**DEPARTMENT OF THE INTERIOR**

**Fish and Wildlife Service**

**50 CFR Part 17**

**[Docket No. FWS-R6-ES-2008-0088]**
**[MO 92210-0-0008-B2]**

## Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Least Chub as Threatened or Endangered

**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 the least chub *(Iotichthys phlegethontis)*, a fish, as threatened or endangered and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). After review of all available scientific and commercial information, we find that listing the least chub as threatened or endangered under the Act is warranted. Currently, however, listing the least 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, we will add the least chub to our list of candidate species with a listing priority number (LPN) of 7. We will develop a proposed rule to list this species as our priorities and funding allow. We will make any determination on critical habitat during development of the proposed listing rule. In the interim, we will address the status of the candidate taxon through our annual Candidate Notice of Review (CNOR).

**DATES:** This finding was made on June 22, 2010.

**ADDRESSES:** This finding is available on the Internet at *http://www.regulations.gov* at Docket Number FWS-R6-ES-2008-0088 and *http://www.fws.gov/mountain-prairie/species/fish/leastchub*. Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Utah Ecological Services Field Office, 2369 West Orton Circle, Suite 50, West Valley City, UT 84119. Please submit any new information, materials, comments, or questions concerning this finding to the above address.

**FOR FURTHER INFORMATION CONTACT:** Larry Crist, Field Supervisor, U.S. Fish and Wildlife Service, Utah Ecological Services Field Office (see **ADDRESSES**); by telephone at (801) 975-3330; or by facsimile at (801) 975-3331. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800-877-8339.

**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 Federal Lists of Threatened and Endangered Wildlife and Plants that contains substantial scientific or commercial information indicating that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we determine that the petitioned action is: (a) Not warranted, (b) warranted, or (c) warranted, but immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are threatened or endangered, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12–month findings in the **Federal Register**.

*Previous Federal Actions*

In 1980, the Service reviewed the status of the least chub and determined that there was insufficient data to warrant its listing as an endangered or threatened species under the Act. On December 30, 1982, we classified the least chub as a Category 2 Candidate Species (47 FR 58454). Category 2 included taxa for which information in the Service's possession indicated that a proposed listing rule was possibly appropriate, but for which sufficient data on biological vulnerability and threats were not available to support a proposed rule. In 1989, we conducted a new status review, and reclassified the least chub as a Category 1 Candidate Species (54 FR 554). Category 1 included taxa for which the Service had substantial information in our possession on biological vulnerability and threats to support preparation of listing proposals. The Service ceased using category designations in February 1996. On September 29, 1995, we published a proposed rule to list the least chub as endangered with critical habitat (60 FR 50518). A listing moratorium, imposed by Congress in 1995, suspended all listing activities and further action on the proposal was postponed.

During the moratorium, the Service, Utah Division of Wildlife Resources (UDWR), Bureau of Land Management (BLM), Bureau of Reclamation (BOR), Utah Reclamation Mitigation and Conservation Commission (URMCC), Confederated Tribes of the Goshute Reservation, and Central Utah Water Conservancy District (CUWCD) developed a Least Chub Conservation Agreement and Strategy (LCCAS), and formed the Least Chub Conservation Team (LCCT) (Perkins *et al.* 1998, entire). The goals of the LCCAS are to ensure the species' long–term survival within its historic range and to assist in the development of rangewide conservation efforts. The objectives of the LCCAS are to eliminate or significantly reduce threats to the least chub and its habitat, to the greatest extent possible, and to ensure the continued existence of the species by restoring and maintaining a minimum number of least chub populations throughout its historic range. The LCCT implements the LCCAS and monitors populations, threats, and habitat conditions. The LCCAS was updated and revised in 2005 (Bailey *et al.* 2005, entire).

As a result of conservation actions and commitments made by signatories to the 1998 LCCAS (Perkins *et al.* 1998, p. 10), measures to protect the least chub were developed and implemented. Consequently, we withdrew the listing proposal on July 29, 1999 (64 FR 41061).

On June 25, 2007, we received a petition dated June 19, 2007, from Center for Biological Diversity, Confederated Tribes of the Goshute Reservation, Great Basin Chapter of Trout Unlimited, and Utah Chapter of the Sierra Club requesting that the least chub be listed as threatened under the Act and critical habitat be designated. Included in the petition and supplement was supporting information regarding the species' taxonomy and ecology, historical and current distribution, present status, and actual and potential causes of decline. We acknowledged the receipt of the petition and supplement in a letter to Center for Biological Diversity, Confederated Tribes of the Goshute Reservation, Great Basin Chapter of Trout Unlimited, and Utah Chapter of the Sierra Club, dated July 13, 2007. In that letter, we also stated that because of staff and budget limitations, it was not practical for us to begin processing the petition at that time. Based on the population status and alleged threats described in the petition, we found no compelling evidence to support an emergency listing at that time.

Funding became available to begin work on the 90–day finding in Fiscal Year (FY) 2008. On October 15, 2008, we published a 90–day finding that the petitioners provided substantial information indicating that the species may be warranted for listing under the Act, initiated the 12–month finding, and opened a 60–day public comment period (73 FR 61007). This notice constitutes the 12–month finding on the June 19, 2007, petition to list the least chub as threatened or endangered.

*Species Information*

Taxonomy and Species Description

The least chub (*Iotichthys phlegethontis*) is an endemic minnow (Family Cyprinidae) of the Bonneville Basin in Utah. Historically, ancient lakes Bonneville and Provo largely covered the Bonneville Basin, but over the past 16,000 years (since the Pleistocene period), these lakes receded, leaving behind the current hydrology of the area (Currey *et al.* 1984, p. 1). Least chub likely persisted in peripheral freshwater sources to the receding lakes and were widely distributed in a variety of the resulting habitat types, including rivers, streams, springs, ponds, marshes, and swamps (Sigler and Miller 1963, p. 91).

The species' taxonomic classification has evolved over time, as described in the 1995 proposed rule (60 FR 50518). The least chub is currently classified within the monotypic genus (containing only one species) *Iotichthys* (Jordan *et al.* 1930, in Hickman 1989, p. 16; Robins *et al.* 1991, p. 21).

As implied by its common name, the least chub is a small fish less than 55 millimeters (2.1 inches) long, identified by an upturned or oblique mouth, large scales, and the absence of an incomplete lateral line (rarely with one or two pored scales) (Sigler and Sigler 1987, p. 182). It has a deeply compressed body, with the front–most part of the dorsal fin (on the back) lying behind the insertion of the pelvic fin (on the underside of the body), and a slender caudle peduncle (area connecting tail fin to the body) (Sigler and Miller 1963, p. 83). Dorsal fin rays number eight (rarely nine), and anal fin rays also number eight (Sigler and Miller 1963, p. 83). The pharyngeal teeth (located near the pharynx) are in two rows (Sigler and Miller 1963, p. 83).

The least chub is a colorful species. Individuals have a gold stripe along blue sides with white to yellow fins (Sigler and Sigler 1987, p. 182). Spawning males are olive–green above, steel–blue on the sides, and have a golden stripe behind the upper end of the gill opening (Sigler and Sigler 1987, p. 182). The fins are lemon–amber, and sometimes the paired fins are bright golden–amber (Sigler and Sigler 1987, p. 182). Females and young are pale olive above, silvery on the sides, and have watery–white fins; their eyes are silvery, with a little gold coloration (Sigler and Sigler 1987, p. 182).

Life History

Sigler and Sigler (1987, p. 183) considered the least chub to be a slow–growing species that rarely lives beyond 3 years of age. However, least chub in natural systems live longer than originally thought (some least chub may live to be 6 years of age) and growth rates vary among populations (Mills *et al.* 2004a, p. 409). Differences in growth rates may result from a variety of interacting processes, including food availability, genetically based traits, population density, and water temperatures (Mills *et al.* 2004a, p. 411).

Least chub are opportunistic feeders, and their diets reflect availability and abundance of food items in different seasons and habitat types (Crist and Holden 1980, p. 808; Lamarra 1981, p. 5; Workman *et al.* 1979, p. 23). Although least chub diets change throughout the year, they regularly consume algae (Chlorophyta and Chrysophyta), midges (Chironomidae), microcrustaceans, copepods, ostracods, and diatomaceous material (Sigler and Sigler 1987, p. 183).

Maintaining hydrologic connections between springheads and marsh areas is important in fulfilling the least chub's ecological requirements (Crawford 1979, p. 63; Crist and Holden 1980, p. 804; Lamarra 1981, p. 10). Least chub follow thermal patterns for habitat use. In April and May, they use the flooded, warmer, vegetated marsh areas at water temperatures of about 16 °C (60 °F) (Crawford 1979, pp. 59, 74), but in late summer and fall they retreat to spring heads as the water recedes, to overwinter (Crawford 1979, p. 58). In the spring, the timing of spawning is a function of temperature and photoperiod (Crawford 1979, p. 39).

The least chub is a partial and intermittent spawner, and spawns within aquatic vegetation (Crawford 1979, p. 74). Adhesive eggs attach to the emergent plants that provide the eggs, larvae, and young with oxygen, food, and cover (Crist and Holden 1980, p. 808). Females release only a few eggs at a time, but continue spawning for an extended period. Total numbers of eggs produced are an indication of fecundity, and individual females produce from 300 to 2,700 eggs (Crawford 1979, p. 62). Fertilized eggs hatch in approximately 2 days at a water temperature of 22 °C (72 °F) (Crawford 1979, p. 74). Although peak spawning activity occurs in May, the reproductive season lasts from April to August, and sometimes longer, depending on environmental conditions such as photoperiod and water temperature (Crawford 1979, pp. 47–48). This reproductive strategy (i.e., repetitive spawning over a period of many weeks) allows the least chub to persist in fluctuating environmental conditions typical of desert habitats (Crawford 1978, p. 2).

Larval least chub grow larger and young fry survive better in silt substrate habitats (Wagner *et al.* 2006, pp. 1, 4, 7). The maximum growth rate for least chub less than 1 year of age occurs at 22.3 °C (72 °F) under captive conditions (Billman *et al.* 2006, p. 434). Thermal preferences demonstrate the importance of warm rearing habitats in producing strong year classes and viable populations (Billman *et al.* 2006, p. 434).

Distribution

The first documented collection of least chub is from a "brook" near Salt Lake City in 1871 (Hickman 1989, p. 16). Between 1871 and 1979, many least chub occurrences were reported across the State, ranging from the eastern portions of the Snake Valley to the Wasatch Front and from the northern extent of the Bear River south to the Beaver River (table 1). Least chub were very common in tributaries to the Sevier, Utah, and Great Salt Lakes in the beginning of the 20th Century (Jordan 1891, p. 30; Jordan and Evermann 1896, in Hickman 1989, p. 1).

TABLE 1.—SUMMARY OF HISTORIC COLLECTIONS OF LEAST CHUB.

| GEOGRAPH AREA | Location | Year Collected | Reference |
|---|---|---|---|
| Wasatch Front | Northwest Salt Lake City | 1933 | Hickman 1989, pp. 16-17 |

TABLE 1.—SUMMARY OF HISTORIC COLLECTIONS OF LEAST CHUB.—Continued

| GEOGRAPH AREA | Location | Year Collected | Reference |
|---|---|---|---|
| | Big Cottonwood Creek | 1953 | Sigler & Miller 1963, pp. 82-83 |
| | Davis County (2 miles west of Centerville) | 1964 | Hickman 1989, pp. 16-17; Bailey *et al.* 2005, p. 16 |
| | Farmington Bay | 1965 | Hickman 1989, pp. 16-17; Bailey *et al.* 2005, p. 16 |
| | Provo River | 1891 | Jordan 1891, p. 30 |
| | Provo River (at confluence with Utah Lake) | 1931 & 1936 | Tanner 1936, p. 170 |
| Northern | Bear River | 1894 | Thompson 2008, p. 1 |
| Southern | Beaver River | 1875 | Cope & Yarrow 1875, pp. 656-657 |
| | Beaver River; Parowan Creek; Clear Creek; & Little Salt Lake | 1942 | Hubbs *et al.* 1942, in Sigler & Miller 1963, p. 82 |
| | Sevier Lake | 1896 | Jordan & Evermann 1896, in Bailey *et al.* 2005, p. 16 |
| Snake Valley | Chimneys Spring; Big Spring; Foote Ranch; Small Knoll; & Gandy area | 1942 | Hickman 1989, p. 16-17 |
| | Leland Harris Spring Complex & Gandy Salt Marsh | 1970 | Hickman 1989, p. 16 |
| | Leland Harris Spring Complex; Bishop Spring Complex (Foote Reservoir & Twin Spring); & Gandy Spring Complex | 1979 | Workman *et al.* 1979, pp. 157-159 |
| | Callao, Utah (Bagley Ranch & Redden Spring) | 1979 | Workman *et al.* 1979, pp. 157-159 |

By the 1940s and 1950s, the numbers of least chub were decreasing (Holden 1974, in Hickman 1989, p. 2). Only 11 known populations existed by 1979 (Workman *et al.* 1979, pp. 156–158). By 1989, least chub had not been collected outside of the Snake Valley for the previous 25 years (Hickman 1989, p. 2). Three wild least chub populations were extant in 1995 (60 FR 50518) (Leland Harris Spring Complex, Gandy Salt Marsh, Bishop Spring Complex).

The current distribution of the least chub is highly reduced from its historic range. The UDWR began surveying for new populations and monitoring existing populations Statewide in 1993. As a result, UDWR found three previously unknown populations of least chub: Mona Springs in 1995, Mills Valley in 1998, and Clear Lake in 2003 (Mock and Miller 2003, p. 3; Hines *et al.* 2008, pp. 44–45). The Mona Springs site is in the southeastern portion of the Great Salt Lake subbasin and occurs on the eastern border of ancient Lake Bonneville, near the highly urbanized Wasatch Front. Clear Lake and Mills Valley are both in the Sevier subbasin, in relatively undeveloped sites (Hines *et al.* 2008, p. 17). A comparison of survey results from the 1970s (Workman *et al.* 1979, pp. 156–158) to surveys from 1993 to 2007 (Hines *et al.* 2008, pp. 36–45) indicates that a majority of the natural populations extant in 1979 were extirpated by 2007 (table 2).

**Table 2.—Comparison of least chub collections in 1979 and their updated status in 2007.**

Asterisk (*) denotes populations discovered after 1979.

Status categories:

- Stable = viable self–sustaining population
- Functionally extirpated = a limited number of least chub present but population is not self sustaining
- Extirpated = least chub no longer present at that location
- Secure = no immediate threats present
- Not secure = immediate threat(s) present

| 1979 Population | Status in 2007 |
|---|---|
| Leland Harris Spring Complex | Stable – Secure |
| Gandy Salt Marsh | Stable – Secure |
| Bishop Springs | Stable – Secure |
| Mills Valley* | Stable – Not secure |
| Clear Lake Wildlife Management Area* | Stable – Not secure |
| Mona Springs* | Functionally extirpated |
| Redden Springs | Extirpated |
| Bagley Ranch Complex | Extirpated |
| Knoll Spring (not verified) | Extirpated |
| Cecil Garland Ranch | Extirpated |
| Tie House | Extirpated |
| Donner | Extirpated |
| Cold | Extirpated |

Five wild, extant populations of least chub remain: the Leland Harris Spring Complex, Gandy Salt Marsh, Bishop Springs Complex, Mills Valley, and Clear Lake (Hines *et al.* 2008, pp. 34–45). Three of these populations (the Leland Harris Spring Complex, Gandy Salt Marsh, and Bishop Spring Complex) occur in the Snake Valley of Utah's west desert and are genetically similar and very close in proximity to each other (Mock and Miller 2003, pp. 17–18). The two remaining extant populations (Mills Valley and Clear Lake) are located on the southeastern border of the native range.

Least chub are still found in small numbers at the Mona Springs site (Hines *et al.* 2008, p. 37). However, because this small number of least chub does not compose a viable self–sustaining population (LCCT 2008a, p. 3), we consider the least chub population at Mona Springs functionally extirpated (see discussion below). The Snake Valley, Mills Valley, Clear Lake, and Mona Springs populations are each genetically distinct (Mock and Miller 2005, p. 276; Mock and Bjerregaard 2007, p. 146). A brief description of the extant wild and the Mona Springs least chub populations is found below.

(1) Leland Harris Spring Complex: R.R. Miller first collected least chub at this site, located north of the Juab/Millard County line, in 1970 (Sigler and Sigler 1987, p. 182). The site consists of 12 to 15 springheads that feed a playa wetland with habitat fluctuating in size seasonally. Least chub have had a persistent presence since monitoring began by the UDWR in 1993 (Hines *et al.* 2008, pp. 41–43). Another spring in the area, Miller Spring, is part of the Leland Harris Spring Complex, but outflows of the two sites are not always connected.

(2) Gandy Salt Marsh: C.L., L.C., and E.L. Hubbs first collected least chub at this site in 1942 (Sigler and Miller 1963, p. 82). Gandy Salt Marsh is south of the Millard/Juab County line and the Leland Harris Spring Complex and consists of private Utah School and Institutional Trust Lands Administration (SITLA) and BLM lands. Measuring approximately 6.4 kilometers (km) (4 miles (mi)) long (north and south) and 3.2 km (2 mi) wide (east and west), the complex consists of approximately 52 small springheads or ponds that drain into a large playa wetland on approximately 1,295 hectares (ha) (3,200 acres (ac)) (BLM 1992, p. 11). Least chub is the dominant fish species at the Gandy Salt Marsh site and comprises a wild self–sustaining population (Hines *et al.* 2008, p. 40). However, the number of occupied sites within the marsh has decreased about 50 percent since 1994 (Wilson 2006, p. 8; Hines *et al.* 2008, p. 41).

(3) Bishop Springs Complex: Least chub were documented at this site in 1942 (Hickman 1989, p. 18). The complex is now the largest occupied least chub site in Snake Valley. Located south and very near Gandy Salt Marsh, the site has large springs containing least chub, including Central Spring and Twin Springs (Hines *et al.* 2008, p. 38). The least chub population in Bishop Springs has remained stable and has demonstrated successful reproduction and recruitment (Hines *et al.* 2008, p. 38). The manmade Foote Reservoir does not contain least chub but contributes water to the playa marshlands that provide seasonal least chub foraging, reproduction, and nursery–type habitat (Crawford 1979, pp. 62–65).

(4) Mills Valley: UDWR biologists discovered least chub at multiple locations at this site in 1998 (Hines *et al.* 2008, p. 44). Mills Valley is in the Sevier River drainage in southeast Juab County (Hines *et al.* 2008, p. 17). It consists of a wetland with numerous springheads throughout the 200–ha (495–ac) complex. The least chub were present during sampling from 2001 through 2006 (Hines *et al.* 2008, p. 44).

(5) Clear Lake: In 2003, UDWR biologists found least chub at the Clear Lake Wildlife Management Area (WMA) in Millard County (Hines *et al.* 2008, p. 45). This reserve consists of a shallow reservoir and diked ponds fed by springs from adjacent Spring Lake. The site is managed by UDWR for waterfowl habitat (Hines *et al.* 2008, p. 45). Information about this least chub population is limited because of its recent discovery; however, successful recruitment is occurring (Hines *et al.* 2008, p. 45).

(6) Mona Springs: The UDWR biologists discovered this least chub site in northeast Juab County in 1995 (Mock and Miller 2003, p. 3). Mona Springs has provided habitat for a genetically distinct, naturally occurring population of least chub. However, the Mona Springs site is no longer suitable for least chub because of the presence of nonnative fish; only four least chub were collected here in 2008 surveys (LCCT 2008a, p. 3). Because of the lack of population viability at this site, we consider the least chub population at Mona Springs functionally extirpated.

Translocations

In an attempt to create refuge (an artificial place of protection for a species) populations and reestablish wild populations, 19 introductions of least chub to new locations rangewide were attempted by UDWR between 1979 and 2008 (see table 3). Of these, two sites are currently stable and secure (one has persisted for 3 years and another for 1 year), seven introductions failed, and three are not secure. The long–term success of seven of the transplants is currently unknown, because they were initiated in 2008 and monitoring information is limited. A description of each of the translocation efforts follows.

**Table 3.—Least chub translocations attempted from 1979 to 2008.**

Status categories:

- Stable = viable self–sustaining population
- Unstable = a limited number of least chub present but population is not self–sustaining
- Extirpated = least chub no longer present at location
- Secure = no immediate threats present
- Not secure = immediate threat(s) present
- Unknown = no established sampling history

| Site | Year | Status |
| --- | --- | --- |
| Lakepoint Pond | 1979 | Extirpated |
| Harley Sanders Pond | 1986 | Extirpated |
| Red Butte Gardens | 1987 | Extirpated |
| Walter Springs | 1995 | Extirpated |
| Deadman Springs | 1996 | Extirpated |
| Antelope Island | 2000 | Extirpated |
| Lucin Pond | 1989 | Unstable – Not secure |
| Garden Creek Pond | 2004 | Stable – Not secure |
| Atherly Reservoir | 2006 | Unstable – Not secure |
| Ibis/Pintail Ponds | 2007 | Extirpated |
| Red Knolls Pond | 2005 | Stable – Secure |
| Willow Pond | 2007 | Stable – Secure |
| Seven northern Utah sites | 2008 | Unknown |

(1) Lakepoint Pond, Tooele County: In 1979, 200 least chub from the Leland Harris Spring Complex were released into Lakepoint Pond located approximately 32 km (20 mi) southwest of Salt Lake City, 1.6 km (1 mi) from the shore of the Great Salt Lake. This site was eliminated by floods in 1983 and 1984 (Hickman 1989, p. 4).

(2) Harley Sanders Pond, Box Elder County: In 1986, UDWR released least chub into Harley Sanders Pond and spring. No least chub were found during sampling in 1988 (Hickman 1989, p. 4).

(3) Red Butte Gardens, Salt Lake County: In 1987, least chub were introduced into the stream and pond at the Utah State Arboretum (Red Butte

Gardens) near Fort Douglas in Salt Lake City (Hickman 1989, p. 5). Attempts to relocate least chub in 1988 were unsuccessful (Hickman 1989, p. 5), so we consider it extirpated and unsuccessful.

(4, 5) Walter/Deadman Springs, Tooele County: Least chub were introduced in 1995 and 1996 to these springs; however, they have been replaced by western mosquitofish (*Gambusia affinis*) (Wilson and Whiting 2002, p. 4; Wilson and Mills 2004, pp. 4–5). Therefore, we consider these sites to be extirpated and unsuccessful.

(6) Antelope Island, Davis County: In December 2000, UDWR introduced least chub to a human–made spring–fed pond on Antelope Island. Mosquitofish have replaced least chub at this site (Thompson 2005, pp. 5–6). Therefore, we consider this site to be extirpated and unsuccessful.

(7) Lucin Pond, Box Elder County: In 1989, 42 least chub were transplanted into this site. Lucin Pond is a human–made pond built in the early 1900s. This least chub population is currently considered unstable and not secure because mosquitofish are present and the water supply to the pond is unreliable (Thompson 2005, pp. 1–4; Hines *et al.* 2008, pp. 47–49).

(8) Garden Creek Pond, Davis County: In 2004, 947 least chub were introduced to this pond on Antelope Island in the Great Salt Lake. It is a 0.04 ha (0.1 ac) pond that was dredged by the Utah Department of Parks and Recreation and is fed by a perennial stream (stream with continuous flow throughout the year). The site was considered a genetic refuge for the functionally extirpated Mona Springs population. Reproduction and recruitment have been occurring; however, the site is threatened by a loss of habitat due to siltation (Thompson 2005, pp. 6–7; Hines *et al.* 2008, p. 46; Thompson 2008, p. 3; LCCT 2008a, pp. 3–4).

(9) Atherly Reservoir, Tooele County: This site is on Faust Creek in Rush Valley, and is part of the 283–ha (700–ac) James Walter Fitzgerald WMA. Approximately 13,000 least chub from the Mills Valley population were introduced in 2006 (Hines *et al.* 2008, p. 50). The UDWR monitoring in 2008 detected only eight least chub (LCCT 2008a, p. 3). Therefore, we do not consider this introduction to be successful at this time.

(10) Ibis/Pintail Ponds, Tooele County: In 2007, least chub from Leland Harris Spring Complex were introduced into Ibis and Pintail Ponds on the Fish Springs National Wildlife Refuge (Hines *et al.* 2008, p. 50). This introduction was unsuccessful, and the site currently does not contain a least chub population. The UDWR is planning to release least chub again in the future after mosquitofish control issues are addressed (LCCT 2008a, p. 3).

(11) Red Knolls Pond, Box Elder County: In 2005, 250 least chub from Bishop Springs were introduced to Red Knolls Pond (Hines *et al.* 2008, p. 50), located in the western portion of Box Elder County on BLM land. Successful recruitment was observed in 2005, 2006, and 2007, indicating that reproduction has been occurring (Hines *et al.* 2008, p. 50; Thompson 2008, p. 4). This site is currently secure and represents a genetic refuge for the Bishop Springs Complex population.

(12) Willow Pond, Box Elder County: On August 22, 2007, 340 least chub from the Clear Lake population were released into this habitat (Hines *et al.* 2008, p. 50), located in the northwest portion of Box Elder County. In 2008, least chub were present and recruitment to the population was apparent (LCCT 2008a, p. 4). This site is currently secure and represents a genetic refuge for the Clear Lake population.

(13) The UDWR introduced least chub into seven additional sites in Cache and Box Elder Counties in 2008 (LCCT 2008a, p. 4). This effort was conducted to establish new refuge populations by stocking State–hatchery–produced least chub into suitable habitat. Success of these introductions cannot be determined for several years; however, the probability of success for some of these introductions may be low because of the possibility of winter kill and the presence of nonnative species.

In summary, we believe that translocated least chub populations can contribute to the long–term conservation of the species by providing a refuge (e.g., hatcheries or other managed systems) for the preservation of a population's genetic diversity. In addition, translocation to a refugium (a native habitat that has escaped ecological changes occurring elsewhere and so provides a suitable habitat for a species) contributes to long–term conservation of least chub by providing conditions necessary to maintain a viable self–sustaining population. However, to date, translocated least chub populations have had relatively poor success because of problems with competing nonnative fishes, inadequate water supply, or for unknown reasons (i.e., least chub were stocked into a particular habitat but could not be relocated during subsequent monitoring). While two populations have indications of successful recruitment and are secure from immediate threats, it is too early to determine whether these populations will contribute to the long–term conservation of least chub. Monitoring of translocated populations will be essential to address the uncertainty that exists about the success of these actions. Due to the uncertainty of the long–term status of translocated least chub populations, they are not considered further in this review.

Hatchery Broodstock

The Wahweap Warmwater Fish Hatchery in Big Water, Utah, and the Fisheries Experiment Station in Logan, Utah, each manage least chub broodstock that were sourced from Mills Valley and Mona Springs (Hines *et al.* 2008, p. 27). These hatcheries help preserve the genetic diversity of source populations of least chub and provide stock for introduction and reintroduction efforts.

**Summary of Information Pertaining to the Five Factors**

Section 4 of the Act (16 U.S.C. 1533), and implementing regulations (50 CFR 424), set forth procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors: (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 manmade factors affecting its continued existence. In making this finding, information pertaining to the least chub in relation to the five factors provided in section 4(a)(1) of the Act is discussed below.

*Factor A. The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range.*

The following potential threats that may affect the habitat or range of least chub are discussed in this section, including: (1) Livestock grazing; (2) oil and gas leasing and exploration; (3) mining; (4) urban and suburban development; (5) water withdrawal and diversion; and (6) drought.

(1) Livestock Grazing

Grazing animals can impact aquatic habitats in multiple ways. Livestock seek springs for food and water, both of which are limited in desert habitats; therefore, they spend a disproportionate amount of time in these areas (Stevens and Meretsky 2008, p. 29). As they spend time at springs, livestock eat and trample plants, compact local soils, and collapse banks of springs (Stevens and Meretsky 2008, p. 29). Input of organic wastes increases nutrient concentrations, and some nutrients (i.e., nitrogen compounds) can become toxic to fish (Taylor *et al.* 1989, in Stevens and Meretsky 2008, p. 29). Domestic animals can also be trapped in soft spring deposits, die and decompose, and pollute the water. All of these effects can result in the loss or decline of native aquatic fauna (Stevens and Meretsky 2008, pp. 29–30).

As explained below, historic livestock grazing impacted four of the five remaining wild least chub sites, and current livestock grazing practices continue to impact these sites. The UDWR monitors these sites and is working on minimizing or removing livestock grazing threats (Hines *et al.* 2008, pp. 22–23). Livestock grazing impacts occur at Mills Valley (Wilson and Whiting 2002, pp. 2–3; Bailey 2006, p. 30; Hines *et al.* 2008, p. 43), Gandy Salt Marsh (Hines *et al.* 2008, p. 39; LCCT 2008b, p. 2), Miller Spring/Leland Harris Spring Complex (Bailey 2006, p. 11; Hines *et al.* 2008, pp. 41–42), and Bishop Springs/Foote Reservoir/Twin Springs (Wheeler and Fridell 2005, p. 5). The Clear Lake site is protected from livestock grazing because it is a WMA managed by the State of Utah (Hines *et al.* 2008, p. 45).

Fencing at Gandy Salt Marsh and Miller Spring/Leland Harris Spring Complex excludes cattle from springhead areas (Hines *et al.* 2008, pp. 39, 41, 43), but livestock damage still occurs at these sites during periods of unmanaged overgrazing or when fences are not maintained (Hines *et al.* 2008, p. 39; LCCT 2008b, p. 2). For example, in July 2008, livestock damage was reported to be extensive and fencing trapped cattle inside the northern area of Gandy Salt Marsh (LCCT 2008b, p. 2).

Impacts from livestock grazing include bank erosion and sedimentation to springheads (LCCT 2008b, p. 5). Miller Spring (at the Leland Harris Spring Complex) was unsuitable for least chub due to sedimentation and trampling associated with livestock use, poor water quality, and the presence of rainbow trout (Hogrefe 2001, p. 7). Extensive efforts by UDWR in 1999 and 2000 to restore and fence the spring and remove nonnatives significantly improved the habitat (Hogrefe 2001, pp. 7, 20); however, the response of least chub to improvements at Miller Spring has not been determined. Most of the other 12 to 15 springs in the Leland Harris Spring Complex have some ungulate damage and bank disturbance (Hines *et al.* 2008, p. 42). A rotational grazing plan has been developed with the landowner and UDWR on 75 ha (188 ac) of the Leland Harris site to improve habitat conditions, but damage to springs and riparian vegetation continues to impact least chub habitat (Hines *et al.* 2008, p. 42).

Twin Springs, at the Bishop Spring complex, is partially protected from livestock by fences, but the larger spring complex, Twin Springs South, is not protected from grazing or wild horse watering access. Twin Springs South has severely impacted banks resulting in shallower water, increased surface area, and sedimentation of spring heads (Wheeler *et al.* 2004, p. 5). On the State–owned WMA portion of the Mills Valley site, grazing is allowed in return for access across private land. The private portion of Mills Valley is overgrazed and damage to water body banks and riparian vegetation has been reported as moderate to severe (UDWR 2006, pp. 27–28). The BLM has built fencing around two Gandy Salt Marsh springheads, Pilot Springs and Red Knolls Pond, to protect least chub transplant locations (Hines *et al.* 2008, p. 24).

In summary, our analysis indicates that, although efforts to control and minimize damage have been implemented and are ongoing, livestock grazing impacts some habitat at most wild least chub sites. Grazing damage is not always severe where it occurs, and livestock are effectively excluded from portions of occupied habitat. However, extensive livestock grazing–related damage has occurred in the last couple of years in some instances, and livestock grazing on private lands where least chub occur is still partially unregulated. Therefore, we conclude that current levels of livestock grazing are likely to significantly threaten least chub populations at Leland Harris Spring Complex, Gandy Salt Marsh, Bishop Springs Complex, and Mills Valley, now and in the foreseeable future.

(2) Oil and Gas Leasing and Exploration

Oil and gas leasing and exploration can have direct and indirect impacts on springs, marshes, and riparian habitats. Vehicles, including drilling rigs and recording trucks, can crush vegetation, compact soils, and introduce exotic plant species (BLM 2008, pp. 4–9 to 4–20). Roads and well pads can affect local drainages and surface hydrology, and increase erosion and sedimentation (Matherne 2006, p. 35). Accidental spills (Etkin 2009, pp. 36–42, 56) can result in the release of hydrocarbon products into ground and surface waters (Stalfort 1998, section 1). Accumulations of contaminants in floodplains can result in lethal or sublethal impacts to endemic sensitive aquatic species (Stalfort 1998, section 4; Fleeger *et al.* 2003, p. 207).

All of the naturally occurring, extant least chub populations occur within the Fillmore BLM area. The majority of BLM land in the Fillmore Field Office is open to oil and gas leasing (BLM 2009a, p. 11). Oil and gas leases have been sold within the watershed areas of most of the naturally occurring least chub populations, but the closest active well to a least chub population is currently 9.7 km (6 mi) away (Megown 2009a, entire). The Gandy Salt Marsh population area is closed to leasing by BLM in accordance with the Fillmore Resource Management Plan (RMP) because of the occurrence of least chub habitat. This RMP will be updated in approximately 10 to 15 years. Any change to the management direction would be reviewed at this time and subject to public comment (BLM 2009a, p. 54). Seismic surveys were conducted on parcels adjacent to the Mills Valley population, and BLM anticipates that a Notice of Staking or Application for Permit to Drill may be filed by the lessee in 2010 (Mansfield 2009, p. 1).

Based on past drilling history, the BLM's Fillmore Field Office determined that recoverable oil and gas is likely to be of low availability within the range of the least chub. They further estimated that exploratory wells will be drilled at the rate of about one well every year for the foreseeable future (BLM 2009a, p. 52). Leases near least chub habitat will not be offered for sale until the Fillmore BLM RMP is revised; the RMP revision is not yet scheduled (Naeve 2009a–c, entire).

Oil and gas leases in the BLM Fillmore Field Office will include lease notices with information on sensitive species and conservation agreement species where appropriate (BLM 2009a, pp. 14, 98–99). These lease notices include measures to coordinate with UDWR to minimize the risk of spreading aquatic exotic species; avoid surface pumping for water; avoid surface disturbances within 100–year floodplains; avoid changes to ground and surface hydrology; and avoid direct disturbances to special status species (BLM 2009a, pp. 98–99). The extent of implementation of each lease notice, and the success of the lease notices, will not be known until development occurs. However, the lease notices in combination with the low energy development potential should ensure that oil and gas development is not a significant threat to the species in the foreseeable future. Recoverable oil and gas across the entire Fillmore Field Office area is expected to be low, with a rate of one exploratory well drilled annually, and the nearest active well is 9.7 km (6 mi) from an extant least chub population. We conclude that oil and gas development are not anticipated to occur at a level that will threaten least chub.

(3) Mining

Mills Valley contains a bog area with a peat and humus resource (Olsen 2004, p. 6). Peat mining has the potential to alter the hydrology and habitat complexity of Mills Valley, making it unsuitable for least chub (Bailey *et al.* 2005, p. 31). An illegal peat removal activity occurred on private lands in the Mills Valley wetlands in 2003 (Wilson 2009a, pers. comm.). The illegal activity was less than 0.2 ha (0.5 ac) in size, and impacts to associated wetlands were restored (Wilson 2009a, pers. comm.). In 2003, a Mills Valley landowner received a permit from the Utah Division of Oil, Gas, and Mining to conduct peat mining on their private land. Although one test hole was dug, no further peat mining occurred in this location. This peat mining permit is now inactive and noncompliant with State regulations requiring payment of mining and bond fees (Wilson 2009a, pers. comm.). Past peat mining activities have been unsuccessful in Mills Valley, and we are unaware of any future private or commercial peat mining proposals.

In summary, our analysis found one illegal peat removal activity and one abandoned attempt at legal peat removal in the Mills Valley least chub population area. We are unaware of any additional private or commercial peat operation proposals in Mills Valley. We conclude that peat mining is not anticipated to occur at a level that will threaten least chub.

(4) Urban and Suburban Development

Urban and suburban development affect least chub habitats through: (1) Changes to hydrology and sediment regimes; (2) inputs of pollution from human activities (contaminants, fertilizers, and pesticides); (3) introductions of nonnative plants and animals; and (4) alterations of springheads, stream banks, floodplains, and wetland habitats by increased diversions of surface flows and connected groundwater (Dunne and Leopold 1978, pp. 693–702).

The least chub was originally common throughout the Bonneville Basin in a variety of habitat types (Sigler and Miller 1963, p. 82). In many urbanized and agricultural areas, residential development and water development projects have effectively eliminated historical habitats and potential reintroduction sites for least chub (Keleher and Barker 2004, p. 4; Thompson 2005, p. 9). Development and urban encroachment have either functionally or completely eliminated most springs, streams, and wetlands along the Wasatch Front (Keleher and Barker 2004, p. 2).

The Mona Springs site, as well as potential reintroduction sites (Keleher and Barker 2004, p. 4; Thompson 2005, p. 9) on the Wasatch Front, are vulnerable to rapid population growth. The human population in the Mona Springs area has increased 64.9 percent from 2000 to mid 2008 (City–Data 2009, p. 1) and a housing development has expanded to within 1 km (0.6 mi) of the Mona Springs least chub site (Megown 2009b, entire). The URMCC, which is responsible for mitigating impacts caused by Federal reclamation projects to fish, wildlife, and related recreation resources in Utah, has purchased and protected much of the Mona Springs habitat areas for conserving least chub and spotted frog populations (see Factor D). However, indirect effects of urban development such as pollution from urban stormwater runoff and changes to hydrologic sediment regimes (e.g., sedimentation from adjacent construction activities) could negatively impact the aquatic habitats at Mona Springs. Even if mosquitofish and other predacious nonnative fish (the primary threat at this site) can be controlled in the future, we believe urban–development–related effects could rise to a level that may preclude reestablishment of a viable least chub population at Mona Springs.

Despite the effects of urban and suburban development on historic populations of least chub, we have no information indicating this is a threat to the five remaining extant least chub populations. These least chub populations occur in relatively remote portions of Utah with minimal human populations. No information is available indicating the level of human occupation near these sites. However, the population centers nearest to extant least chub populations are more than 16 km (10 mi) away and have populations of less than 3,000 persons (Utah Governor's Office of Planning and Budget 2009, entire).

To summarize, development along the eastern portion of the least chub historic range has contributed to the elimination of most of the historic populations of least chub. The Mona Springs site is currently the only site in this geographic area that still contains least chub, but the population is functionally extirpated. We have no information suggesting that future urban or suburban development will occur at a level that will threaten least chub.

(5) Water Withdrawal and Diversion

Hydrologic alterations, including water withdrawal and diversion, affect a variety of abiotic and biotic factors that regulate least chub population size and persistence. Abiotic factors include physical and chemical characteristics of the environment, such as water levels and temperature, while biotic factors include interactions with other individuals or other species (Deacon 2007, pp. 1–2). Water withdrawal directly reduces available habitat, impacting water depth, water surface area, and flows from springheads (Alley *et al.* 1999, p. 43). As available habitat decreases, the characteristics and value of the remaining habitat changes. Reductions in water availability to least chub habitat reduce the quantity and quality of the remaining habitat (Deacon 2007, p. 1).

Water withdrawal and diversion reduces the size of ponds, springs, and other water features that support least chub (Alley *et al.* 1999, p. 43). Assuming that the habitat remains at carrying capacity for the species or, in other words, assuming all population processes (birth rate, death rate, etc.) remain unchanged, smaller habitats support fewer individuals by offering fewer resources for the population (Deacon 2007, p. 1).

Because least chub live in patchily distributed desert aquatic systems, reduction in habitat size also affects the quality of the habitat. Reduced water depth may isolate areas that would be hydrologically connected at higher water levels. Within least chub habitat, springheads offer stable environmental conditions, such as temperature and oxygen levels, for refugia and overwintering, but offer little food or vegetation (Deacon 2007, p. 2). In contrast, marsh areas offer vegetation for spawning and feeding, but exhibit wide fluctuations in environmental conditions (Crawford 1979, p. 63; Crist and Holden 1980, p. 804). Maintaining hydrologic connections between springheads and marsh areas is important because least chub migrate between these areas to access the full range of their ecological requirements (Crawford 1979, p. 63; Crist and Holden 1980, p. 804; Lamarra 1981, p. 10).

Although we have not directly observed the effects of flow reductions on wild least chub populations, we believe that flow reductions will reduce the hydrology that supports wetland

and wetland/upland transition zones which, in turn, provide vegetation needed for the least chub reproductive cycle (Crawford 1979, p. 38; Lamarra 1981, p. 10). Alterations of natural flow processes also could alter sediment transport processes that prevent vegetation encroachment into sensitive spring areas (60 FR 50520).

Reductions in water may alter chemical and physical properties of aquatic habitats. As water quantity decreases, temperatures may rise (especially in desert ecosystems with little shade cover), dissolved oxygen may decrease, and the concentration of pollutants may increase (Alley *et al.* 1999, p. 41; Deacon 2007, p. 1). These modified habitat conditions are likely to significantly impact least chub life history processes, possibly beyond the state at which the species can survive. The maximum growth rate for least chub less than 1 year of age would occur at 22.3 °C (72.1 °F). Temperatures above or below this have the potential to negatively impact growth and affect survival rates (Billman *et al.* 2006, p. 438).

Reduced habitat quality and quantity may cause niche overlaps with other fish species, increasing hybrid introgression, interspecific competition, and predation (Deacon 2007, p. 2) (see Factor C. Predation; Factor E. Hybridization). Reduction in flow of springs reduces opportunities for habitat niche partitioning; therefore, fewer species are able to coexist. The effect is especially problematic with respect to introduced species. Native species may be able to coexist with introduced species in relatively large habitats (see Factor C. Predation), but become increasingly vulnerable to extirpation as habitat size diminishes (Deacon 2007, p. 2).

Habitat reduction may affect the species by altering individual success. Fish and other aquatic species tend to adjust their maximum size to the amount of habitat available, so reduced habitat may reduce the growth capacity of least chub (Smith 1981, in Deacon 2007, p. 2). Reproductive output decreases exponentially as fish size decreases (Deacon 2007, p. 2). Therefore, reduction of habitat volume in isolated desert springs and streams reduces reproductive output (Deacon 2007, p. 2). Longevity also may be reduced resulting in fewer reproductive seasons (Deacon 2007, p. 2).

Current Groundwater Pumping

The Utah State Engineer (USE), through the Utah Division of Water Rights (UDWRi), is responsible for the administration of water rights, including the appropriation, distribution, and management of the State's surface and groundwater. This office has broad discretionary powers to implement the duties required by the office. The USE's Office was created in 1897, and the State Engineer is the chief water rights administrative officer. For groundwater management, Utah is divided into groundwater areas, and policy is determined by area (BLM 2009b, entire).

A joint report by the U.S. Geological Survey (USGS) and several State of Utah agencies provided a description of groundwater conditions in the State of Utah for 2008 (Burden 2009, entire). Each of the locations occupied by least chub had a corresponding summary by valley or hydrographic area for: the number of wells constructed in 2008; the total estimated groundwater withdrawn in the area for 2008; the total estimated groundwater withdrawn for each year for the previous 10 years; and groundwater level monitoring results from several monitoring wells for varying periods of record (~20 to 75 years). For all valleys and hydrographic areas, the predominant (greater than 79 percent) use of withdrawn groundwater was for irrigation with remaining uses including industrial, public supply, domestic, and stock (Burden 2009, pp. 5, 89).

The Juab Valley, where the Mona Springs least chub site is located, had a total of two new wells, and 26,000 acre–feet per year (afy) withdrawn for 2008 (Burden 2009, pp. 3–5). This is more than double the amount withdrawn in 1998 (12,000 afy) and is an overall increase from the 1998–2007 average (22,000 afy) (Burden 2009, p. 6). All supplies of surface and groundwater are fully appropriated; however, new wells could be developed with existing groundwater rights (UDWRi 2009d, pp. 1–2).

Although the Mills Valley population site did not have a corresponding pumping area in the report, the Central Sevier Valley summary represents pumping activity in the river valley upstream of this population and may be indicative of the potential for groundwater withdrawal effects. The Central Sevier Valley had a total of 13 new wells, and 24,000 afy withdrawn in 2008 (Burden 2009, pp. 3–5). This is 4,000 afy more than the amount withdrawn in 1998 (20,000 afy) and is an 8,000–afy increase from the 1998–2007 average (16,000 afy) (Burden 2009, p. 6). Since 1997, the corresponding part of the Sevier River Basin was closed to all new appropriations of groundwater. However, new groundwater development can occur under existing groundwater rights (UDWRi 2009d, pp. 3–4).

The Clear Lake least chub site is located within the Sevier Desert groundwater pumping basin, which had 11 new wells with 44,000 afy withdrawn in 2008 (Burden 2009, pp. 3–5). This is 32,000 afy more than the amount of water withdrawn in 1998 (12,000 afy) and is a 20,000–afy increase from the 1998–2007 average (24,000 afy) (Burden 2009, p. 6). Since 1997, this part of the Sevier River Basin was closed to all new appropriations of groundwater except for domestic filings not exceeding 1.0 acre–foot and for filings reviewed on an individual basis in limited areas of the basin (UDWRi 2009d, pp. 5–6).

The Snake Valley summary, which corresponds to the pumping activity in the vicinity of Leland Harris Spring Complex, Gandy Salt Marsh, and Bishop Spring Complex did not report the number of new wells, but did specify 19,800 and 20,200 afy withdrawn for 2007 and 2008, respectively, in Utah (Burden 2009, p. 89). Additional information on groundwater pumping over the last decade was not provided. State of Nevada Division of Water Resources reported that 11,000 afy of groundwater was pumped from the Nevada portion of Snake Valley in 2009 (NDWR 2009, entire). Groundwater is currently open to appropriation in Snake Valley in Utah (UDWRi 2009d, pp. 7–9) and Nevada (NDWR 2009, entire).

The previously discussed increases in groundwater pumping have occurred at the same time that a declining trend in groundwater level was observed at wells monitored in or very near basins with least chub populations (Burden 2009, pp. 41–57, 89, 96). Groundwater monitoring shows that water levels generally rose in the early to mid 1980s, likely as a result of greater–than–average precipitation. However, groundwater levels generally declined from the mid–to–late 1980s to the present. Although drought conditions were present in the eastern Great Basin (areas with extant least chub populations) during this time (See Factor A. Drought), localized annual precipitation levels were either average to slightly above average (Mona Springs and Mills Valley least chub sites) or were generally increasing, if below average (Clear Lake and Snake Valley least chub sites), during this same timeframe (Burden 2009, pp. 41–57, 89, 96).

For the four basins discussed above, a more specific analysis of groundwater level fluctuations over the last decade (1998–2009) provides some indication of the scope of change. Groundwater levels from six monitoring wells in Juab Valley (where the Mona Springs least chub site is located) declined an average of 6.1 meters (m) (20 feet (ft)) with declines ranging from 0.6 to 10.1 m (2 to 33 ft) (Burden 2009, pp. 41–45). As stated above, groundwater monitoring in Central Sevier Valley basin represents pumping activity and groundwater levels in the river valley upstream of the Mills Valley least chub population and may be indicative of the potential for groundwater withdrawal effects. Groundwater levels in 10 monitoring wells in this area declined an average of 0.9 m (3 ft) with declines ranging from 0 to 1.5 m (0 to 5 ft). Data from 15 monitoring wells in the Sevier Desert groundwater pumping basin (where the Clear Lake least chub site is located) indicated that groundwater levels declined an average of 2.4 m (8 ft) with declines ranging from 0.3 to 5.5 m (1 to 18 ft), and groundwater monitoring levels in the Snake Valley (in the vicinity of Leland Harris Spring Complex, Gandy Salt Marsh, and Bishop Spring Complex) declined 1.2 m (4 ft) with declines ranging from 0.3 to 3 m (1 to 10 ft) (Burden 2009, pp. 46–52, 89–96).

We have limited information linking groundwater pumping to decreases in flow at sites where least chub previously existed. Agricultural pumping, combined with drought, has affected several springs in Snake Valley. These include Knoll Spring near the town of Eskdale and springs on private properties in the town of Callao (Sabey 2008, p. 2). These sites were all historically documented locations of least chub that no longer harbor the species (Hickman 1989, pp. 16–17; Garland 2007, pers. comm.).

Pumping for agricultural purposes, combined with the effects of drought, has impacted flow in a number of springs in Snake Valley. Although no least chub historically occurred at Needle Point Spring, the BLM has detailed monitoring information linking nearby groundwater pumping and its effect on the spring's flow. In 2001, the water level at Needle Point Spring in Southern Snake Valley dropped to levels not seen in 40 years (Summers 2008, pp. 1–2). This spring has a long history of existence, identified as early as 1939 by the Civilian Conservation Corps, when springflow was measured at 6 gallons per minute (Summers 2008, p. 1). For the past several decades, the spring was developed and used for watering livestock and wild horses (Summers 2008, p. 1). The 2001 decline in groundwater level at Needle Point Spring was likely the result of, and coincides with, increased irrigation in Hamlin Valley approximately 3.2 km (2 mi) west, and not a result of the lowered precipitation (Summers 2008, p. 3).

Although the causal effect of groundwater pumping is unknown in the following observations, UDWR has documented decreases in habitat at two least chub sites. They recently reported decreases in least chub habitat from springs drying and decreasing in size at the Clear Lake least chub site (LCCT 2008b, p. 2). The UDWR found that annual drying of some ponds with least chub is becoming a consistent trend resulting in declining habitat quality, and is therefore limiting the distribution of least chub at Clear Lake. Average water depth among affected ponds decreased from 0.5 m (1.6 ft) in 2006 to 0.2 m (0.7 ft) in 2008 (LCCT 2008b, p. 2). At the Gandy Salt Marsh site, least chub populations have declined by more than 50 percent (from 1993 to 2006) as a result of a reduction in available habitats due to the drying of springs throughout the complex (Wilson 2006, p. 8).

As described above, current groundwater pumping levels have increased in the last 10 years and in some locations have more than doubled. Groundwater levels have decreased during this same time period while precipitation levels were average or generally increasing if below average. Negative impacts to least chub habitat were documented at the same time this scenario was occurring. In addition, all basins where least chub occur are currently open to additional groundwater pumping. Therefore, we conclude that current levels of groundwater pumping are likely to significantly threaten all least chub populations now and in the foreseeable future.

Snake Valley has harbored the most secure least chub populations over the past 50 years (Hickman 1989, p. 2; Hines *et al.* 2008, pp. 34–45). As detailed in the following sections of this document, proposed water development projects intend to transport water from the underlying aquifers in the vicinity of Snake Valley. Projects include a Southern Nevada Water Authority (SNWA) Groundwater Development (GWD) Project, appropriation of groundwater by the Central Iron County Water Conservancy District and Beaver County, Utah, and an increase of water development by the Confederated Tribes of the Goshute Reservation. These water withdrawals threaten to change the underlying hydrology of the area and may modify least chub habitat and impact the extant populations in the Snake Valley in the foreseeable future (see below for more information).

Southern Nevada Water Authority Proposed Groundwater Development Project

One of the most significant threats to extant least chub populations may be proposed groundwater withdrawals from the Snake Valley aquifer. Several applications for groundwater withdrawal from the Snake Valley aquifer are pending (SNWA 2008, p. 1–6), and SNWA has applied to the BLM for issuance of rights–of–way to construct and operate a system of regional water supply and conveyance facilities (SNWA 2008, p. 1–3). The SNWA GWD Project includes construction and operation of groundwater production wells, water conveyance facilities, and power facilities (SNWA 2008, p. 1–3). The proposed production wells and facilities would be located predominately on public lands managed by BLM (SNWA 2008, p. 1–3).

As proposed, the SNWA GWD Project would convey up to 170,000 afy of groundwater from hydrographic basins in Clark, Lincoln, and White Pine Counties, Nevada, to SNWA member agencies and the Lincoln County Water Conservancy District (SNWA 2008, p. 1–1). Although all SNWA facilities are planned for development in Nevada, associated pumping from the Spring Valley and Snake Valley hydrographic basins (SNWA 2008, pp. 1–4, Figures 1–2) is expected to affect Utah groundwater resources and consequently habitats of the least chub (Welch *et al.* 2007, p. 82).

The SNWA would receive all groundwater conveyed from the Snake Valley (approximately 50,679 afy) and Spring Valley (approximately 68,000 afy) Basins (SNWA 2008, p. 1–6, Table 1–1). The groundwater that SNWA intends to convey would be from existing and future permitted water rights (SNWA 2008, p. 1–6, Table 1–1). If all permits are granted, SNWA intends to start pumping operations for Spring Valley in 2028 and Snake Valley in 2050 (BLM 2009, p. 2–12). As substantiated below, the SNWA GWD project is likely to significantly threaten least chub populations in the foreseeable future.

The Service has been concerned about impacts from this proposed large–scale water withdrawal for many years. In 1990, the Service and other Department of the Interior (DOI) agencies (BLM, National Park Service, and Bureau of Indian Affairs) protested water rights applications in Spring and Snake Valley, based in part on potential impacts to water–dependent natural resources (Plenert 1990, p. 1; Nevada

State Engineer (NSE) 2007, p. 11). In 2006, DOI agencies reached a stipulated agreement with SNWA for the Spring Valley water rights applications, withdrew their protests, and did not participate in the NSE's hearing (NSE 2007, p. 11). For the Spring Valley portion of the project, the Stipulated Agreement established a process for developing and implementing hydrological and biological monitoring, management, and mitigation for biological impacts (NSE 2007, p. 11).

To better understand the potential effects of the proposed large–scale groundwater pumping, the NSE issued an October 28, 2008 order (Interim Order No. 2 and Scheduling Order) in which the applicant (SNWA) was required to provide a groundwater model that simulates groundwater pumping and potential impacts from pumping in the amount of 10,000, 25,000, and 50,000 afy for the timeframes of 10, 25, 50, 100, and 200 years. The NSE hearings on these applications were scheduled to begin on September 28, 2009. These hearings were postponed based on a pending agreement between the States of Nevada and Utah as described below.

According to the Lincoln County Conservation, Recreation, and Development Act (LCCRDA) of 2004 (LCCRDA 2004, entire), the States must reach an agreement on the division of Snake Valley groundwater prior to any transbasin groundwater diversions. Utah and Nevada have reached a draft agreement that is still under discussion and not yet finalized (Kikuchi and Conrad 2009, p. 3; Styler and Biaggi 2009, entire). As drafted, the agreement preserves and protects existing water rights, defines the available groundwater supply in Snake Valley as 132,000 afy, provides 41,000 afy of unallocated water to Utah and Nevada, and monitors withdrawals to identify and avoid adverse impacts (Kikuchi and Conrad 2009, p. 2).

To assist in developing this agreement, the LCCRDA required a study of groundwater quantity, quality, and flow characteristics in the carbonate and alluvial aquifers of White Pine County, Nevada; groundwater basins located in White Pine or Lincoln Counties, Nevada; and adjacent areas of east–central Nevada and western Utah (Welch *et al.* 2007, p. iii). The USGS, the Desert Research Institute, and the State of Utah conducted this Basin and Range Carbonate Aquifer System (BARCAS) study. The USGS released a final report of the BARCAS study on February 22, 2008 (Welch *et al.* 2007, entire).

The BARCAS study included a water–resources assessment of the geologic framework and hydrologic processes influencing the quantity and quality of groundwater resources. The USGS determined that groundwater systems underlying many of the valleys in eastern Nevada and western Utah are not isolated, but rather contribute to or receive flow from adjoining basins (Welch *et al.* 2007, pp. 4-5). They also determined that some large-volume springs cannot be supported entirely by the local recharge from the adjacent mountains; these springs depend on water from potentially hundreds of miles (kilometers) away (Welch *et al.* 2007, p. 5).

Groundwater flows in a general direction from Spring Valley to Snake Valley. Thus, large-scale pumping in Spring Valley is expected to impact groundwater in Snake Valley. Current groundwater pumping in Spring Valley was estimated at 18,475 afy in 2007 (NSE 2007, p. 35). The additional 68,000 afy of groundwater pumping being proposed would be a 368-percent increase in total groundwater pumped (NSE 2007, p. 56). The proposed total amount (86,475 afy) is 93 percent of the estimated 93,000 afy annual natural recharge for the basin and 114 percent of the estimated 76,000-afy annual natural discharge of the basin (Welch *et al.* 2007, p. 81).

Although current groundwater pumping for all of Snake Valley (Nevada and Utah) was estimated at 35,000 afy in 2005, water rights are currently allocated for 67,000 afy in Nevada (12,000 afy) and Utah (55,000 afy) (Welch *et al.* 2007, p. 81; Kikuchi and Conrad 2009, p. 2). An additional 41,000 afy of groundwater pumping is being proposed by the States of Nevada and Utah in their interstate agreement. This amount of additional groundwater pumping would be in place of the 50,679 afy that the SNWA project intends to pump, and would thus be a 61-percent increase in total groundwater allocated for pumping (SNWA 2008, pp. 1-6, Tables 1-1). The proposed total amount (108,000 afy) is 97 percent of the estimated 111,000-afy annual natural recharge for the basin and 82 percent of the estimated 132,000-afy annual natural discharge of the basin (Welch *et al.* 2007, p. 81; Kikuchi and Conrad 2009, p. 2).

The BARCAS study included assessments of the hydrogeology, recharge, and discharge of groundwater flow and geochemistry of 13 hydrographic areas in eastern Nevada and western Utah, including the Spring and Snake Valleys. The BARCAS study estimated that the study-wide natural average annual groundwater recharge exceeded natural annual discharge by about 90,000 afy (Welch *et al.* 2007, pp. 81-82). However, factoring in human use of groundwater (80,000 afy) into this estimate resulted in a nearly balanced groundwater budget over the study area. Thus, future long-term use of groundwater at the current level or any increased level (e.g., SNWA GWD project) could decrease subsurface outflow and spring discharge in the foreseeable future (Welch *et al.* 2007, p. 82). The study concluded that "decreases in outflow would be more likely in sub-basins having high pumping and relatively large outflow, such as in Snake Valley" (Welch *et al.* 2007, p. 82). As explained in the previous section (Current Groundwater Pumping), decreases in flow to some springs have already occurred in Snake Valley.

In addition to the BARCAS study, in 2007 the Utah State Legislature charged the Utah Geological Survey with conducting a 2–year study (West Desert Groundwater Monitoring Project) to characterize the background water levels and chemistry; understand regional flow in the carbonate and basin-fill aquifer systems and their connectivity; quantify future groundwater drawdowns; and collect data for future groundwater-flow models (UGS 2008, entire). The groundwater monitoring network in Utah's west desert should better define background water levels and geochemical conditions prior to SNWA pumping, and also be able to help quantify changes after pumping begins.

A lack of information exists on the extent of the aquifers, their hydraulic properties, and the distribution of water levels that would contribute to a reliable prediction of the amount or location of drawdown, or the rate of change in natural discharge, caused by pumping (Prudic 2006, p. 3). Despite the lack of site-specific information, we can reasonably expect that additional groundwater withdrawal in Spring and Snake Valleys will directly reduce spring discharge through reduced flows from the shallow basin-fill aquifer or through reduction of the hydraulic head of the deep carbonate aquifer (Welch *et al.* 2007, p. 82). As those flows become increasingly disconnected, habitats lose characteristics essential to aspects of complex lifecycles, particularly the reproductive requirements of least chub (Deacon 2007, p. 3). Increases in groundwater use above the 2005 levels could significantly alter the hydrology in areas surrounding least chub habitat (Welch *et al.* 2007, p. 82).

The extent and timing of these effects will vary among springs, based on their distance from extraction sites and location relative to regional groundwater flow paths (Patten *et al.* 2007, pp. 398-399). Some, and maybe all, predictions of detrimental impacts to the Snake Valley Hydrographic Basin from groundwater pumping are likely to occur (Kirby and Hurlow 2005, p. 33) and are likely to significantly threaten, and possibly eliminate, the remaining least chub populations in Snake Valley in the foreseeable future.

Prior to the completion of the SNWA GWD Project, baseline data collection and research on biologic and hydrologic impacts will continue. Federal, State, and county government agencies, as well as nongovernmental organizations and private interests, maintain a high level of concern regarding negative impacts to spring discharge rates, and ultimately least chub habitats, from groundwater pumping.

Other Proposed Water Development Projects

In addition to SNWA, other municipalities are interested in developing water resources in areas that are potentially hydrologically connected to least chub habitat. The following information is provided to characterize the additional potential threat of groundwater development, but does not at this time represent a clear threat to least chub or their habitat. Actual effects will, in part, be dependent on the degree of connectivity of water developments to least chub habitats.

On October 17, 2006, the Central Iron County (Utah) Water Conservancy District filed applications to appropriate underground water in Hamlin Valley, Pine Valley, and Wah Wah Valley in the amounts of 10,000, 15,000, and 12,000 afy, respectively (UDWRi 2009a, pp. 2, 12, 23). The principal use of this applied-for water is municipal, with minor amounts used for stock watering (UDWRi 2009a, entire). To date, the USE has not acted upon these applications. Similarly, Beaver County, Utah, purchased water right applications in 2007 originally filed on October 6, 1981, for Wah Wah, Pine, and Hamlin Valleys (UDWRi 2009b, pp. 2, 5, 8). A hearing was held on December 10, 2008, on these Beaver County (successor-in-interest) applications, and on September 14, 2009, these water rights were rejected by the State Engineer (UDWRi 2009b, pp. 3, 6, 9). Lastly, the State of Utah School and Institutional Trust Lands Administration (SITLA) filed applications for up to 9,600 afy from underground water wells in the Snake Valley (UDWRi 2009c, entire). These water rights all occur in areas that are hydrologically connected to Snake Valley and, thus, utilization of this water could impact least chub habitat.

The Confederated Tribes of the Goshute Reservation, located in east-central Nevada (White Pine County) and west-central Utah (Juab and Tooele Counties) is interested in developing their as yet unused water rights. They have a 1905 decreed surface water right along the Deep Creek system in Utah (Steele 2008, p. 2), and are currently planning to increase Deep Creek basin rights to provide for community development projects (Steele 2008, p. 3). They estimate that up to 50,000 afy will be needed for beneficial uses including expanded crop and livestock irrigation, fishery management, surface water reservoir operation and maintenance, and water pipeline conveyance (Steele 2008, p. 3). The USE is currently reviewing their application to develop 50,000 afy of water from the Deep Creek Valley.

To conclude, we assessed the threat of water withdrawal and diversion by analyzing available information on historic, current, and planned future groundwater development. It is clear that historic and current groundwater withdrawal has impacted least chub and caused population extirpations. Future water withdrawals are a significant threat to extant populations. Local agriculture pumping and drought have historically and are currently diminishing springs and least chub habitats in Snake Valley. Many historic springs are permanently dry, largely because of historic groundwater withdrawal. New wells are being drilled on a yearly basis, and the amount of groundwater withdrawal is generally increasing.

In 2008, the NSE approved a major portion of the SNWA groundwater rights applications for the Spring Valley Hydrographic Basin. Current active applications for groundwater withdrawals in areas supporting least chub include SNWA applications in Snake Valley, and potential projects by Central Iron County Water Conservancy District, Beaver County, Utah, and the Confederated Tribes of the Goshute Reservation. Because of the complexities of determining groundwater budgets and the effects of future pumping, it is not possible at this time to determine the degree to which least chub habitats would be affected by groundwater pumping. However, information on current groundwater pumping indicates that groundwater levels are generally decreasing in basins or hydrographic areas with least chub, and that future large-scale groundwater pumping in or near the Snake Valley populations of least chub is predicted to result in decreased subsurface outflow and spring discharge in Snake Valley.

The Snake Valley contains the only remaining naturally occurring and relatively secure populations of least chub. Our analysis indicates that groundwater withdrawals will continue to increase in the future and lead to a decrease in suitable habitat for least chub; this is a significant threat to the species, now and in the foreseeable future.

(6) Drought

Prolonged droughts have primary and secondary effects on groundwater resources. Decreased precipitation leads to decreased recharge of aquifers. Decreased surface-water resources generally lead to increased groundwater withdrawal and increased requests for water-well construction permits (Hutson *et al.* 2004, p. 40; Burden 2009, p. 2). Past and future climatic conditions (See Factor E. Climate Change) influence the water available to both water development and aquatic habitats, with water development usually taking priority.

The impacts to least chub habitat from drought can include: reduction in habitat carrying capacity; lack of connectivity resulting in isolation of habitats and resources; alteration of physical and chemical properties of the habitat, such as temperature, oxygen, and pollutants; vegetation changes; niche overlap resulting in hybridization, competition, and predation; and reduced size and reproductive output (Alley *et al.* 1999, pp. 41, 43; Deacon 2007, pp. 1-2). These impacts are similar to those associated with water withdrawal and diversions as described in Factor A.

Recently, the Utah and Nevada portions of the Great Basin experienced drought conditions from 1999 until 2004 (Lambert 2009, pers. comm.; NDMC 2009, entire). The recent drought is not unusual for its length, but is for its severity; water year 2002 will be recorded as one of the driest years on record for many parts of the Great Basin (Lambert 2009, pers. comm; NDMC 2009, entire).

Although it is not possible to separate the effects of drought from the effects of water withdrawal in order to analyze each separately as a threat to the least chub, the cumulative impacts of both threats have impacted least chub populations in the past. The cumulative impact of drought and water development for irrigation has led to the loss of springs in the Snake Valley, including those on the Bagley and Garland Ranches (Garland 2007, pers. comm.). More recently, a multiyear drought from 1999 to 2004 (Lambert 2009, pers. comm.; NDMC 2009, entire) impacted least chub habitats, such as the Gandy Salt Marsh (Wilson 2006, p. 8). At this site, UDWR observed the reduction of least chub habitat from springs drying up throughout the complex (Wilson 2006, p. 8).

Although least chub have survived for thousands of years with intermittent natural drought conditions, recent human settlement has exacerbated drought conditions via human water use (Hutson *et al.* 2004, p. 2). On its own, drought is not considered a significant threat to the species as this is a natural condition with which least chub evolved. However, the documented extirpation and population reductions of least chub caused by drought and groundwater withdrawal, and plans for future large-scale groundwater withdrawal, lead us to conclude that drought is a significant threat to least chub.

Conservation Agreements

The LCCAS is the guiding document for management of least chub (Bailey *et al.* 2005, entire) by the multiagency LCCT. Signatories to the LCCAS include UDWR, the Service, BLM, BOR, URMCC, the Confederated Tribes of the Goshute Reservation, CUWCD, and SNWA (Bailey *et al.* 2005, p. 2). The LCCAS and the LCCT provide expertise, recommendations, and coordination of funding for the conservation of the species, but do not provide regulatory protection. In 1999, we withdrew a proposed rule to list the least chub after analyzing the LCCAS and determining that the conservation actions contained within afforded greater protection to the least chub and rendered the existing regulatory mechanisms adequate. We revisit that determination here.

Numerous conservation actions implemented through the LCCAS were most recently summarized by UDWR (Hines *et al.* 2008, entire). Annual surveys and monitoring of least chub have occurred since at least 1998 across the species' historic range. These surveys resulted in the discovery of two new populations of least chub at Mills Valley and Clear Lake. In addition, the surveys resulted in identification of a few suitable reintroduction sites and the establishment of refuge populations (as discussed in the "Translocations" section above). Research efforts initiated and directed by the LCCAS have improved our knowledge of least chub life history and genetic structure (Mock and Miller 2005, p. 276; Mock and Bjerregaard 2007, p. 146). The LCCT was successful in securing land acquisitions, easements, and water rights to partially protect least chub populations and habitats at Mona Springs, Bishop Springs, and Gandy Salt Marsh. Habitat enhancement projects have focused on nonnative vegetation removal, grazing management, and springhead and pond restorations. Efforts are ongoing to control the impacts of nonnative aquatic species, such as mosquitofish, but to date these methods have been largely unsuccessful (for further discussion of nonnative species see Factor D below).

The LCCAS has proved invaluable in providing better information concerning the least chub's status and distribution, and implementation of research under the LCCAS has increased our understanding of least chub life history, genetics, and interactions with invasive species (Hines *et al.* 2008, entire). The LCCT has addressed several of the factors previously thought to threaten the least chub and has made substantial progress on the threat of grazing and direct habitat loss, as well as the conservation of least chub genetics. However, the participants signatory to the Agreement have no ability to protect the least chub from the primary threat of loss of habitat due to groundwater development and only limited ability to protect the species from the threat of nonnative fish introduction (Hines *et al.* 2008, entire). Limitations of the LCCAS and its participants also include their ability to manage livestock grazing on private and SITLA lands.

Summary of Factor A

At this time, based on best available information, we do not believe that mining, and oil and gas leasing and exploration, or urban and suburban development significantly threaten least chub now or in the foreseeable future. However, loss of habitat has extirpated least chub from all but a fraction of its historical range primarily as a result of development along the Wasatch Front and water diversions throughout the Bonneville Basin. Remaining least chub populations are threatened by livestock grazing (excluding the Clear Lake site) and development of water resources for agricultural practices and urban development. We find that listing the least chub as a threatened or endangered species is warranted due to livestock grazing; water withdrawal and diversion; and drought occurring now and in the foreseeable future.

Habitat at four of the five extant populations of least chub is currently impacted by livestock grazing. Although fencing and limited livestock grazing management have reduced or eliminated many of the negative impacts associated with this practice, impacts to least chub habitat continue to result from livestock grazing on private lands or in areas where livestock grazing is uncontrolled for short periods of time. Grazing impacts continue to occur on an intermittent basis at Leland Harris Spring Complex, Gandy Salt Marsh, Bishop Springs Complex, and Mills Valley.

Three of the five extant populations of least chub persist in close proximity to one another in the Snake Valley and occur within the same groundwater basin, where they depend on springs and associated wetlands. Additional significant groundwater development is expected to occur by 2028 for Spring Valley and 2050 for Snake Valley with the possibility of subsequent landscape-level effects to Snake Valley and remnant least chub populations.

It is difficult to predict the foreseeable future regarding large-scale groundwater withdrawal and resultant effects to least chub. We expect that there may be a lag time after pumping commences before effects will be realized by the species or measured by scientists. Because the agreement that would manage groundwater allocations in Snake Valley is still in draft form, the groundwater hydrology of the Snake Valley is not well known, and the area is already experiencing changes in water regime due to the effects of water withdrawal, drought, and climate change, we cannot confidently predict when impacts from water withdrawals will occur.

Therefore, we find the least chub is threatened by the present or threatened destruction, modification, or curtailment of the species' habitat or range, now and in the foreseeable future.

*B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes.*

Commercial, recreational, scientific, and educational utilizations are not common least chub related activities, and protections are in place to limit their effect on the species. Least chub are considered a "prohibited" species under Utah's Collection Importation and Possession of Zoological Animals Rule (R-657-3-1), which makes it unlawful to collect or possess least chub without a permit. Over the past 8 years only two permits were issued by UDWR for survey of least chub in the wild. All fish collected for these studies were released unharmed (Wilson 2009b, p. 1). Use of least chub for scientific or educational purposes also is controlled by UDWR, and the agency typically provides least chub from fish hatchery stocks for these purposes (Wilson 2009b, pp. 1-4.). The UDWR has collected least chub from the wild (an average of 334 per year combined for all extant populations for the last 10 years) to augment hatchery stocks or for transfer to new or existing translocation sites (Wilson 2009b, pp. 2-3). We are aware of no evidence that least chub are being illegally collected for commercial or recreational purposes.

Summary of Factor B

Least chub are not being overutilized for commercial, recreational, scientific, or educational purposes. Fish that are needed for research purposes can be provided from fish hatchery stocks. A limited number of least chub have been collected from wild populations for hatchery augmentation or for translocation purposes, but we have no information to suggest that this causes a threat to extant populations now or in the foreseeable future. We find that overutilization for commercial, recreational, scientific, or educational purposes of the least chub is not a threat now or in the foreseeable future.

*C. Disease or Predation.*

Predation

Least chub rarely persist where nonnative fishes have been introduced (Osmundson 1985, p. 2; Hickman 1989, pp. 2-3, 9). The species is tolerant of broad natural habitat conditions and is well adapted to persist in the extreme, yet natural, environments of springs and playa marshes of the Bonneville Basin, but they are not an effective competitor with nonnative species (Lamarra 1981, p. 1), and are constantly threatened by the introduction and presence of nonnative fish (Hickman 1989, p. 10).

The mosquitofish is the most detrimental invasive fish to least chub (Perkins *et al.* 1998, p. 23; Mills *et al.* 2004b, entire). Mosquitofish predate on the eggs and the smaller size classes of least chub and compete with adults (Mills *et al.* 2004b, p. 713). The presence of mosquitofish changes least chub behavior and habitat use because young least chub retreat to heavily vegetated, cooler habitats in an effort to seek cover from predation. In these less optimal environments, they have to compete with small mosquitofish that also are seeking refuge from adult mosquitofish. This predatory refuge scenario, in turn, affects survivorship and growth of least chub young of year (Mills *et al*. 2004b, pp. 716-717).

Mosquitofish tolerate an extensive range of environmental conditions and have high reproductive potential (Pyke 2008, pp. 171, 173). The ecological impact of introduced mosquitofish is well documented. Mosquitofish profoundly alter ecosystem function, and several studies have demonstrated their effects on the decline of native amphibians and small fish (Alcaraz and Garcia-Berthou 2007, pp. 83-84; Pyke 2008, pp. 180-181). The mosquitofish is native only to the southern United States and northern Mexico, but has been introduced into more than 50 countries (García-Berthou et al. 2005, p. 453) to control mosquito populations and malaria (Pyke 2008, p. 172).

Mosquito abatement districts throughout Utah have released mosquitofish for mosquito control since 1931 (Radant 2002, p. 2). The mosquitofish have expanded into aquatic ecosystems throughout Utah (Sigler and Sigler 1996, pp. 227-229). Despite extensive efforts that include chemical poisoning and mechanical removal, the elimination of mosquitofish from least chub habitats has not been successful. Mosquitofish have contributed to the functional extirpation of least chub populations at the naturally occurring Mona Springs site (Hines *et al.* 2008 pp. 35-37), and contributed to the extirpation of least chub at three translocation sites including Walter and Deadman Springs at Fish Springs National Wildlife Refuge (Wilson and Whiting 2002, p. 4), and at an Antelope Island pond (Thompson 2005, pp. 5-6).

The UDWR implemented a Memorandum of Agreement (MOA) with Mosquito Abatement Districts in an effort to reduce the continued spread of mosquitofish (Radant 2002, entire). The MOA established administrative processes and procedures for collecting, holding, propagating, transporting, distributing, and releasing mosquitofish for signatory mosquito abatement districts. Mosquito abatement districts that did not sign the MOA are prohibited from engaging in any mosquitofish-related activities (Radant 2002, p. 1). The MOA restricts the use of mosquitofish to locations approved by the UDWR (Radant 2002, p. 5). The MOA was established to function in perpetuity, but any party to the agreement can terminate their involvement by providing 60 days' written notice to the UDWR. Termination by one or more parties will not act to terminate the agreement to other parties. Once a signatory terminates their involvement in the MOA, they are prohibited from engaging in any mosquitofish activities (Radant 2002, p. 7). This policy is not expected to change in the foreseeable future.

Other nonnative fishes predate upon and compete with least chub. Rainwater killifish (*Lucania parva)* and plains killifish (*Fundulus zebrinis)* have been illegally introduced into least chub habitats by unknown entities (Perkin *et al.* 1998, p. 23). These fish are potential competitors with the least chub because they are closely related to mosquitofish and have similar life histories and habitat requirements (Perkins *et al.* 1998, p. 23).

Introduced game fishes, including largemouth bass (*Micropterus salmoides*), rainbow trout (*Oncorhynchus mykiss*), common carp (*Cyprinus carpio*), and brook trout (*Salvelinus fontinalis*) are predators of least chub, and these species are present in both native and introduced least chub habitats (Workman *et al.* 1979, pp. 1-2, 136; Osmundson 1985, p. 2; Sigler and Sigler 1987, p. 183; Crist 1990, p. 5). Clear Lake and Mills Valley least chub populations are currently sympatric with nonnative predators other than mosquitofish. Rainbow trout and common carp are present in Clear Lake (Hines *et al.* 2008, p. 43). Clear Lake is an expansive habitat that allows least chub to temporarily coexist with nonnative fishes, but least chub will become increasingly vulnerable to extinction if habitat size diminishes (Deacon 2007, p. 2) or nonnative numbers increase. Nonnative sunfish (*Lepomis* sp.), which is a voracious predator, and fathead minnow (*Pimephales promelas*) (Sigler and Sigler 1987, p. 306), are established at the Mills Valley site and are increasing in number (Hines *et al.* 2008, p. 43).

In summary, least chub are unlikely to persist indefinitely in the presence of nonnative species, particularly mosquitofish. Mosquitofish are a predator of least chub eggs and young, and they compete with least chub for food items. The presence of nonnative predacious fish results in the decline and eventual elimination of least chub populations. The stocking of mosquitofish into least chub habitat by Statewide mosquito abatement programs has been addressed by an MOA that regulates this practice. Removing mosquitofish from aquatic habitats has not been successful, and they continue to invade new sites. Four naturally occurring or introduced least chub populations have been extirpated by mosquitofish (Hines *et al.* 2008 pp. 35-37; Wilson and Whiting 2002, p. 4; Thompson 2005, pp. 5-6). These include the sites of Deadman and Walter springs, Antelope Island, and Mona Springs. Two of the five remaining least chub populations (Mills Valley and Clear Lake) are coexisting with nonnative species. Therefore, we determine that the continued existence of least chub is threatened by the presence of nonnative fish species and their potential spread into least chub habitat. This threat will become exacerbated in the future by any reductions in water quantity that further fragment and degrade the habitat.

Disease and Parasitism

Disease and parasitism have not affected least chub to a significant degree. Workman *et al.* (1979, pp. 2, 103-107) found the parasite blackspot (*Neascus cuticola*) present in the least chub population at the Leland Harris Spring Complex site during 1977–78 sampling, and at the time determined that all least chub examined appeared robust and in good condition. More recently, the parasite was identified in least chub at the Bishop Springs site by Wheeler *et al.* (2004, p. 5). Although we have no information that allows us to determine the effect of blackspot on least chub at the Bishop Springs site, monitoring over the past 14 years indicates that the population has remained stable (Hines *et al.* 2008, pp. 37-39).

The exotic snail *Melanoides tuberculata* is an intermediate host and vector for parasites known to be dangerous to humans, livestock, and wild animals, including threatened endemic fishes and amphibians (Rader *et al.* 2003, p. 647). *M. tuberculata* occurs at the Bishop Springs and Clear Lake sites, but we do not have any information that links this snail species to parasites that are harmful to least chub (Rader *et al.* 2003, p. 649). *M. tuberculata* appears to be restricted by water temperature, but has the potential to be found in other least chub habitats in the future, because sampling for *M. tuberculata* has not occurred at all known least chub sites (Rader *et al.* 2003, pp. 650-651).

In 2006, least chub from the Leland Harris Spring Complex population were subjected to a disease-check regimen at the Fisheries Experiment Station in Logan, Utah. Eight different parasites were detected on the fish; however, it was the opinion of LCCT that the presence of these parasites is common on a seasonal basis for most wild populations of least chub (Wilson 2009b, p. 4). Considering that least chub are the dominant fish species at the Leland Harris Spring Complex site and that their population appears stable (Hines *et al.* 2008, p. 42), these diseases are likely having a minimal effect on the species.

Although parasites exist in least chub habitats, and some least chub have been found to harbor parasites, we do not have evidence that individual least chub or least chub populations are significantly compromised or threatened by the presence of parasites.

Summary of Factor C

At this time, we know of no information that indicates that the presence of parasites or disease significantly affects least chub, now or in the foreseeable future.

There is strong evidence that least chub are threatened by the presence of nonnative fish species in their habitats. Populations of least chub that are sympatric with nonnative fish have become extirpated or functionally extirpated, and extant populations generally decline when in the presence of nonnative fish, especially mosquitofish. The MOA with the mosquito abatement districts is a positive step toward prohibiting the spread of mosquitofish in least chub habitats. Although hatchery stocks provide a source for reintroductions, removal of nonnative fish has not been successful; sites previously used for translocation sites have had limited success; and very few new sites that are appropriate for least chub introductions are available. Based on the best scientific and commercial information available to us, we conclude that nonnative fish predation of least chub is a threat to the continued existence of the species, now and in the foreseeable future.

*D. Inadequacy of Existing Regulatory Mechanisms*

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to extant threats that place least chub in danger of becoming either threatened or endangered. Regulatory mechanisms affecting the species fall into four general categories: (1) Land management, (2) State mechanisms, (3) Federal mechanisms, and (4) conservation agreements.

(1) Land Management

Wild populations of least chub are distributed across private, BLM, SITLA, and State UDWR lands and incur varying regulatory mechanisms depending on land ownership.

(1) Mona Springs: Habitat in the vicinity of Mona Springs was primarily private land (Wilson 2009c, pers. comm.). However, the URMCC acquired 34.6 ha (85.5 ac) in 1998 and 7.2 ha (17.7 ac) in 2006 for the protection of least chub and Utah State sensitive species the Columbia spotted frog (*Rana lutreiventris*) (Hines *et al.* 2008, p. 34). The URMCC has recently purchased and protected an additional 44.5 ha (18 ac) of land on the north end of the spring complex (Wilson 2009c, pers. comm.). The amount of habitat owned and managed by URMCC provides protection from direct habitat loss. However, land ownership by URMCC cannot protect the springs from loss of water caused by groundwater pumping or from the threat of nonnative fish that are now at this site.

(2) Leland Harris Spring Complex: Land ownership for least chub occupied habitat is primarily private although there also has been occupied habitat on nearby SITLA and BLM land (Hines *et al.* 2008, pp. 41-42; Jimenez 2009, pers. comm.; Wilson 2009c, pers. comm.). Miller Spring (located in this complex) and surrounding wetlands (approximately 20.2 ha (50 ac)) are protected through a conservation easement between UDWR and a private landowner. This level of land management provides some protection through cooperative grazing management under the conservation easement; however, impacts resulting from livestock grazing still occur (see Factor A. Livestock Grazing). There also is some protection provided through Federal land management under the BLM RMP and future energy lease notices (See Factor A. Mining, and Oil and Gas Leasing and Exploration). However, existing land management does not protect the site from loss of water due to groundwater pumping or the possibility of nonnative fish invasion. We are unaware of any land management protection mechanisms on SITLA lands.

(3) Gandy Salt Marsh: Land ownership includes BLM, SITLA, and private lands (Wilson 2009c, pers. comm.). The BLM has designated 919 ha (2,270 ac) as an Area of Critical Environmental Concern (ACEC) that is closed to oil and gas leasing to protect the least chub. The ACEC includes most of the lake bed and aquatic habitats and is fenced to exclude livestock (BLM 1992, pp. 11, 16, 18). This level of land management is adequate to protect the site from human-caused impacts associated with energy development and livestock grazing on Federal lands, but does not protect the habitat on SITLA or private lands. In addition, there is not protection from the loss of water due to groundwater pumping or the possibility of nonnative fish invasion.

(4) Bishop Springs Complex: Land ownership is primarily private, but includes SITLA and BLM lands (Wilson 2009c, pers. comm.). In 2006, UDWR purchased water rights from the landowner for Foote Reservoir and Bishop Twin Springs (a.k.a. Bishop Small Springs) (Wilson 2009c, pers. comm.). These water bodies provide most of the perennial water to the

complex (Hines *et al.* 2008, p. 37). In 2008, UDWR obtained a permit for permanent change of use from the USE for instream flow according to a seasonal schedule. This instream flow helps to maintain water levels at Bishop Springs Complex, protecting the least chub and Columbia spotted frog populations (Hines *et al.* 2008, p. 37). The UDWR-owned instream flow water rights may protect least chub populations in this area from loss of water due to existing private landowner uses. However, this level of land management cannot protect for the possibility of nonnative fish invasion or impacts associated with livestock grazing on private lands, and it may not be adequate to protect the site from the indirect loss of water associated with future large-scale groundwater pumping. We are unaware of any land management protection mechanisms on SITLA lands.

(5) Mills Valley: Most of the Mills Valley site is privately owned, and no management agreements are in place. The UDWR is working with landowners to improve the current grazing management plans (Hines *et al.* 2008, p. 43). Approximately 36.4 ha (90 ac) is owned by UDWR as the Mills Meadow WMA (Wilson 2009c, pers. comm.). Livestock grazing rights at this WMA are awarded to adjacent landowners in exchange for public and UDWR access to their property (Stahli and Crockett 2008, p. 5). The limited amount of habitat owned by UDWR provides some protection from direct habitat loss and other direct human-caused impacts, and UDWR's efforts to work with private landowners may provide protection on some private land. However, this level of land management cannot protect the area from all impacts associated with livestock grazing (see Factor A. Livestock Grazing), loss of water caused by groundwater pumping, or from the threat of nonnative fish that are now at this site.

(6) Clear Lake: This population occurs on the Clear Lake WMA, which is managed by UDWR (Wilson 2009c, pers. comm.). The land owned and managed by UDWR provides protection from direct habitat loss associated with human land-uses, including livestock grazing. However, this level of land management cannot protect the area from loss of water caused by groundwater pumping or from the threat of nonnative fish that are now at this site.

(2) State Mechanisms

Least chub are considered "prohibited" species under the Utah Collection Importation and Possession of Zoological Animals Rule (R-657-3-1), making them unlawful to collect or possess. These species receive protection from unauthorized collection and take. While its classification is not a regulatory mechanism, the least chub is classified in the State of Utah Wildlife Action Plan as a Tier 1 Sensitive Species, a status that includes federally listed species and species for which a conservation agreement has been completed and implemented (Bailey *et al.* 2005, p.3). This classification includes species for which there is credible scientific evidence to substantiate a threat to continued population viability.

Introduced nonnative fishes for mosquito abatement and game-fishing purposes can be detrimental to the persistence of least chub (see Factor C. Predation). The UDWR follows their Policy for Fish Stocking and Transfer Procedures and no longer stocks nonnative fish into least chub habitat (Hines *et al.* 2008, p. 25). This Statewide policy specifies protocols for the introduction of nonnative species into Utah waters and states that all stocking actions must be consistent with ongoing recovery and conservation actions for State of Utah sensitive species, including least chub. This policy is not expected to change in the foreseeable future.

Mosquito abatement districts are not prohibited from spraying least chub habitat to control for mosquitoes. This practice has the potential to reduce least chub prey items, and it may negatively affect potential reintroduction sites. The BLM has rejected a Juab County (location of Mills Valley and Leland Harris Springs Complex least chub populations) request to implement a mosquito-control spraying program in marsh and spring areas on BLM-administered lands; however, this does not prevent the county from spraying on privately owned lands (Perkins *et al.* 1998, p. 24).

In summary, abatement districts may be having an effect on least chub populations by spraying to reduce mosquito larvae. On the basis of the information we have at this time, we do not believe that mosquito spraying is having a significant effect on least chub at an individual or population level. As a result, we do not find that it is a significant threat to the species.

The State of Utah operates under guidelines to prevent the movement of aquatic invasive species, including quagga mussels (*Dreissena* sp.), zebra mussels (*Dreissena* sp.), and mud snails (*Potamopyrgus* sp.) during fish transfer operations (UDWR 2009, entire). Protocols include notification and evaluation of water sources being considered for fish transfers, fish health inspections, and completion of an updated Hazard Analysis and Critical Control Point Plan. These protocols should help reduce the probability of additional aquatic invasive species introductions to least chub habitats.

Regulatory mechanisms that relate to historic groundwater withdrawal are implemented through the USE through the UDWRi, the Lincoln County Water Conservancy District, and the Central Iron County Water Conservancy District as described in Factor A. Water Withdrawal and Diversion section. Groundwater withdrawal in the Snake Valley for future municipal development is subject to both Federal and State regulatory processes. The LCCRDA directed a study of groundwater quantity, quality, and flow characteristics in Utah and Nevada counties, and the Utah State Legislature requested a study on groundwater recharge and discharge to better determine effects of planned groundwater withdrawal. The SNWA may begin pumping groundwater for a portion of their proposed projects prior to completion of the study that will help better disclose effects of the action. A lack of data on effects of groundwater withdrawal to least chub is a concern, and the ability of water districts to effectively manage groundwater to avoid impacts to least chub populations has not been demonstrated. (See Factor A. Water Withdrawal and Diversion for more detail.) Therefore, we find that the State regulatory mechanisms in existence do not adequately protect the least chub from the threat of reduction of habitat due to water development projects.

(3) Federal Mechanisms

The major Federal mechanisms for protection of least chub and its habitat are through section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) permitting process and the National Environmental Policy Act (42 U.S.C. 4231 *et seq.*) (NEPA). Various Executive Orders (11990 for wetlands, 11988 for floodplains, and 13112 for invasive species) provide guidance and incentives for Federal land management agencies to manage for habitat characteristics essential for least chub conservation.

The primary Federal land management entity across the range of extant least chub populations is the BLM. The least chub is designated as a sensitive species by the BLM in Utah. The policy in BLM Manual 6840-Special Status Species Management states: "Consistent with the principles of multiple use and in compliance with existing laws, the BLM shall designate sensitive species and implement species management plans to conserve these species and their habitats and shall ensure that discretionary actions authorized, funded, or carried out by the BLM would not result in significant decreases in the overall range-wide species population and their habitats" (BLM 2008, p. 10).

The NEPA has a provision for the Service to assume a cooperating agency role for Federal projects undergoing evaluation for significant impacts to the human environment. This includes participating in updates to RMPs. As a cooperating agency, we have the opportunity to provide recommendations to the action agency to avoid impacts or enhance conservation for least chub and its habitat. For projects where we are not a cooperating agency, we often review proposed actions and provide recommendations to minimize and mitigate impacts to fish and wildlife resources.

Acceptance of our NEPA recommendations is at the discretion of the action agency. The BLM land management practices are intended to ensure avoidance of negative effects to species whenever possible, while also providing for multiple-use mandates; therefore, maintaining or enhancing least chub habitat is considered in conjunction with other agency priorities.

As described in Factor A, BLM designated the Gandy Salt Marsh as an ACEC, and it is closed to oil and gas leasing (Jimenez 2009, pers. comm.). In addition, the Fillmore Oil and Gas Environmental Assessment provides lease notices that can protect least chub and their habitats. We conclude in Factor A that oil and gas recovery on BLM lands near least chub habitats is anticipated to occur at a slow rate and is not considered a significant threat now or in the foreseeable future. The aforementioned lease notices and other potential RMP protection measures will thus be beneficial for site-specific management; however, we do not anticipate a significant threat from activities on BLM lands to the existence of the least chub. Therefore, we find that the current regulatory structure for oil and gas leasing is adequate to protect least chub and its habitat from this potential threat.

Least chub population areas contain wetland habitats, and section 404 of the Clean Water Act regulates fill in wetlands that meet certain jurisdictional requirements. Activities that result in fill of jurisdictional wetland habitat require a section 404 permit. We can review permit applications and provide recommendations to avoid and minimize impacts and implement conservation measures for fish and wildlife resources, including the least chub. However, incorporation of Service recommendations into section 404 permits is at the discretion of the U.S. Army Corps of Engineers. In addition, not all activities in wetlands involve fill and not all wetlands are "jurisdictional." Regardless, we have evaluated threats to the species' habitat where fill of wetlands may occur, including peat mining and oil and gas development. At this time we do not have information to indicate that this is at a level that threatens the species now or in the foreseeable future.

Summary of Factor D

We find that regulatory mechanisms related specifically to land management are sufficient for mitigating potential threats from land development to the least chub at four of the population sites: Mona Springs (URMCC land acquisition), Gandy Salt Marsh (BLM ACEC), Bishop Springs (protection of water rights), and Clear Lake (UDWR WMA). The UDWR continues to work with landowners at Mills Valley and the Leland Harris Spring Complex to implement beneficial grazing practices and maintain fences; however, because livestock-grazing-related impacts are still observed at most extant least chub sites, we determined that grazing is considered a significant threat to the least chub (see Factor A. Livestock Grazing).

The BLM has provided protective mechanisms in the form of lease notices for conservation agreement and sensitive species, including the least chub, which can minimize impacts from oil and gas drilling. We also retain the ability to comment on NEPA evaluations for other projects on BLM lands that may impact the least chub. We determined that oil and gas drilling is not a threat to the least chub given the low level of expected energy development in the area (see Factor A. Mining, and Oil and Gas Leasing and Development).

Regulatory mechanisms are not in place to sufficiently protect the least chub from local or large-scale groundwater withdrawal. See Factor A for more information regarding water rights and proposed groundwater withdrawal.

Although mosquito spraying is not prevented by regulatory mechanisms, we have no information indicating that mosquito spraying is a significant threat to the least chub.

We find that the inadequacy of existing mechanisms to regulate groundwater withdrawal is a threat now and in the foreseeable future for the least chub.

*E. Other Natural or Manmade Factors Affecting Its Continued Existence.*

Natural and manmade threats to the species include: (1) hybridization; (2) loss of genetic diversity; (3) stochastic disturbance and population isolation; (4) drought and climate change; and (5) cumulative effects.

(1) Hybridization

Hybridization can be a concern for some fish populations. An introgressed population results when a genetically similar species is introduced into or invades least chub habitat, the two species interbreed (i.e., hybridize), and the resulting hybrids survive and reproduce. If the hybrids backcross with one or both of the parental species, genetic introgression occurs (Schwaner and Sullivan 2009, p. 198). Continual introgression can eventually lead to the loss of genetic identity of one or both parent species, thus resulting in a "hybrid swarm" consisting entirely of individual fish that often contain variable proportions of genetic material from both of the parental species (Miller and Behnke 1985, p. 514).

Hybridization is commonly associated with disturbed environments (Hubbs 1955, p. 18). In complex habitats, reproductive isolator mechanisms can be eliminated as a result of habitat alteration and degradation, and resultantly, overlaps of reproductive niches and breakdowns of behavior occur due to overcrowding (Crawford 1979, p. 74; Lamarra 1981, p. 7). The Bonneville Basin has suffered major alterations to its aquatic environments, including loss of habitat through water diversions (Sigler and Sigler 1987, p. 39). Disturbances allow dispersal of species to habitats where they did not naturally occur. Water diversions may allow isolated springs that previously held distinctly separate populations (allopatric) to overlap habitats (sympatry) and present an opportunity for hybridization to occur. Habitats such as playa marshes of the Utah west desert may become restricted to spring heads as a result of water diversion, drought, and climate change. Inadequate habitat diversity forces sympatric species into close spawning proximity. Hybridization is even more likely since least chub are broadcast spawners for an extended period of time, and this timeframe can overlap with the spawning period of other species, including the native Utah chub and speckled dace (Crawford 1979, p. 74; Miller and Behnke 1985, p. 509).

A morphometric study of specimens collected in 1977 and 1978 documented hybridization of least chub with Utah chub (*Gila atraria*) and speckled dace (*Rhinichthys osculus*) at five locations (Workman *et al.* 1979, pp. 156-158; Miller and Behnke 1985, p. 510). Least chub populations no longer occur at three of these locations, and the other two – Gandy Salt Marsh and Bishop Springs (documented as Foote Reservoir at the time) – are relatively healthy least chub populations that had no evidence of hybridization in genetic samples collected in 1997. Although no hybridization-specific studies have been conducted on least chub, recent genetic investigations have not documented hybridization in extant least chub populations (Mock and Miller 2003, p. 10).

In summary, most habitats where least chub hybrids were found in the late 1970s consisted of altered systems that lacked the complexity required for reproductive isolation. Least chub no longer occur at three of these sites, and no new evidence of hybridization has surfaced for the other two extant locations. Despite the recorded incidence of hybridization in the past, there are no known new occurrences. Therefore, hybridization is not considered a significant threat to the least chub now or in the foreseeable future.

(2) Loss of Genetic Diversity

The level of genetic diversity in individual fish populations influences survival and adaptability to environmental change. Maintaining sufficient levels of genetic diversity within all least chub populations is important, primarily because they exist in small, isolated populations compared to the once-expansive historical populations of Lake Bonneville. Maintaining genetic diversity in refugia and source populations is important as well.

The patterns of genetic divergence and diversity within and among populations were described for five of the six naturally occurring least chub populations (six including the population now functionally extirpated at Mona Springs), representing three of the known locations (Snake Valley and Mona Springs in the Great Salt Lake subbasin, and Mills Valley in the Sevier subbasin) (Mock and Miller 2005, pp. 273-275). The analysis included amplified fragment-length polymorphism analysis and mitochondrial DNA sequencing. Pronounced, but temporally shallow, genetic structuring among these three locations was apparent and consistent with patterns of recent and historical hydrogeographic isolation. The most genetically divergent population in this analysis was in Mona Springs, at the extreme southeastern reach of the Great Salt Lake subbasin, followed by the Mills Valley population in the Sevier subbasin. The three Snake Valley populations (Leland Harris Spring Complex, Gandy Salt Marsh, and Bishop Springs) were genetically similar, which is expected due to their spatial proximity. The sixth and southernmost population at Clear Lake was not included in the initial analyses (Mock and Miller 2005, pp. 273-275), but later analysis indicated that the population is most similar to the Mills Valley population, which is consistent with their location in the Sevier subbasin. The Clear Lake population was distinct from, and possibly more diverse than, the Mills Valley population (Mock and Bjerregaard 2007, p. 146).

Genetic diversity within naturally occurring least chub populations appears to be healthy with respect to molecular diversity (Mock and Miller 2005, pp. 273-275). Gandy Salt Marsh and Leland Harris Spring Complex contain the highest diversity. This suggests that: (1) These least chub populations are large enough to avoid significant historical genetic drift as their populations become more isolated from each other; or (2) these populations have been historically large, and their recent decline has been so rapid that the loss of population genetic diversity is not yet detectable. Genetic drift affects the genetic makeup of the population but, unlike natural selection, through an entirely random process. So although genetic drift is a mechanism of evolution, it does not work to produce adaptations. Thus, genetic drift may rapidly reduce population-level genetic diversity if populations stay small or are subject to continued bottlenecks (Mock and Miller 2005, p. 276).

Translocated populations in Lucin and Walter Springs maintained the genetic identity of their source populations (Gandy Salt Marsh and Leland Harris Spring Complex for Lucin Springs, and Leland Harris Spring Complex for Walter Springs) and showed no evidence of a genetic bottleneck (Mock and Miller 2005, pp. 273-275). However, this result is not unusual because these translocated populations were separated from their source populations for only a few generations. Bottlenecks in confined, strong-source, and refugial populations can lead to adaptive divergence that is not yet detectable with genetic techniques but may be reflected in behavioral changes and habitat adaptations as a result of the hatchery environment. These may cause a loss of fitness in naturally occurring populations if refugia and source individuals are used in a supplemental capacity (Mock and Miller 2005, pp. 273-275).

In summary, we find that extant wild least chub natural populations show adequate genetic diversity to sustain healthy populations, and bottlenecks are not apparent in wild, transplanted, or hatchery populations. As described in part (3) of this section, refugia exist for four of the five persisting wild sites, and these can provide supplementation to the genetic pools of individual populations if necessary.

(3) Environmentally Stochastic Disturbance and Population Isolation

Environmentally stochastic events can include several types of natural events, such as drought, wildfire and its resultant effects, or flood. Least chub populations could be affected by drought, especially when exacerbated by water withdrawal or, potentially, climate change. We address climate change in part (4) of this section.

Least chub populations are isolated, both naturally and as the result of human impacts. Habitat connectivity is absent among the three east/southeast Bonneville Basin populations, and the west desert populations are similarly disconnected except in years of exceptionally high water (Perkins *et al.* 1998, p. 23). We have no evidence of least chub populations being affected by fire or its resultant effect such as siltation; however, one translocated population was eliminated by flooding of the Great Salt Lake (see Translocation section).

Translocated least chub populations can successfully maintain genetic diversity of wild populations (Mock and Miller 2005, pp. 273-277). Refuge or hatchery populations are established for three (Bishop Spring Complex, Mills Valley, and Clear Lake) of the five extant least chub populations as well as for the functionally extirpated Mona Springs population (Hines *et al.* 2008, pp. 34-50). Until management measures can be implemented to increase the quantity and quality of new sites and existing habitats, refuge populations provide a source of genetic material that stores adaptive differences not detectable with molecular markers that may vary within populations. These might include habitat quality parameters, seasonal temperature regimes, life-history traits, and morphology (Mock and Miller 2003, pp. 18-19; Mock and Bjerregaard 2007, p. 146).

In summary, loss of connectivity resulting in small, genetically isolated populations is a concern and requires ongoing monitoring; however, genetic stocks from four wild least chub populations are available from established refugia to augment the gene pools of extant populations and prevent genetic bottlenecks. Therefore, we have determined that environmentally stochastic disturbance and population isolation is not considered a threat to the least chub now or in the foreseeable future.

(4) Climate Change

The groundwater flow system encompassing least chub habitat is affected by natural climatic conditions, primarily precipitation and temperature (Welch *et al.* 2007, p. 37). Least chub have evolved in the Great Basin desert ecosystem, demonstrating their ability to withstand historical climatic variability, including drought conditions (Hines *et al.* 2008, pp. 19, 26). However, under future climatic conditions and the added pressure of human water consumption, these evolutionary adaptations may not be adequate to guarantee long-term survival of least chub populations.

Climate variability adds uncertainty to predictions of water recharge and availability of natural aquifers (Welch *et al.* 2007, p. 48). Predictions of future climatic conditions can no longer rely on analysis of past climatic trends, but must instead take into account predicted global climate change. Therefore, it is important to consider how future climatic conditions may impact least chub. Both the IPCC and the U.S. Global Climate Change Program conclude that changes to climatic conditions, such as temperature and precipitation regimes, are occurring and are expected to continue in western North America over the next 100 years (Parson *et al.* 2000, p. 248; Smith *et al.* 2000, p. 220; Solomon *et al.* 2007, p. 70 Table TS.6; Trenberth *et al.* 2007, pp. 252-253, 262-263). In western North America, surface warming corresponds with reduced mountain snowpack (Mote *et al.* 2005 and Regonda *et al.* 2005, cited in Vicuna and Dracup 2007, p. 330; Trenberth *et al.* 2007, p. 310) and a trend toward earlier snowmelt (Stewart *et al.* 2004, pp. 217, 219, 223).

Utah has experienced about 1.6 °C (2.9 °F) of warming over the last 100 years (1908–2007) (Saunders *et al.* 2008, p. 44). Modeling of future climate change for Utah projects the State to warm more than the average for the entire globe, with fewer frost days, longer growing seasons, and more heat waves (UBRAC 2007, p. 2). Although exact temperature increases are not known, projected temperature rise in the southwestern United States by 2050 ranges between 1.4 and 2.0 °C (2.5 and 4.5 °F) for a lower emissions scenario, and between 2.5 and 3.1 °C (3.5 and 5.5 °F) for a higher emissions scenario (USGCRP 2009, p. 129).

Precipitation models predict a reduction in mountain snowpack, a threat of severe and prolonged episodic drought (UBRAC 2007, p. 3), and a decline in summer precipitation across all of Utah (p. 18). However, Utah is in the transition zone for predicted changes in winter precipitation (between the northwest and southwest United States), resulting in low confidence in future winter precipitation trends (UBRAC 2007, p 18).

More locally to least chub, the hydrology of the Great Salt Lake Basin will be impacted by changes in mountain runoff (UBRAC 2007, p. 18). While predictions indicate that the Great Salt Lake Basin will be affected by declining mountain snowpack and the resulting runoff, the timing and extent of these changes are unclear (UBRAC 2007, p. 19). Drought conditions and higher evaporation rates result in lowered groundwater levels, reduced spring flows, and reductions in size and depth of pool habitat for least chub (Wilson 2006, p. 8). Although current data and climate predictions do not indicate the exact nature of future changes to extant least chub habitat sites, we can assume that similar effects will be likely.

Because the least chub depends on small, ephemeral springfed wetlands for major portions of its life history (spawning, nursery niches, and feeding) and the amount of this habitat available will likely be reduced and restricted to spring heads, the severity of climate change is an important factor in the species' persistence. Under circumstances of restricted habitats, both hybridization and extirpation have occurred (Hubbs 1955, p. 18; Miller and Behnke 1985, p. 514). Additionally, the species is bound by dispersal barriers throughout its range and cannot retreat to additional habitats or easily recolonize areas after they have been extirpated.

Despite the clear evidence that climate change has had an effect on temperature over the last 100 years, as well as its potential causal association with more intense drought conditions that were experienced in the southwestern United States over the last decade (see Factor A. Drought), the information available to us at this time does not suggest that climate change alone is a significant threat to least chub. While climate change is likely to have affected aquatic resources to some extent in the past, including habitat used by least chub, at this time our analysis indicates that groundwater withdrawal historically caused a more significant long-term impact and that separating the effects of climate change from those of groundwater withdrawal is not possible. Likewise, we determine that groundwater withdrawal will be the overriding impact to least chub in the foreseeable future.

(5) Cumulative Effects

We cannot completely predict the cumulative effects of climate change, current and future groundwater withdrawal, and drought on least chub at this time, but we know that each will occur to some extent and be compounded by the others. At least five Snake Valley populations, and as many as 15 springs of occupied least chub sites, have been extirpated in the last 30 years as a result of drought or irrigation practices (see previous sections, Historical Occurrences and Current Distribution). Snake Valley harbors the last remaining native habitats and the last three naturally occurring least chub populations that are not severely impacted by nonnative fish and urbanization.

The effects of proposed large-scale groundwater withdrawal as described in Factor A are likely to compound the effects that localized groundwater development has had on least chub. As described above, past water development in localized areas has resulted in drying of least chub habitat and the extirpation of the species from these habitats. Extant least chub habitats will likely be impacted by reduced water and consequently wetted area and wetland habitat reductions will result from these threats individually, and will be compounded cumulatively with drought and climate change. The cumulative effect of these three threats will likely intensify the probable effects described in Factor A: Water Withdrawal and Diversions, Drought, and Factor E: Climate Change.

In summary, we find that the potential combinations of drought, current and future groundwater withdrawal, and climate change are likely to occur and be significant threats to least chub in the foreseeable future. Significant effects have already occurred as a result of drought and water diversions, and least chub populations in Snake Valley have been extirpated.

Summary of Factor E

We assessed the potential risks of hybridization, loss of genetic diversity, and environmentally stochastic disturbance to least chub populations. Limited hybridization was documented in the late 1970s at five sites; however, least chub are no longer found at these sites or recent genetic analysis shows that hybridization is no longer an issue for extant populations. Levels of genetic diversity are appropriate to sustain least chub populations, and genetic refuges exist for three of five extant populations. The available information does not suggest that environmentally stochastic disturbance threatens extant least chub populations, and if necessary, refugia populations are available to augment existing populations. Based on the best scientific and commercial information available, we conclude that least chub is not, now or in the foreseeable future, threatened by hybridization, loss of genetic diversity, or environmentally stochastic disturbance.

Least chub have persisted for thousands of years, and naturally occurring drought does not significantly threaten the species. Climate models predict that the State may warm more than average, with more heat waves, less mountain snowpack, and a decline in summer precipitation. It also is clear that historic and current water withdrawal, combined with the effects of drought, have had significant negative effects on least chub. It is anticipated that these phenomena will combine to reduce the quality and quantity of least chub habitat, and that when combined with the effects of climate change, these three factors will significantly threaten the least chub.

Therefore, we find that the least chub is at risk of extinction now and in the foreseeable future because of the cumulative effects of climate change, current and future groundwater withdrawal, and drought.

It is difficult to predict the foreseeable future regarding the cumulative effects of climate change, groundwater withdrawal, and drought and their resultant effects to least chub. Drought is a natural event that could happen at any time and is, therefore, a factor considered for the foreseeable future. Current estimates for climate change are most accurate for change in temperature, but not precipitation; and climatic models are generally accurate to about 2030 for this parameter (Solomon *et al.* 2007, p. 74). Thus, for cumulative effects of climate change, groundwater withdrawal, and drought, it is anticipated that large-scale groundwater pumping will be the overriding factor now and in the foreseeable future.

**Finding**

As required by the Act, we considered the five factors in assessing whether the least chub is threatened or endangered throughout all or a significant portion of its range. We have carefully examined the best scientific and commercial information available regarding the past, present, and future threats faced by the least chub. We reviewed the petition, information available in our files, other available published and unpublished information, and we consulted with recognized least chub experts and other Federal, State, and tribal agencies. In considering what factors might constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine how significant a threat it is. If the threat is significant, it may drive or contribute to the risk of extinction of the species such that the species warrants listing as threatened or endangered as those terms are defined by the Act.

On the basis of the best scientific and commercial information available, we find that listing of the least chub as threatened or endangered is warranted. We will make a determination on the status of the species as threatened or endangered when we do a proposed listing determination. However, as explained in more detail below, an 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.

Review of least chub historic population trends shows that the current distribution of the least chub is highly reduced from its historic range. In the late nineteenth century, least chub were very common in tributaries to Sevier, Utah, and the Great Salt Lakes and for the next 50 years, surveys demonstrated that this species was found across the Bonneville Basin in Utah, including Snake Valley. By the 1940s and 1950s, the numbers of least chub in range and abundance surveys were definitely decreasing with only 11 extant populations existing by 1979, and 3 extant wild populations known in 1995. UDWR surveys in the 1990s and 2000s discovered three new populations on the eastern extent of the historic range; however, one of these populations is functionally extirpated. The Service now considers five extant, wild, viable populations to exist, with only three (all in Snake Valley) being considered secure from the effects of nonnative fish.

This status review found threats to the least chub related to Factors A, C, D, and E, as described in the following paragraphs and summarized in Table 4. We find that the best available information for Factor A indicates that listing the least chub as threatened or endangered under the Act is warranted due to the effects of livestock grazing and water withdrawal and diversions on the species and its habitat. Although the LCCAS and the UDWR have worked to protect least chub habitat with grazing enclosures where possible and grazing management plans in some areas, livestock-grazing-related impacts are still observed at most least chub sites. There is substantial evidence showing the negative effect of historical groundwater withdrawal on least chub. While uncertainty exists on the magnitude of effects to the least chub from proposed large-scale groundwater pumping, concern regarding the remaining five extant, wild populations is sufficient to indicate that the species is at risk of extinction in the foreseeable future, especially when combined with the threat of drought.

We find that the best available information concerning Factor C (Predation) indicates that listing the least chub as threatened or endangered under the Act is warranted due to the continuing threat of nonnative species, particularly mosquitofish, for which there is no known means of control. Several significant efforts have been made to remove mosquitofish from least chub habitats, without success. The wild least chub population at Mona Springs is functionally extirpated due to mosquitofish, and nonnative fish are present at two of the five remaining viable populations.

We find that the best available information concerning Factor D (Inadequacy of Existing Regulatory Mechanisms) indicates that the least chub is at risk of extinction in the foreseeable future due to inadequacy of existing regulations to regulate groundwater withdrawals and ameliorate their effects on least chub habitat.

We find that the best available information concerning Factor E (Other Natural or Manmade Factors Affecting Its Continued Existence) indicates that the least chub is at risk of extinction in the foreseeable future because of the cumulative effects of drought, current and future groundwater withdrawal, and climate change on the remaining naturally occurring populations in Snake Valley.

TABLE 4.—SUMMARY OF LEAST CHUB STATUS AND THREATS BY POPULATION IN THE UNITED STATES.

| Population | Current Status | Current & Future Threats |
| --- | --- | --- |
| Leland Harris Spring Complex | Extant | Factor A. Livestock grazing, groundwater withdrawal, drought. |
| Gandy Salt Marsh | Extant | |
| Bishop Springs Complex | Extant | Factor C. Nonnative fishes. |
| Mills Valley | Extant | Factor D. Inadequacy of existing mechanisms to regulate groundwater withdrawal.<br>Factor E. Cumulative effects of climate change, groundwater withdrawal, & drought. |
| Mona Springs | Extirpated | Factor A. Groundwater withdrawal, drought.<br>Factor C. Nonnative fishes. |
| Clear Lake | Extant | Factor D. Inadequacy of existing mechanisms to regulate groundwater withdrawal.<br>Factor E. Cumulative effects of climate change, groundwater withdrawal, & drought. |

Because our finding on the petition to list is warranted but precluded, we do not need to specifically determine whether it is appropriate to perform a "significant portion of the range" analysis for this species. Because of a small and restricted population distribution, and because of threats described above, the least chub should be listed as threatened or endangered throughout its entire range. We will review whether to list the species as threatened or endangered during the proposed listing rule process.

We have reviewed the available information to determine if the existing and foreseeable threats render the species at risk of extinction now such that issuing an emergency regulation temporarily listing the species as per section 4(b)(7) of the Act is warranted. We have determined that issuing an emergency regulation temporarily listing the species is not warranted for this species at this time because five populations persist, three are currently free from nonnative species, and all are currently free from large-scale groundwater pumping. However, if at any time we determine that issuing an emergency regulation temporarily listing the least chub is warranted, we will initiate this action at that time.

**Preclusion and Expeditious Progress**

Preclusion is a function of the listing priority of a species in relation to the resources that are available and competing demands for those resources. Thus, in any given fiscal year (FY), multiple factors dictate whether it will be possible to undertake work on a proposed listing regulation or whether promulgation of such a proposal is warranted but precluded by higher-priority listing actions.

The resources available for listing actions are determined through the annual Congressional appropriations process. The appropriation for the Listing Program is available to support work involving the following listing actions: Proposed and final listing rules; 90–day and 12–month findings on petitions to add species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) or to change the status of a species from threatened to endangered; annual determinations on prior "warranted but precluded" petition findings as required under section 4(b)(3)(C)(i) of the Act; critical habitat petition findings; proposed and final rules designating critical habitat; and litigation-related, administrative, and program-management functions (including preparing and allocating budgets, responding to Congressional and public inquiries, and conducting public outreach regarding listing and critical habitat).

The work involved in preparing various listing documents can be extensive and may include, but is not limited to: Gathering and assessing the best scientific and commercial data available and conducting analyses used as the basis for our decisions; writing and publishing documents; and obtaining, reviewing, and evaluating public comments and peer review comments on proposed rules and incorporating relevant information into final rules. The number of listing actions that we can undertake in a given year also is influenced by the complexity of those listing actions; that is, more complex actions generally are more costly. For example, during the past several years, the cost (excluding publication costs) for preparing a 12–month finding, without a proposed rule, has ranged from approximately $11,000 for one species with a restricted range and involving a relatively uncomplicated analysis to $305,000 for another species that is wide-ranging and involving a complex analysis.

We cannot spend more than is appropriated for the Listing Program without violating the Anti-Deficiency Act (see 31 U.S.C. 1341(a)(1)(A)). In addition, in FY 1998 and for each fiscal year since then, Congress has placed a statutory cap on funds that may be expended for the Listing Program, equal to the amount expressly appropriated for that purpose in that fiscal year. This cap was designed to prevent funds appropriated for other functions under the Act (for example, recovery funds for removing species from the Lists), or for other Service programs, from being used for Listing Program actions (see House Report 105-163, 105th Congress, 1st Session, July 1, 1997).

Recognizing that designation of critical habitat for species already listed would consume most of the overall Listing Program appropriation, Congress also put a critical habitat subcap in place in FY 2002 and has retained it each subsequent year to ensure that some funds are available for other work in the Listing Program: "The critical habitat designation subcap will ensure that some funding is available to address other listing activities" (House Report No. 107 - 103, 107th Congress, 1st

Session, June 19, 2001). In FY 2002 and each year until FY 2006, the Service has had to use virtually the entire critical habitat subcap to address court-mandated designations of critical habitat, and consequently none of the critical habitat subcap funds have been available for other listing activities. In FY 2007, we were able to use some of the critical habitat subcap funds to fund proposed listing determinations for high-priority candidate species. In FY 2009, while we were unable to use any of the critical habitat subcap funds to fund proposed listing determinations, we did use some of this money to fund the critical habitat portion of some proposed listing determinations so that the proposed listing determination and proposed critical habitat designation could be combined into one rule, thereby being more efficient in our work. In FY 2010, we are using some of the critical habitat subcap funds to fund actions with statutory deadlines.

Thus, through the listing cap, the critical habitat subcap, and the amount of funds needed to address court-mandated critical habitat designations, Congress and the courts have in effect determined the amount of money available for other listing activities. Therefore, the funds in the listing cap, other than those needed to address court-mandated critical habitat for already listed species, set the limits on our determinations of preclusion and expeditious progress.

Congress also recognized that the availability of resources was the key element in deciding, when making a 12–month petition finding, whether we would prepare and issue a listing proposal or instead make a "warranted but precluded" finding for a given species. The Conference Report accompanying Public Law 97-304, which established the current statutory deadlines and the warranted-but-precluded finding, states (in a discussion on 90–day petition findings that by its own terms also covers 12–month findings) that the deadlines were "not intended to allow the Secretary to delay commencing the rulemaking process for any reason other than that the existence of pending or imminent proposals to list species subject to a greater degree of threat would make allocation of resources to such a petition [that is, for a lower-ranking species] unwise."

In FY 2010, expeditious progress is that amount of work that can be achieved with $10,471,000, which is the amount of money that Congress appropriated for the Listing Program (that is, the portion of the Listing Program funding not related to critical habitat designations for species that are already listed). However these funds are not enough to fully fund all our court-ordered and statutory listing actions in FY 2010, so we are using $1,114,417 of our critical habitat subcap funds in order to work on all of our required petition findings and listing determinations. This brings the total amount of funds we have for listing actions in FY 2010 to $11,585,417. Our process is to make our determinations of preclusion on a nationwide basis to ensure that the species most in need of listing will be addressed first and also because we allocate our listing budget on a nationwide basis. The $11,585,417 is being used to fund work in the following categories: compliance with court orders and court-approved settlement agreements requiring that petition findings or listing determinations be completed by a specific date; section 4 (of the Act) listing actions with absolute statutory deadlines; essential litigation-related, administrative, and listing program-management functions; and high-priority listing actions for some of our candidate species.

In 2009, the responsibility for listing foreign species under the Act was transferred from the Division of Scientific Authority, International Affairs Program, to the Endangered Species Program. Starting in FY 2010, a portion of our funding is being used to work on the actions described above as they apply to listing actions for foreign species. This has the potential to further reduce funding available for domestic listing actions, although there are currently no foreign species issues included in our high-priority listing actions at this time. The allocations for each specific listing action are identified in the Service's FY 2010 Allocation Table (part of our administrative record).

In FY 2007, we had more than 120 species with an LPN of 2, based on our September 21, 1983, guidance for assigning an LPN for each candidate species (48 FR 43098). Using this guidance, we assign each candidate an LPN of 1 to 12, depending on the magnitude of threats (high vs. moderate to low), immediacy of threats (imminent or nonimminent), and taxonomic status of the species (in order of priority: monotypic genus (a species that is the sole member of a genus); species; or part of a species (subspecies, distinct population segment, or significant portion of the range)). The lower the listing priority number, the higher the listing priority (that is, a species with an LPN of 1 would have the highest listing priority). Because of the large number of high-priority species, we further ranked the candidate species with an LPN of 2 by using the following extinction-risk type criteria: International Union for the Conservation of Nature and Natural Resources (IUCN) Red list status/rank, Heritage rank (provided by NatureServe), Heritage threat rank (provided by NatureServe), and species currently with fewer than 50 individuals, or 4 or fewer populations.

Those species with the highest IUCN rank (critically endangered), the highest Heritage rank (G1), the highest Heritage threat rank (substantial, imminent threats), and currently with fewer than 50 individuals, or fewer than 4 populations, comprised a group of approximately 40 candidate species ("Top 40"). These 40 candidate species have had the highest priority to receive funding to work on a proposed listing determination. As we work on proposed and final listing rules for these 40 candidates, we are applying the ranking criteria to the next group of candidates with an LPN of 2 and 3 to determine the next set of highest priority candidate species.

To be more efficient in our listing process, as we work on proposed rules for these species in the next several years, we are preparing multispecies proposals when appropriate, and these may include species with lower priority if they overlap geographically or have the same threats as a species with an LPN of 2. In addition, available staff resources are also a factor in determining high-priority species provided with funding. Finally, proposed rules for reclassification of threatened species to endangered are lower priority, since as listed species, they are already afforded the protection of the Act and implementing regulations.

We assign the least chub a Listing Priority Number (LPN) of 7 based on our finding that the species faces threats that are of moderate magnitude and high imminence. Under the Service's LPN Guidance (September 21, 1983; 48 FR 43098), the magnitude of threat is the first criterion we look at when establishing a listing priority. The guidance indicates that species with the highest magnitude of threat are those species facing the greatest threats to their continued existence. These species receive the highest listing priority. At present, the threats facing the least chub do not meet the highest magnitude rank, because the threats are not of uniform intensity and the level of the threats is moderate. Although many of the factors we analyzed (e.g., grazing, groundwater withdrawal, nonnative species) are present throughout the range, they are not to the level that they are causing high-magnitude threats to least chub in the majority of the five remaining populations. Grazing, groundwater withdrawal, and nonnative predation threats are of high magnitude in some populations but are of low magnitude or nonexistent in other populations, such that when considering the overall species' range, the threats average out to being of moderate magnitude.

Under our LPN Guidance, the second criterion we consider in assigning a listing priority is the immediacy of threats. This criterion is intended to ensure that the species facing actual, identifiable threats are given priority over those for which threats are only potential or that are intrinsically vulnerable but are not known to be presently facing such threats. We consider the threats imminent because we have factual information that the threats are identifiable and that the species is currently facing them in many portions of its range. These actual, identifiable threats are covered in greater detail in factors A and C of this finding and include livestock grazing, groundwater withdrawal, and nonnative species predation.

The third criterion in our LPN guidance is intended to devote resources to those species representing highly distinctive or isolated gene pools as reflected by taxonomy. The least chub is a species within a monotypic genus, and therefore it receives a higher priority than a species, subspecies, or DPS.

We will continue to monitor the threats to the least chub, and the species' status on an annual basis, and should the magnitude or the imminence of the threats change, we will revisit our assessment of LPN.

Because we assigned the least chub an LPN of 7, work on a proposed listing determination for the least chub is precluded by work on higher priority listing actions with absolute statutory, court ordered, or court-approved deadlines and final listing determinations for those species that were proposed for listing with funds from FY 2009. This work includes all the actions listed in the tables below under expeditious progress (see tables 5 and 6).

As explained above, a determination that listing is warranted but precluded must also demonstrate that expeditious progress is being made to add or remove qualified species to and from the Lists of Endangered and Threatened Wildlife and Plants. (Although we do not discuss it in detail here, we are also making expeditious progress in removing species from the Lists under the Recovery program, which is funded by a separate line item in the budget of the Endangered Species Program. As explained above in our description of the statutory cap on Listing Program funds, the Recovery Program funds and actions supported by them cannot be considered in determining expeditious progress made in the Listing Program.) As with our "precluded" finding, expeditious progress in adding qualified species to the Lists is a function of the resources available and the competing demands for those funds. Given that limitation, we find that we are making progress in FY 2010 in the Listing Program. This progress included preparing and publishing the following determinations:

TABLE 5.—FY 2010 COMPLETED LISTING ACTIONS.

| Publication Date | Title | Actions | FR Pages |
|---|---|---|---|
| 10/08/2009 | Listing *Lepidium papilliferum* (Slickspot Peppergrass) as a Threatened Species Throughout Its Range | Final Listing Threatened | 74 FR 52013-52064 |
| 10/27/2009 | 90-day Finding on a Petition To List the American Dipper in the Black Hills of South Dakota as Threatened or Endangered | Notice of 90–day Petition Finding, Not substantial | 74 FR 55177-55180 |
| 10/28/2009 | Status Review of Arctic Grayling (*Thymallus arcticus*) in the Upper Missouri River System | Notice of Intent to Conduct Status Review | 74 FR 55524-55525 |
| 11/03/2009 | Listing the British Columbia Distinct Population Segment of the Queen Charlotte Goshawk Under the Endangered Species Act: Proposed rule. | Proposed Listing Threatened | 74 FR 56757-56770 |
| 11/03/2009 | Listing the Salmon-Crested Cockatoo as Threatened Throughout Its Range with Special Rule | Proposed Listing Threatened | 74 FR 56770-56791 |
| 11/23/2009 | Status Review of Gunnison sage-grouse (*Centrocercus minimus*) | Notice of Intent to Conduct Status Review | 74 FR 61100-61102 |
| 12/03/2009 | 12-Month Finding on a Petition to List the Black-tailed Prairie Dog as Threatened or Endangered | Notice of 12–month petition finding, Not warranted | 74 FR 63343-63366 |
| 12/03/2009 | 90-Day Finding on a Petition to List Sprague's Pipit as Threatened or Endangered | Notice of 90–day Petition Finding, Substantial | 74 FR 63337-63343 |
| 12/15/2009 | 90-Day Finding on Petitions To List Nine Species of Mussels From Texas as Threatened or Endangered With Critical Habitat | Notice of 90–day Petition Finding, Substantial | 74 FR 66260-66271 |
| 12/16/2009 | Partial 90-Day Finding on a Petition to List 475 Species in the Southwestern United States as Threatened or Endangered With Critical Habitat | Notice of 90–day Petition Finding, Not substantial and Subtantial | 74 FR 66865-66905 |
| 12/17/2009 | 12–month Finding on a Petition To Change the Final Listing of the Distinct Population Segment of the Canada Lynx To Include New Mexico | Notice of 12–month petition finding, Warranted but precluded | 74 FR 66937-66950 |

TABLE 5.—FY 2010 COMPLETED LISTING ACTIONS.—Continued

| Publication Date | Title | Actions | FR Pages |
|---|---|---|---|
| 1/05/2010 | Listing Foreign Bird Species in Peru and Bolivia as Endangered Throughout Their Range | Proposed Listing Endangered | 75 FR 605-649 |
| 1/05/2010 | Listing Six Foreign Birds as Endangered Throughout Their Range | Proposed Listing Endangered | 75 FR 286-310 |
| 1/05/2010 | Withdrawal of Proposed Rule to List Cook's Petrel | Proposed rule, withdrawal | 75 FR 310-316 |
| 1/05/2010 | Final Rule to List the Galapagos Petrel and Heinroth's Shearwater as Threatened Throughout Their Ranges | Final Listing Threatened | 75 FR 235-250 |
| 1/20/2010 | Initiation of Status Review for *Agave eggersiana* and *Solanum conocarpum* | Notice of Intent to Conduct Status Review | 75 FR 3190-3191 |
| 2/09/2010 | 12–month Finding on a Petition to List the American Pika as Threatened or Endangered | Notice of 12–month petition finding, Not warranted | 75 FR 6437-6471 |
| 2/25/2010 | 12-Month Finding on a Petition To List the Sonoran Desert Population of the Bald Eagle as a Threatened or Endangered Distinct Population Segment | Notice of 12–month petition finding, Not warranted | 75 FR 8601-8621 |
| 2/25/2010 | Withdrawal of Proposed Rule To List the Southwestern Washington/Columbia River Distinct Population Segment of Coastal Cutthroat Trout *(Oncorhynchus clarki clarki*) as Threatened | Withdrawal of Proposed Rule to List | 75 FR 8621-8644 |
| 3/18/2010 | 90-Day Finding on a Petition to List the Berry Cave salamander as Endangered | Notice of 90–day Petition Finding, Substantial | 75 FR 13068-13071 |
| 3/23/2010 | 90-Day Finding on a Petition to List the Southern Hickorynut Mussel *(Obovaria jacksoniana*) as Endangered or Threatened | Notice of 90–day Petition Finding, Not substantial | 75 FR 13717-13720 |
| 3/23/2010 | 90-Day Finding on a Petition to List the Striped Newt as Threatened | Notice of 90–day Petition Finding, Substantial | 75 FR 13720-13726 |
| 3/23/2010 | 12-Month Findings for Petitions to List the Greater Sage-Grouse *(Centrocercus urophasianus*)as Threatened or Endangered | Notice of 12–month petition finding, Warranted but precluded | 75 FR 13910-14014 |
| 3/31/2010 | 12-Month Finding on a Petition to List the Tucson Shovel-Nosed Snake *(Chionactis occipitalis klauberi*) as Threatened or Endangered with Critical Habitat | Notice of 12–month petition finding, Warranted but precluded | 75 FR 16050-16065 |
| 4/5/2010 | 90-Day Finding on a Petition To List Thorne's Hairstreak Butterfly as or Endangered | Notice of 90–day Petition Finding, Substantial | 75 FR 17062-17070 |
| 4/6/2010 | 12–month Finding on a Petition To List the Mountain Whitefish in the Big Lost River, Idaho, as Endangered or Threatened | Notice of 12–month petition finding, Not warranted | 75 FR 17352-17363 |
| 4/6/2010 | 90-Day Finding on a Petition to List a Stonefly *(Isoperla jewetti*) and a Mayfly *(Fallceon eatoni*) as Threatened or Endangered with Critical Habitat | Notice of 90–day Petition Finding, Not substantial | 75 FR 17363-17367 |
| 4/7/2010 | 12-Month Finding on a Petition to Reclassify the Delta Smelt From Threatened to Endangered Throughout Its Range | Notice of 12–month petition finding, Warranted but precluded | 75 FR 17667-17680 |
| 4/13/2010 | Determination of Endangered Status for 48 Species on Kauai and Designation of Critical Habitat | Final Listing Endangered | 75 FR 18959-19165 |
| 4/15/2010 | Initiation of Status Review of the North American Wolverine in the Contiguous United States | Notice of Initiation of Status Review | 75 FR 19591-19592 |
| 4/15/2010 | 12-Month Finding on a Petition to List the Wyoming Pocket Gopher as Endangered or Threatened with Critical Habitat | Notice of 12–month petition finding, Not warranted | 75 FR 19592-19607 |
| 4/16/2010 | 90-Day Finding on a Petition to List a Distinct Population Segment of the Fisher in Its United States Northern Rocky Mountain Range as Endangered or Threatened with Critical Habitat | Notice of 90–day Petition Finding, Substantial | 75 FR 19925-19935 |
| 4/20/2010 | Initiation of Status Review for Sacramento splittail *(Pogonichthys macrolepidotus)* | Notice of Initiation of Status Review | 75 FR 20547-20548 |
| 4/26/2010 | 90-Day Finding on a Petition to List the Harlequin Butterfly as Endangered | Notice of 90–day Petition Finding, Substantial | 75 FR 21568-21571 |

TABLE 5.—FY 2010 COMPLETED LISTING ACTIONS.—Continued

| Publication Date | Title | Actions | FR Pages |
|---|---|---|---|
| 4/27/2010 | 12-Month Finding on a Petition to List Susan's Purse-making Caddisfly *(Ochrotrichia susanae)* as Threatened or Endangered | Notice of 12–month petition finding, Not warranted | 75 FR 22012-22025 |
| 4/27/2010 | 90–day Finding on a Petition to List the Mohave Ground Squirrel as Endangered with Critical Habitat | Notice of 90–day Petition Finding, Substantial | 75 FR 22063-22070 |
| 5/4/2010 | 90-Day Finding on a Petition to List Hermes Copper Butterfly as Threatened or Endangered | Notice of 90–day Petition Finding, Substantial | 75 FR 23654-23663 |

Our expeditious progress also includes work on listing actions that we funded in FY 2010 but have not yet been completed to date. These actions are listed below. Actions in the top section of the table are being conducted under a deadline set by a court. Actions in the middle section of the table are being conducted to meet statutory timelines, that is, timelines required under the Act. Actions in the bottom section of the table are high-priority listing actions. These actions include work primarily on species with an LPN of 2, and selection of these species is partially based on available staff resources, and when appropriate, include species with a lower priority if they overlap geographically or have the same threats as the species with the high priority. Including these species together in the same proposed rule results in considerable savings in time and funding, as compared to preparing separate proposed rules for each of them in the future.

TABLE 6.—ACTIONS FUNDED IN FY 2010 BUT NOT YET COMPLETED.

| Species | Action |
|---|---|
| Actions Subject to Court Order/Settlement Agreement | |
| 6 Birds from Eurasia | Final listing determination |
| Flat-tailed horned lizard | Final listing determination |
| Mountain plover | Final listing determination |
| 6 Birds from Peru | Proposed listing determination |
| Sacramento splittail | Proposed listing determination |
| White-tailed prairie dog | 12–month petition finding |
| Gunnison sage-grouse | 12–month petition finding |
| Wolverine | 12–month petition finding |
| Arctic grayling | 12–month petition finding |
| *Agave eggergsiana* | 12–month petition finding |
| *Solanum conocarpum* | 12–month petition finding |
| Mountain plover | 12–month petition finding |
| Thorne's Hairstreak Butterfly | 12–month petition finding |
| Hermes copper butterfly | 12–month petition finding |
| Actions with Statutory Deadlines | |
| Casey's june beetle | Final listing determination |
| Georgia pigtoe, interrupted rocksnail, and rough hornsnail | Final listing determination |
| 2 Hawaiian damselflies | Final listing determination |
| African penguin | Final listing determination |
| 3 Foreign bird species (Andean flamingo, Chilean woodstar, St. Lucia forest thrush) | Final listing determination |
| 5 Penguin species | Final listing determination |
| Southern rockhopper penguin – Campbell Plateau population | Final listing determination |

TABLE 6.—ACTIONS FUNDED IN FY 2010 BUT NOT YET COMPLETED.—Continued

| Species | Action |
|---|---|
| 5 Bird species from Colombia and Ecuador | Final listing determination |
| 7 Bird species from Brazil | Final listing determination |
| Queen Charlotte goshawk | Final listing determination |
| Salmon crested cockatoo | Proposed listing determination |
| Black-footed albatross | 12–month petition finding |
| Mount Charleston blue butterfly | 12–month petition finding |
| Least chub[1] | 12–month petition finding |
| Mojave fringe-toed lizard[1] | 12–month petition finding |
| Pygmy rabbit (rangewide)[1] | 12–month petition finding |
| Kokanee – Lake Sammamish population[1] | 12–month petition finding |
| Delta smelt (uplisting) | 12–month petition finding |
| Cactus ferruginous pygmy-owl[1] | 12–month petition finding |
| Northern leopard frog | 12–month petition finding |
| Tehachapi slender salamander | 12–month petition finding |
| Coqui Llanero | 12–month petition finding |
| White-sided jackrabbit | 12–month petition finding |
| Jemez Mountains salamander | 12–month petition finding |
| Dusky tree vole | 12–month petition finding |
| Eagle Lake trout[1] | 12–month petition finding |
| 29 of 206 species | 12–month petition finding |
| Desert tortoise – Sonoran population | 12–month petition finding |
| Gopher tortoise – eastern population | 12–month petition finding |
| Amargosa toad | 12–month petition finding |
| Pacific walrus | 12–month petition finding |
| Wrights marsh thistle | 12–month petition finding |
| 67 of 475 southwest species | 12–month petition finding |
| 9 Southwest mussel species | 12–month petition finding |
| 14 parrots (foreign species) | 12–month petition finding |
| Berry Cave salamander[1] | 12–month petition finding |
| Striped Newt[1] | 12–month petition finding |
| Fisher – Northern Rocky Mountain Range[1] | 12–month petition finding |
| Mohave Ground Squirrel[1] | 12–month petition finding |
| Puerto Rico Harlequin Butterfly | 12–month petition finding |
| Southeastern pop snowy plover & wintering pop. of piping plover[1] | 90–day petition finding |
| Eagle Lake trout[1] | 90–day petition finding |
| Ozark chinquapin[1] | 90–day petition finding |
| Smooth-billed ani[1] | 90–day petition finding |

TABLE 6.—ACTIONS FUNDED IN FY 2010 BUT NOT YET COMPLETED.—Continued

| Species | Action |
|---|---|
| Bay Springs salamander[1] | 90–day petition finding |
| 32 species of snails and slugs[1] | 90–day petition finding |
| *Calopogon oklahomensis*[1] | 90–day petition finding |
| White-bark pine | 90–day petition finding |
| 42 snail species (Nevada & Utah) | 90–day petition finding |
| HI yellow-faced bees | 90–day petition finding |
| Red knot *roselaari* subspecies | 90–day petition finding |
| Honduran emerald | 90–day petition finding |
| Peary caribou | 90–day petition finding |
| Western gull-billed tern | 90–day petition finding |
| Plain bison | 90–day petition finding |
| Giant Palouse earthworm | 90–day petition finding |
| Mexican gray wolf | 90–day petition finding |
| Spring Mountains checkerspot butterfly | 90–day petition finding |
| Spring pygmy sunfish | 90–day petition finding |
| San Francisco manzanita | 90–day petition finding |
| Bay skipper | 90–day petition finding |
| Unsilvered fritillary | 90–day petition finding |
| Texas kangaroo rat | 90–day petition finding |
| Spot-tailed earless lizard | 90–day petition finding |
| Eastern small-footed bat | 90–day petition finding |
| Northern long-eared bat | 90–day petition finding |
| Prairie chub | 90–day petition finding |
| 10 species of Great Basin butterfly | 90–day petition finding |
| 6 sand dune (scarab) beetles | 90–day petition finding |
| Gila monster – Utah population | 90–day petition finding |
| Golden-winged warbler | 90–day petition finding |
| Sand-verbena moth | 90–day petition finding |
| Aztec (beautiful) gilia | 90–day petition finding |
| Arapahoe snowfly | 90–day petition finding |
| High Priority Listing Actions[3] | |
| 19 Oahu candidate species[3] (16 plants, 3 damselflies) (15 with LPN = 2, 3 with LPN = 3, 1 with LPN =9) | Proposed listing |
| 17 Maui-Nui candidate species[3] (14 plants, 3 tree snails) (12 with LPN = 2, 2 with LPN = 3, 3 with LPN = 8) | Proposed listing |
| Sand dune lizard[3] (LPN = 2) | Proposed listing |
| 2 Arizona springsnails[3] *(Pyrgulopsis bernadina* (LPN = 2), *Pyrgulopsis trivialis* (LPN = 2)) | Proposed listing |
| 2 New Mexico springsnails[3] *(Pyrgulopsis chupaderae* (LPN = 2), *Pyrgulopsis thermalis* (LPN = 11)) | Proposed listing |
| 2 mussels[3] (rayed bean (LPN = 2), snuffbox No LPN) | Proposed listing |

TABLE 6.—ACTIONS FUNDED IN FY 2010 BUT NOT YET COMPLETED.—Continued

| Species | Action |
|---|---|
| 2 mussels[3] (sheepnose (LPN = 2), spectaclecase (LPN = 4),) | Proposed listing |
| Ozark hellbender[2] (LPN = 3) | Proposed listing |
| Altamaha spinymussel[3] (LPN = 2) | Proposed listing |
| 5 southeast fish[3] (rush darter (LPN = 2), chucky madtom (LPN = 2), yellowcheek darter (LPN = 2), Cumberland darter (LPN = 5), laurel dace (LPN = 5)) | Proposed listing |
| 8 southeast mussels (southern kidneyshell (LPN = 2), round ebonyshell (LPN = 2), Alabama pearlshell (LPN = 2), southern sandshell (LPN = 5), fuzzy pigtoe (LPN = 5), Choctaw bean (LPN = 5), narrow pigtoe (LPN = 5), and tapered pigtoe (LPN = 11)) | Proposed listing |
| 3 Colorado plants[3] (Pagosa skyrocket *(Ipomopsis polyantha)* (LPN = 2), Parchute beardtongue *(Penstemon debilis)* (LPN = 2), Debeque phacelia *(Phacelia submutica)* (LPN = 8)) | Proposed listing |

[1] Funds for listing actions for these species were provided in previous FYs.
[2] We funded a proposed rule for this subspecies with an LPN of 3 ahead of other species with LPN of 2, because the threats to the species were so imminent and of a high magnitude that we considered emergency listing if we were unable to fund work on a proposed listing rule in FY 2008.
[3] Funds for these high-priority listing actions were provided in FY 2008 or 2009.

We have endeavored to make our listing actions as efficient and timely as possible, given the requirements of the relevant law and regulations, and constraints relating to workload and personnel. We are continually considering ways to streamline processes or achieve economies of scale, such as by batching related actions together. Given our limited budget for implementing section 4 of the Act, these actions described above collectively constitute expeditious progress.

The least 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 intend that any proposed listing action for the least chub 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 references cited is available on the Internet at *http://www.regulations.gov* and upon request from the Utah Field Office (see **ADDRESSES** section).

## Authors

The primary authors of this notice are the staff members of the Utah Field Office.

## Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: June 4, 2010

**Jeffrey L. Underwood**

*Acting Director, U.S. Fish and Wildlife Service*

[FR Doc. 2010–15070 Filed 6–21–10; 8:45 am]

**BILLING CODE 4310–55–S**

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## DEPARTMENT OF THE INTERIOR

## Fish and Wildlife Service

## 50 CFR Part 17

**[FWS–R4–ES–2008–0119; 92220–1113–0000–C6]**

**RIN 1018–AX01**

# Endangered and Threatened Wildlife and Plants; Proposed Reclassification of the Tulotoma Snail From Endangered to Threatened

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Proposed rule.

**SUMMARY:** We, the U.S. Fish and Wildlife Service (Service), propose to reclassify the tulotoma snail (*Tulotoma magnifica*) from endangered to threatened, under the authority of the Endangered Species Act of 1973, as amended (Act). This proposed action is based on a review of the best available scientific and commercial data, which indicate that the endangered designation no longer correctly reflects the status of this snail. We have documented a substantial improvement in the species' distribution and numbers over the past 15 years, including the discovery of several populations that were unknown when the species was listed. Minimum flows and other conservation measures have been implemented below two dams in the Coosa River, improving habitat and resulting in the expansion of tulotoma snail numbers and range in the Coosa River. The Alabama Clean Water Partnership has also developed the Lower Coosa River Basin Management Plan to address nonpoint source pollution and watershed management issues in most Coosa River tributaries occupied by the tulotoma snail. While great strides have been made to improve the species status, additional efforts are required to address the remaining threats to the species. We are seeking comments from the public on this proposal.

**DATES:** We will accept comments received or postmarked on or before August 23, 2010. We must receive requests for public hearings, in writing, at the address shown in the **FOR FURTHER INFORMATION CONTACT** section by August 6, 2010.

**ADDRESSES:** You may submit comments by one of the following methods:

- *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments on Docket No. FWS–R4–ES–2008–0119.
- *U.S. mail or hand-delivery:* Public Comments Processing, Attn: RIN 1018–AW08; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Drive, Suite 222; Arlington, VA 22203.

We will not accept e-mail or faxes. We will post all comments on *http://www.regulations.gov.* This generally