture, aquarium releases, bait-bucket release (release of fish used as bait by anglers), and for use in biological control (U.S. Fish and Wildlife Service 2001).

Dudley and Matter (2000) found that nonnative green sunfish prey on, compete with, and virtually eliminate recruitment of Gila chub (a recently federally listed species that is closely related to headwater chub) in Sabino Creek in Arizona. Similar effects of green sunfish on Gila chub have been documented in Silver Creek in Arizona (Unmack *et al.* 2003). In the Verde River, Bonar *et al.* (2004) found that largemouth bass, smallmouth bass, bluegill, green sunfish, channel catfish, flathead catfish, and yellow bullhead all consumed native fish. Roundtail chub (a closely related species to headwater chub) have been found in stomachs of largemouth bass in the lower Salt River (P. Unmack, Arizona State University, pers. comm. 2004). Bestgen and Propst (1989) reported that, of nonnatives present in New Mexico, smallmouth bass, flathead catfish, and channel catfish most impacted headwater chub via predation.

Nonnative crayfish also appear to prey on and compete with all life stages of Gila chub (Carpenter 2000, 2005), a fish species closely related to headwater chub. At least two species of crayfish (*Procambaris clarki* and *Orconectes virilis*) have been introduced into Arizona aquatic systems and one or both species co-occur with headwater chub in at least four streams. Crayfish are considered a cause of decline for one population of headwater chub, and are documented as having contributed to the extirpation of two of its populations (Voeltz 2002).

Disease, and especially parasites, are a threat. Asian tapeworm (*Bothriocephalus acheilognathi*) was introduced into the United States via imported grass carp in the early 1970s. It has since become well-established in the southeast and mid-south and has been recently found in the southwest. The definitive host in the life cycle of *B. acheilognathi* is cyprinid fishes, and, therefore, it is a potential threat to the headwater chub as well as to the other native fishes in Arizona. The Asian tapeworm affects fish health in several ways. Two direct impacts are by impeding the digestion of food as it passes through the intestinal track, and when large numbers of worms feed off of the fish they can cause emaciation and starvation. The Asian tapeworm is present in the Colorado River basin in the Virgin River (Heckman *et al.* 1986) and the Little Colorado River (Clarkson *et al.* 1997). It has recently invaded the Gila River basin and was found during the fall 1998 Central Arizona Project (CAP) monitoring in the Gila River near Ashurst-Hayden Dam.

Anchor worm (*Lernaea cyprinacea*) (Copepoda), an external parasite, is unusual in that it has little host specificity, infecting a wide range of fishes and amphibians. Severe *Lernaea* sp. infections have been noted in a number of chub populations. Hendrickson (1993) noted very high infections of *Lernaea* sp. during warm periods in the Verde River, and Voeltz (2002) reported that headwater chubs found in Gun Creek in 2000, when surface flow was almost totally lacking, ''showed signs of stress, and many had Lernaea, black grub, lesions and an unidentified fungus.'' Increases in infection negatively affect headwater chub populations with Girmendonk and Young (1997) concluding that ''parasitic infestations may greatly affect the health and thus population size of native fishes.''

Factor D: The Inadequacy of Existing Regulatory Mechanisms

There are currently no specific Federal protections for headwater chub, and generalized Federal protections found in Forest plans, Clean Water Act dredge and fill regulations for streams, and other statutory, regulatory, or policy provisions have not been shown to be effective in preventing the decline of this species. Presently, Federal, State, and Tribal statutes, regulations, and planning have not achieved significant conservation of headwater chub and its habitat.

As described above, introductions of nonnative fish are likely a significant threat to headwater chub. Fish introductions are illegal unless approved by the respective States. However, enforcement is difficult. Many nonnative fish populations are established through illegal introductions. Nine species of fish, crayfish, and waterdogs (tiger salamanders (*Ambystoma pigrimum*)) may be legally used as bait in Arizona, all of which are nonnative to the State of Arizona and several of which are known to have serious adverse effects on native species. The portion of the State in which use of live bait is permitted is limited, and use of live bait is restricted in much of the Gila River system in Arizona (Arizona Game and Fish Department 2004). New Mexico allows use of live bait-fish (New Mexico Game and Fish Department 2004). Live bait use of two species of sunfish and all ''minnows'' are allowed. Goldfish (Carassius auratus), a nonnative formerly allowed for live bait use, is no longer allowed. Arizona and New Mexico also continue to stock nonnative fishes within areas that are connected to habitat of headwater chub.

Increasing restrictions of live bait use will reduce the input of nonnative species into headwater chub habitat. However, it will do little to reduce unauthorized bait use or other forms of ''bait-bucket'' transfer (*e.g.*, dumping of unwanted aquarium fish, which may be invasive nonnative species) not directly related to bait use. In fact, those other ''bait-bucket'' transfers are expected to increase as the human population of Arizona increases and as nonnative species remain available to the public through aquaculture and the aquarium trade. The general public has been known to dump unwanted pet fish and other aquatic species into irrigation ditches such as the CAP aqueduct in the Phoenix metropolitan area (U.S. Fish and Wildlife Service 2001).

The Arizona Game and Fish Department also regulates species of

nonnatives that can legally be brought into the State. Prohibited nonnative species are put onto the Restricted Live Wildlife List (Commission Order 12–4–406). However, species are allowed unless they are prohibited by placement on the list, rather than the more conservative approach of prohibited unless specifically allowed, and this leaves a serious regulatory inadequacy that allows the opportunity for many noxious nonnatives to be legally imported and introduced into Arizona. New Mexico has adopted a more stringent approach; no live animal (except domesticated animals or domesticated fowl or fish from government hatcheries) is allowed to be imported without a permit (NMS 17–3–32). However, the majority of the headwater chub range occurs within Arizona.

The Federal Land Policy Management Act of 1976 (43 U.S.C. 1701 *et seq.*) and the National Forest Management Act of 1976 (16 U.S.C. 1600 *et seq.*) direct Federal agencies to prepare programmatic-level management plans to guide long-term resource management decisions. In addition, the U.S. Forest Service is required to manage habitat to maintain viable populations of existing native and desired nonnative vertebrate species in planning areas (36 CFR 219.19). The Forest Service is the largest landowner and manager of headwater chub habitat. The Forest Service lists the headwater chub as a sensitive species in the lower Colorado River basin in the southwestern region (Arizona and New Mexico). However, a sensitive species designation provides little protection to the headwater chub because it only requires the Forest Service to analyze the effects of their actions on sensitive species, but does not require that they choose environmentally benign actions. Voeltz (2002) found that livestock grazing occurred in every drainage in which headwater chub occur and he considered this land use an ongoing threat. Most of these areas where the majority of extant populations of headwater chub occur are managed by the Forest Service.

Wetland values and water quality of aquatic sites inhabited by the headwater chub are afforded varying protection under the Federal Water Pollution Control Act of 1948 (33 U.S.C. 1251–1376), as amended; Federal Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands); and section 404 of the Clean Water Act, which regulates dredging and filling activities in waterways.

The New Mexico Department of Game and Fish has adopted a wetland protection policy whereby the Department does not endorse any project that would result in a net decrease in either wetland acreage or wetland habitat values. This policy may afford some protection to headwater chub habitat, although it is advisory only and destruction or alteration of wetlands is not regulated by State law.

The State of Arizona Executive Order Number 89–16 (Streams and Riparian Resources), signed on June 10, 1989, directs State agencies to evaluate their actions and implement changes, as appropriate, to allow for restoration of riparian resources. At this time, we have no monitoring information on the effects of this Executive Order, nor do we have information indicating that actions taken under it have been effective in reducing adverse effects to the headwater chub.

The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321–4347) requires Federal agencies to consider the environmental impacts of their actions. Most actions taken by the Forest Service and other Federal agencies that affect the headwater chub are subject to NEPA. NEPA requires Federal agencies to describe the proposed action, consider alternatives, identify and disclose potential environmental impacts of each alternative, and involve the public in the decision-making process. However, Federal agencies are not required to select the alternative having the least significant environmental impacts. A Federal action agency may select an action that will adversely affect sensitive species provided that these effects were known and identified in a NEPA document.

Status of headwater chub on Tribal lands is not well known. Any regulatory or other protective measures for the species on Tribal lands would be at the discretion of the individual Tribe and non-Tribal entities would not likely be privy to information on the adequacy of such measures. The San Carlos Apache Tribe has developed a fisheries management plan that provides protection to headwater chub; however, there are only two populations of the species that occur on San Carlos Apache lands.

The State of New Mexico is seeking to add the headwater chub as an endangered species under its Wildlife Conservation Act, which prohibits take (New Mexico Wildlife Conservation Act 17–2–41(B)). Unlike the Federal Act, however, habitat destruction does not constitute take under New Mexico's law. The Arizona Game and Fish Department has created a draft conservation agreement and strategy for several native Arizona fishes including headwater chub. These efforts are not yet complete. AGFD has also implemented conservation actions that have benefited the species, including assisting with restoration of headwater chub habitat in Fossil Creek. We are working with both Arizona and New Mexico to ensure that these efforts will be as effective as possible. However, at this time, these efforts are not finalized, no funding has been committed to ensure their execution, and their future effectiveness is uncertain. We will evaluate these efforts using the guidelines developed in our Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE) (68 FR 15100; March 28, 2003).

Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence

The rarity of headwater chub increases its extinction risk associated with stochastic events such as drought, flood, and wildfire. Headwater chub populations have been fragmented and isolated to smaller stream segments and are thus vulnerable to natural or manmade factors (*e.g.*, drought, groundwater pumping) that might further reduce their population sizes. Headwater chub are not considered secure in any of the stream segments where they occur (Voeltz 2002). In general, Arizona is an arid state; about one-half of Arizona receives less than 10 inches of rain a year. As described above in factor A, dewatering and other forms of habitat loss have resulted in fragmentation of headwater chub populations, and water demands from a rapidly increasing human population could further reduce habitat available to these species, and further fragment populations. In examining the relationship between species distribution and extinction risk in southwestern fishes, Fagan *et al.* (2002) found that the number of occurrences or populations of a species is less significant a factor in determining extinction risk than is habitat fragmentation. Fragmentation of habitat makes the headwater chub vulnerable to extinction from threats of further habitat loss and competition from nonnative fish and other threats because immigration and recolonization from adjacent populations is not likely. Thus, the risk of extinction of this species, based on their degree of fragmentation alone, is high and is predicted to increase with increasing fragmentation and rarity (Fagan *et al.* 2002).

The probability of catastrophic stochastic events that could eliminate isolated populations of this species is

exacerbated by a century of livestock grazing and fire suppression that has led to unnaturally high fuel loadings (Cooper 1960; Covington and Moore 1994; Swetnam and Baison 1994; Touchan *et al.* 1995; White 1985). We have information indicating that the intensity of forest fires has increased in recent times (Covington and Moore 1994; National Interagency Fire Center 2006). Fires in the Southwest frequently occur during the summer monsoon season. As a result, fires are often followed by rain that washes ash-laden debris into streams (Rinne 2004). Extreme summer fires, such as the 1990 Dude Fire, and corresponding ash flows have decimated some fish populations including headwater chub populations in the East Verde River (Voeltz 2002). Recently, several extreme summer fires, including the 2002 Rodeo-Chedeski Fire and the 2004 Willow Fire, have resulted in significant losses of individuals and populations of headwater chub throughout Arizona (A. Robinson, Arizona Game and Fish Department, pers. comm. 2005). Carter and Rinne (unpubl. data) found that the Picture Fire both benefited and eliminated headwater chub from portions of Spring Creek. The fire eliminated chubs from Turkey Creek, a tributary to Spring Creek. In other parts of Spring Creek, however, chubs initially declined but later thrived after the fire, presumably because most of the nonnative fishes were eliminated. Every extant population of headwater chub is at risk of experiencing effects from wildfire.

Finding

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by the headwater chub. We reviewed the petition, information available in our files, other published and unpublished information submitted to us during the public comment period following our 90-day petition finding, and consulted with recognized headwater chub experts and other Federal and State resource agencies. On the basis of the best scientific and commercial information available, we find that proposing to list the headwater chub throughout its range is warranted, but that immediate proposal of a regulation implementing this action is precluded by higher priority listing actions, and progress is being made to add or remove qualified species from the Lists of Endangered and Threatened Wildlife and Plants.

In making this finding, we recognize that there have been declines in the distribution and abundance of the headwater chub, primarily attributed to the introduction and subsequent predation by, and competition with, nonnative fishes, as documented in a large body of scientific research (Miller 1961; Minckley 1973; Bestgen and Propst 1989; Miller *et al.* 1989; Minkley and Deacon 1991; Creef and Clarkson 1993; Bonar *et al.* 2004), as well as declines resulting from a host of land uses that have dewatered and degraded the species' habitats (Miller 1961; Miller 1972; Minckley 1973; Deacon *et al.* 1979; Bestgen and Propst 1989; Bezzerides and Bestgen 2002; Voeltz 2002). Direct predation and competition of nonnative fishes on the headwater chub has resulted in rangewide population declines and local extirpations (*e.g.*, Christopher Creek, Rye Creek, and Horton Creek). Because we have found that nonnative species are present in every remaining population of this species, we conclude that all remaining populations are at risk of declines and extirpation as a result of predation by nonnative species. Furthermore, all remaining populations are fragmented and isolated, making them vulnerable to further declines and local extirpations from other factors, as discussed in detail above and outlined in Table 2 above (Fagan *et al.* 2002). Populations that go extinct following habitat fragmentation are unlikely to be recolonized due to the isolation from, and lack of, habitat connectivity to potential source populations.

The isolation of remaining headwater chub populations and habitat fragmentation as a result of nonnative fish introductions and habitat alteration have made remaining populations vulnerable to extinction from random events such as parasites and stochastic events (Fagan *et al.* 2002). Stochastic events, such as fire, have only recently been recognized as an important factor in the decline of this species (Rinne 2004). We believe that fire will continue to be a factor in the decline of this species (National Interagency Fire Center 2006; *www.nifc.gov*). Other factors include parasitism and the inadequacy of existing regulatory mechanisms. These factors have contributed to declines or extirpations of headwater chub.

We conclude that the overall magnitude of threats to the headwater chub is high, and that the overall immediacy of these threats is imminent. While we conclude that listing the headwater chub is warranted, an immediate proposal to list this species is precluded by other higher priority listing actions. At the present time there are over 280 species that we regard as candidates for addition to the Lists of Endangered and Threatened Wildlife and Plants, 95 of which have the same listing priority as the headwater chub. During fiscal year (FY) 2006, almost our entire national listing budget will be consumed by work on various listing actions to comply with court orders and court-approved settlement agreements; to meet statutory deadlines for petition finding or listing determinations; to evaluate and determine emergency listing; and to complete essential litigation-related, administrative, and program management tasks.

The headwater chub will be added to the list of candidate species upon publication of this 12-month finding. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

We have reviewed the available information to determine if the existing and foreseeable threats pose an emergency. We have determined that an emergency listing is not warranted for this species at this time because a number of populations exist, and some of these appear to be stable at the current time. However, if at any time we determine that emergency listing of the headwater chub is warranted, we will seek to initiate an emergency listing.

We intend that any proposed listing action for these fish species will be as accurate as possible. Therefore, we will continue to accept additional information and comments from all concerned governmental agencies, the scientific community, industry, or any other interested party concerning this finding.

References Cited

A complete list of all references cited herein is available upon request from the Field Supervisor at the Arizona Ecological Services Office (see **ADDRESSES** section).

Author

The primary author of this document is the Arizona Ecological Services Office (see **ADDRESSES** section).

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: April 27, 2006.

H. Dale Hall,

Director, Fish and Wildlife Service.

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