

**AMENDMENT TO THE 2005  
CONSERVATION AGREEMENT AND  
STRATEGY  
FOR THE  
LEAST CHUB (*IOTICHTHYS  
PHLEGETHONTIS*)**



Photograph by Mark Belk

**February 2014**

**Prepared by: Least Chub Conservation Team**

## **BACKGROUND**

Initially formalized in 1998 (Perkins et al. 1998, entire), and revised in 2005 (Bailey et al. 2005, entire), the Least Chub Conservation Agreement and Strategy (LCCAS) is a collaborative and cooperative effort among resource agencies to develop and implement conservation actions for least chub (*Iotichthys phlegethontis*) and its habitat. The purpose of the partnership is to ensure the long-term persistence of least chub within its historic range and provide a framework for future conservation efforts. The Utah Department of Natural Resources, Division of Wildlife Resources (UDWR), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), Bureau of Reclamation (BOR), Utah Reclamation Mitigation and Conservation Commission (URMCC), Central Utah Water Conservancy District (CUWCD), Confederated Tribes of the Goshute Reservation, and Southern Nevada Water Authority (SNWA) are signatories to these agreements and have implemented conservation actions to benefit least chub and its habitat, monitored their effectiveness, and adapted strategies as new information became available. Among other actions, coordination under the LCCAS resulted in the acquisition and purchase of occupied habitat, creation of exclosures to limit grazing or full removal of grazing at wild population sites, an agreement with the mosquito abatement districts to limit the introduction and use of western mosquitofish (*Gambusia affinis*), establishing introductions of least chub within historical unoccupied habitat, Memorandums of Understanding (MOU) with grazing operators on private lands, restoration of habitats, and groundwater monitoring within wild population sites.

This amendment to the 2005 LCCAS outlines several additional conservation actions that will be enacted to further address the threats that were identified in the USFWS June 22, 2010 12-month finding (75 FR 35398). This amendment reviewed the most recent least chub population and habitat information and found that the following should ensure continued protection of least chub from identified threats: 1) a Candidate Conservation Agreement with Assurances (CCAA) with private landowners; 2) the purchase of grazing rights on UDWR land; 3) funding for a Population Viability Analysis (PVA) to evaluate wild and introduced populations; 4) nonnative fish management plans; 5) additional fencing and habitat restoration of key sites, 6) maintenance and monitoring of introduced populations and evaluation of how they offset threats; and 7) completion of a bathymetry study of a wild population site.

Overall, the LCCAS amendment addresses the following threats to the least chub, originally described in the USFWS 12-month finding: 1) livestock grazing; 2) groundwater withdrawal; 3) inadequacy of existing mechanisms to regulate groundwater withdrawal; 4) nonnative fishes; 5) the effects of climate change and drought; and 6) cumulative interaction of individual factors listed above (Table 1).

## **GOAL**

The goal of the LCCAS and this amendment is to ensure the long-term persistence of the least chub within its historic range, provide a framework for future conservation efforts, and ultimately eliminate or significantly minimize the threats identified in the USFWS 2010 12-month finding such that listing the species is no longer necessary.

## **Objectives**

The following objectives were described in the 2005 LCCAS and will continue to be enacted through this amendment:

Objective 1: To eliminate or significantly reduce threats to least chub and its habitat to the greatest extent possible;

Objective 2: To restore and maintain self-sustaining populations throughout its historic range that will ensure the continued existence of least chub.

- a. Maintain all six wild populations and their respective introduced populations.
- b. Maintain introduced population goals of three per GMU source with at least one per distinct wild population source.

These objectives will continue to be achieved through implementation of the LCCAS and this Amendment. The status of least chub will be evaluated annually to assess program progress and additional conservation actions will be implemented and monitored for effectiveness in an adaptive management framework. For more information see specific conservation actions in the CONSERVATION ACTIONS section below and in Table 3.

## **OTHER BENEFITS**

The primary focus of this agreement is the conservation of least chub and its habitat; however, other species occurring within or adjacent to the least chub's occupied habitat may also benefit. These species include Columbia spotted frog (*Rana luteiventris*), a State of Utah sensitive species which is managed under a Conservation Agreement and Strategy, boreal toad (*Bufo boreas*) a species under review by USFWS, and the California floater (*Anodonta californiensis*), a mollusk listed as a State of Utah species of concern. By emphasizing the conservation of habitats and ecosystems where least chub occur, the accomplishment of actions identified in the LCCAS should significantly reduce or eliminate threats for these species as well.

## **INVOLVED PARTIES**

### **United States Department of the Interior**

**Fish and Wildlife Service**  
Utah Ecological Services Field Office  
West Orton Circle Suite 50  
West Valley City, UT 24119

**Bureau of Land Management**  
Utah State Office  
440 West 200 South, Suite 500  
Salt Lake City, UT 84101

**Bureau of Reclamation**  
Upper Colorado Region  
125 South State Street, RM 6107  
Salt Lake City, Utah 84138-1102

**Utah Department of Natural Resources**  
**Division of Wildlife Resources**  
1594 W. North Temple  
Salt Lake City, Utah 84116

**Utah Reclamation Mitigation and Conservation Commission**  
230 South 500 East, Suite 230  
Salt Lake City, UT 84102

**Central Utah Water Conservancy District**  
355 W. University Parkway  
Orem, UT 84058

**Southern Nevada Water Authority**  
PO Box 99956  
Las Vegas, NV 89193

## **AUTHORITY**

All parties to the LCCAS and this amendment recognize that each agency has specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of species and the management and development of public land and water resources. Nothing in the LCCAS or this amendment is intended to abrogate any of the parties' respective responsibilities. The LCCAS and this amendment is also subject to and is intended to be consistent with all applicable Federal and State laws and regulations.

Section 4 of the Endangered Species Act (ESA) requires species to be listed as endangered or threatened solely on the basis of their biological status and threats to their existence. When evaluating a species for listing, the USFWS considers five factors: 1) the present or threatened destruction, modification, or curtailment of a species' habitat or range; 2) overutilization of the species for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) inadequacy of regulatory mechanisms; and 5) other natural or manmade factors that affect the continued existence of the species.

However, it is easier to conserve species before they need to be listed as endangered or threatened than to try to recover them when they are in danger of extinction or likely to become endangered. Candidate Conservation Agreements (CCAs) are voluntary agreements among management agencies (including any local, state and federal agencies) to reduce or remove threats to candidate or other at-risk species. Parties to a CCA work with the USFWS to design conservation measures and monitor the effectiveness of plan implementation. The USFWS can take existing and future conservation measures into account when evaluating the status of species in accordance with section 4 of the ESA and evaluate the conservation measures under the Policy

for Evaluation of Conservation Efforts When Making Listing Decisions (PECE). The purpose of PECE is to ensure consistent and adequate evaluation of recently formalized conservation efforts when making listing decisions. The policy provides guidance on how to evaluate conservation efforts that have not yet been implemented or have not yet demonstrated effectiveness. The evaluation focuses on the certainty that the conservation measures will be implemented and effective.

The national interagency Memorandum of Understanding (MOU) for the conservation of species tending towards federal listing issued on January 25, 1994 (94-SMU-058) provides the general framework for cooperation and participation among cooperators in conservation of these species. The LCCAS is consistent with the provisions of the national interagency MOU.

The BLM, a signatory to the 1998 and 2005 LCCAS (Perkins et al. 1998, entire; Bailey et al. 2005, entire), has an updated Special Status Species Management Manual that provides guidance for the management and conservation of federally listed and other special status species and the habitats on which they depend (BLM 2008). Methods and procedures of conservation include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, and transportation. As applied to special status species, conservation means to use, and the use of, methods and procedures such that there is no longer any threat to their continued existence or need to continue their status as a special status species. Additionally, the BLM has land use management plans, specifically, the BLM Fillmore Field Office's 1993 House Range Resource Area Resource Management Plan Amendment that designated Gandy Marsh (an area occupied by least chub) as an Area of Critical Environmental Concern (ACEC) provides additional management and protection for this species (BLM 1993, entire).

The LCCAS is subject to and is intended to be consistent with all applicable Federal and State laws and regulations, as described herein, and those provided previously in the 2005 LCCAS (Bailey et al. 2005, p.2-3).

## **STATUS OF THE SPECIES**

The least chub was recognized as a threatened species by the Endangered Species Committee of the American Fisheries Society in 1972, and again in 1989 (Miller 1972, p. 250; Williams et al. 1989, pp. 2, 5). In 1980, USFWS reviewed the species' status and determined that there was insufficient data to warrant its listing as an endangered or threatened species. On December 30, 1982, USFWS classified the least chub as a Category 2 Candidate Species (47 FR 58454). In 1989, USFWS again conducted a status review, and reclassified least chub as a Category 1 Candidate Species (54 FR 554). On September 29, 1995, USFWS 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 1998 LCCAS was written and the signatories formed the Least Chub Conservation Team (Perkins et al. 1998, 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 being addressed and implemented. Consequently, USFWS withdrew the listing proposal on July 29, 1999 (64 FR 41061).

On June 25, 2007, USFWS received a petition 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. The 90-day finding (73 FR 61007, October 15, 2008) concluded the petition presented substantial information in support of listing. The subsequent 12-month finding (75 FR 35398, June 22, 2010) identified least chub as a species for which listing as endangered or threatened was warranted (with a listing priority number of 7) but was precluded due to higher priority listing decisions. Following the finding, the annual Candidate Notice of Reviews (CNOR) were completed in 2010 (75 FR 69222, November 10, 2010), 2011 (76 FR 66370, October 26, 2011), 2012 (77 FR 69993, November 21, 2012) and 2013 (77 FR 70103, November 22, 2013), all of which maintained the species as a candidate with a listing priority number of 7. As a result of the Service's multidistrict litigation settlement with petitioners, a proposed listing rule or a withdrawal of the 12-month finding is required by summer 2014.

## **SPECIES INFORMATION**

This section provides a brief species description and an update to the 2005 LCCAS, including current biological information, surveys and ongoing research of the species since 2005.

### Species Description

The least chub is a minnow endemic to the Bonneville Basin of Utah, and is the sole representative of the genus *Iotichthys* (Bailey et al. 2005, p. 18). As implied by its common name, the least chub is a small fish less than 55 millimeters (2.1 inches) long (Sigler and Sigler 1987, p. 182). Historically, least chub inhabited a variety of habitat types in different environments, including rivers, streams, creeks, springs, ponds, marshes and swamps (Sigler and Sigler 1987, p. 182). Today, the species is typically found in spring and marsh complexes in association with a variety of herbaceous emergent, floating, and submergent vegetation (Crist and Holden 1980).

The least chub is a partial and intermittent spawner. Crawford (1978, p. 2) found that least chub females produced only a few eggs at a time but release eggs over an extended period. This unique reproductive strategy coupled with broad tolerances to water quality extremes, and the ability to mature in one year, allow the least chub to successfully reproduce in the strongly fluctuating environment of the spring/marsh complexes typical of desert habitats (Crawford 1978, p. 2; Crawford 1979, pp. 47-48; Hickman 1989). In general, the springs where least chub are found exhibit cool stable temperatures, relatively low, stable dissolved oxygen values, and low conductivities. The connected marshes display higher temperatures, conductivity, pH and dissolved oxygen than the spring areas (Hickman 1989). Seasonal water quality changes in the aquatic habitats and life history requirements result in fish movement back and forth between the different habitat types, especially between springs and marshes (Crist and Holden 1980). The presence and accessibility of these warmer marsh habitats has produced strong year classes and viable populations (Billman et al. 2006, p. 434). Therefore, maintenance of 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).

Additional information on least chub taxonomy, distribution, adult and larval behavior and ecology, and other species information can be found in the USFWS 12-month finding (75 FR 35398, June 22, 2010).

## Population Dynamics and Status

### *Population management*

Establishment of additional populations of least chub in an effort to provide additional security for existing populations has been a goal of the conservation team since it was established. Early introductions were not highly successful but additional information on least chub habitat requirements informed later introductions to increase the success rate. The goals of the introduced populations have changed since the establishment of the 1998 LCCAS, from two introduced populations for each of the three genetically distinct populations, to two introduced populations for each of the six wild populations, to the current goal of three introduced populations for each of the three genetic management units (GMU) with at least one of the introduced populations representing each of the six wild populations. The current goal was based on genetic analysis (Mock and Miller 2003), recommendations from the Oregon State University (OSU) adaptive management tool (Peterson and Saenz 2013, in draft), and the agreement of the conservation team based on the available evidence that the GMU was the appropriate conservation unit.

At this time the criteria and definition of an introduced population was also modified. When experimental introductions failed, they typically failed in the first year or two after introduction. The team decided that a successful introduced population must have at least two seasons of documented recruitment and must face no significant threats at the site; otherwise it was considered an experimental introduction until these conditions could be met. Although introduction sites are selected based on their low level of existing threats, a thorough threat assessment is conducted prior to least chub introduction at the site, and includes evaluation of the water source and stability, presence of non-native fish (presence does not exclude site from consideration), land use, habitat, and the site ownership (UDWR 2013b, entire).

Currently, the introduced population goals (requiring three introduced populations for each of the three GMUs with at least one of the introduced populations representing each of the six wild populations) have been met or exceeded for all but one wild population (Table 1). The Clear Lake population in the Sevier GMU currently does not have a representative introduced population. In 2013, a fire and debris flow impacted the population at Willow Springs, the only Clear Lake introduced population site. UDWR and BLM personnel salvaged as many fish as possible, and relocated them to the Fisheries Experiment Station (FES) hatchery facility. UDWR is working to reestablish an introduction site for this population. Additional fish will be transported from Clear Lake to FES in 2014 to increase the founding number of individuals for this temporary hatchery population. This population will be held at FES until a suitable introduction site can be found. The Clear Lake population was also introduced into Teal Springs in 2013. This introduction is currently considered an experimental population, as it is too recent

**Table 1. Introduced least chub sites by GMU, wild population source, land ownership, year introduced (Yr), size, surface acres (Ac), water source and rights, grazing activity, site security and presence of mosquitofish (MOF).**

Name	Source GMU	Source Pop	Ownership	Yr	Size	Ac	Complexity	Water Source	Water Right	Grazing	Site Security	MOF	Notes
<b>Introduced populations meeting refuge criteria</b>													
Fitzgerald WMA	Sevier	Mills Valley	UDWR	2006	Large	147	Pond & natural wetland	Faust Creek and spring	Yes	No	Med	No	
Rosebud Top Pond	Sevier	Mills Valley	Private	2008	Med	4.5	semi-natural	2 springs, 1 piped	Yes, private	No	Med	No	
Cluster Springs	Sevier	Mills Valley	BLM	2008	Small	0.1	Natural ponds	Springs	Yes, BLM	fenced; mod elk use	High	No	
Escalante Elementary	Wasatch Front	Mona	Local Gov	2006	Small	0.08	Constructed ponds	Well	Unk.	No	High	No	
Upper Garden Creek	Wasatch Front	Mona	State Parks	2011	Small	0.4	Semi-natural	Perennial stream	Yes, Parks	No; fenced from buffalo	Med	No	
Deseret	Wasatch Front	Mona	DoD	2011	Med	0.9	Constructed ponds	Perennial stream	No	No	Very High	No	
Red Knolls Pond	West Desert	Bishop	BLM	2005	Small	0.03	Semi-natural	Spring	Yes, BLM	No	Med	No	
Keg Spring	West Desert	Gandy	BLM	2009	Small	0.2	Semi-natural	Spring	Yes, BLM	Fenced; water gap	Med	No	
Pilot Spring	West Desert	Leland Harris	BLM	2008	Small	0.33	Semi-natural	Spring	Yes BLM	Yes, seasonal. Water gap.	High	No	
Pilot Spring SE	Sevier	Mills Valley	BLM	2008	Small	0.25	Semi-natural	Piped from springs	Yes, BLM	Yes, winter only.	High	No	
<b>Introduced populations anticipated to meet refuge criteria in the coming years</b>													
Stokes Nature Center	Sevier	Mills Valley	Private	2008	Small	0.5	Natural pond	old river oxbow, springs	Yes, private	No	High	No	No MOU
Chambers Spring	Sevier	Mills Valley	Private	2008	Med	0.4	Natural pond	Spring	Yes, private	No	Med	No	No MOU
Fairfield Big Spring	Wasatch Front	Mona	Private	2013	Med	2	Natural spring	Spring	No	No	Med	No	New site

to meet the introduction criteria. Depending on the success of this introduction, it could be considered a successful introduced population for Clear Lake by 2015.

The introduced populations provide redundancy and resiliency to the wild least chub populations. The intent of these populations is to create a secure genetic refuge, mitigate current and future threats that may affect wild populations, and provide a source for reestablishing a wild population or introducing additional populations if needed.

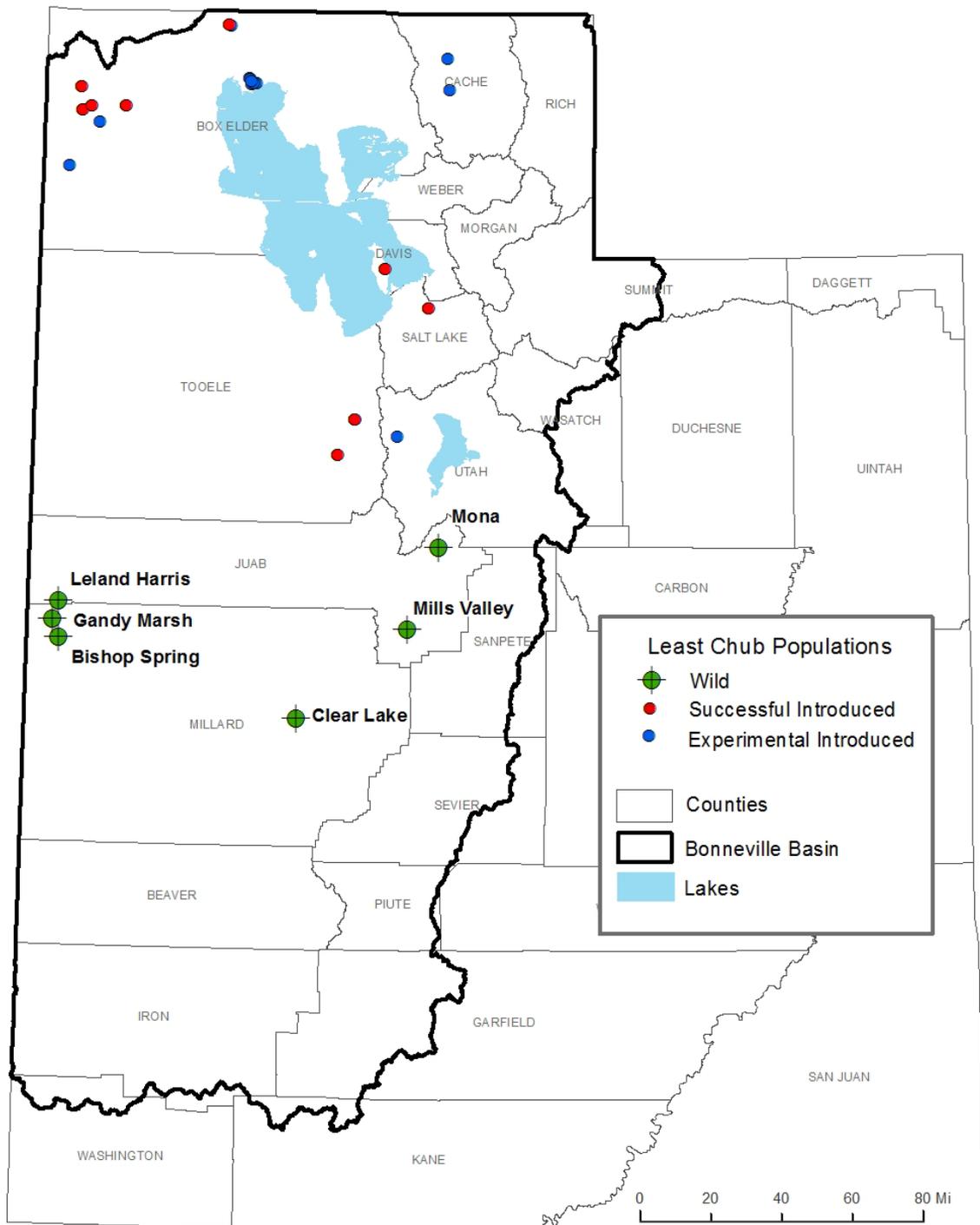
### *Least chub populations*

The six wild populations occur in three basins in Utah (Figure 1). The least chub populations within these basins are more closely related to each other than to populations in other basins (Mock and Miller 2003, pp. 17-18) and are managed as three GMUs. The wild populations within these GMUs are the West Desert (Bishop, Gandy, Leland Harris), Sevier Basin (Mills Valley and Clear Lake), and Wasatch Front (Mona).

#### **West Desert GMU:**

The west desert populations were the first populations of least chub discovered, and all occur in the Snake Valley of Utah. They consist of large complex spring and wetland systems made up of multiple springheads. There are three refuge populations for this GMU, one representing each of the three wild populations (Red Knolls Pond, Keg Spring, and Pilot Spring). The modeled 100 year extinction probabilities for each of these sites (with a probability of catastrophic events of 0.025 and probability of mosquitofish introduction of 0.023) is: Gandy = 0.179, Bishop = 0.275, Leland Harris = 0.414, Red Knolls = 0.00, Keg = 0.00, and Pilot = 0.89 (Peterson and Saenz 2013, in draft). Assuming that each of the populations are independent, probabilities of extinction for individual sites can be multiplied together to provide a probability that at least one population of the group persisting. Using 0.001 for sites with a 0.00 probability results in a probability of at least one of these populations persisting of 100 per cent.

- (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 12-15 springheads that feed a playa wetland; with habitat fluctuating in size seasonally. Least chub have been monitored at this site since 1993 with successful reproduction and recruitment documented during each annual survey (Hines et al. 2008, pp. 41-43; UDWR 2010, p. II-6; UDWR 2013a p. II-6). 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 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 Marsh is south of the Millard/Juab County line and the Leland Harris Spring Complex and consists of private, 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 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 Marsh site and comprises a wild self-sustaining population (Hines *et al.* 2008, p.



**Figure 1. Locations of the wild and introduced least chub populations within the Bonneville Basin of Utah.**

40; UDWR 2012a, p. III-3). The number of occupied sites within the marsh decreased about 50 percent between 1993 and 2009 (Hines et al. 2008, p. 41; UDWR 2010, III-8; UDWR 2012a, p. III-9). UDWR biologists manually restored degraded springhead habitats between 2006 and 2012 resulting in an increase of occupied sites within the marsh (18 of 52 sites) to the highest level since 1994 (UDWR 2012a, p. III-3; UDWR 2013a p. III-6). The least chub population in Gandy Marsh is stable and has demonstrated successful reproduction and recruitment during each annual sampling survey (Hines et al. 2008, p. 38; UDWR 2010, p. III-3; UDWR 2012a, p. III-3, 9; UDWR 2013a, p. III-5).

- (3) Bishop Springs Complex: Least chub were first 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 of and very near Gandy Marsh, the site has large springs containing least chub, including Central Spring and Twin Springs (Hines et al. 2008, p. 38), and recently, Foote Spring. Least chub were introduced to Foote Spring in 2010, and were not observed in 2011 but were abundant in 2012 (UDWR 2013a, p. III-5). In 2012, UDWR biologists began extensive nonnative plant removal from Foote Spring and anticipate continued removal efforts at this location. The least chub population in Bishop Springs is stable and has demonstrated successful reproduction and recruitment during each annual sampling survey (Hines et al. 2008, p. 38; UDWR 2010, p. III-3; UDWR 2012a, p. III-3, 9; UDWR 2013a, p. III-5).

#### **Sevier Basin GMU:**

The Mills Valley and Clear Lake populations occur in this GMU. These populations were discovered more recently than the other populations. There are four introduced populations for Mills Valley (Fitzgerald WMA, Rosebud Top Pond, SE Pilot Spring, and Cluster Springs). The 100 year extinction probability has not been calculated for Clear Lake yet and it is lacking a successful introduced population that meet the introduction criteria. The modeled 100 year extinction probability for Mills Valley introduced sites (with a probability of catastrophic events of 0.025 and probability of mosquitofish introduction of 0.023) is: Mills Valley = 0.021, Fitzgerald WMA = 0.00, Rosebud = 0.00, SE Pilot = 0.76, and Cluster = 0.79 (Peterson and Saenz 2013, in draft). The probability that at least one of these populations will persist for 100 years is 100 per cent.

- (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. Least chub juveniles and adults have been present during sampling since 2001, indicating successful reproduction and recruitment (Hines et al. 2008, p. 44; UDWR 2010, p. II-7; UDWR 2012a, p. II-11; UDWR 2013a, p. II-7). In 2013, mosquitofish were detected at the UDWR Waterfowl Management Area (WMA) during annual sampling.
- (5) Clear Lake: In 2003, UDWR biologists found least chub at the UDWR owned Clear Lake WMA in Millard County (Hines et al. 2008, p. 45). The site consists of diked ponds fed by springs from adjacent Spring Lake, and is managed by UDWR for waterfowl habitat

(Hines et al. 2008, p. 45). The least chub population in Clear Lake is stable and has demonstrated successful reproduction and recruitment during each annual sampling survey (Hines et al. 2008, p. 45; UDWR 2010, p. III-3; UDWR 2012a, p. III-3; UDWR 2013a, p. II-3-4).

### **Wasatch Front GMU:**

The Mona Springs population is the only wild site in this GMU. Mosquitofish have invaded the site and pose a significant threat to the wild population. Least chub were salvaged from Mona Springs soon after the mosquitofish discovery and placed in the Wahweap Hatchery. The hatchery population has been the source of fish for the creation of multiple introduced populations and restocking least chub back into the wild Mona population site. There are three refuge populations for Mona (Escalante School, Upper Garden Creek Pond, and Deseret Chemical Depot). The original Mona population was considered functionally extirpated, and no estimated extinction probability was calculated for the population. Extensive habitat restoration and restocking occurred in 2012 and 2013, in an effort to restore the viability of the site. Although it is too early to determine, the restoration may prove to be successful for least chub in select areas of the spring complex. The modeled 100 year extinction probabilities for each of these refuge sites (with a probability of catastrophic events of 0.025 and probability of mosquitofish introduction of 0.023) is: Upper Garden Creek Pond = 0.92, Deseret = 0.00, Escalante = 0.94 (Peterson and Saenz 2013, in draft). The probability that at least one of these populations will persist for 100 years is 99.9 per cent.

- (6) Mona Springs: The UDWR biologists discovered this least chub site in northeast Juab County in 1995 (Mock and Miller 2003, p. 3). At that time, Mona Springs provided habitat for a genetically distinct, naturally occurring population of least chub. However, the Mona Springs site is currently not suitable for least chub because of the presence of nonnative fish; only four least chub were collected here in 2008 (LCCT 2008, p. 3), 13 in 2009 (UDWR 2010, p. II-8), three in 2010, five in 2011 and nine least chub in 2012 surveys (UDWR 2012a, p. II-11; UDWR 2012b p. II-13; UDWR 2013a, p. II-9).

### Threats to the species

The USFWS assesses existing and potential threats facing a species based on the five criteria as required by Section 4(a) (1) of the ESA. Within each of these criteria, several factors which have contributed to the degradation of least chub habitat and its populations were identified in the USFWS least chub 12-month finding. Threats that were identified included: 1) livestock grazing; 2) groundwater withdrawal; 3) nonnative fishes; 4) inadequacy of regulatory mechanisms to address groundwater withdrawal; 5) the effects of climate change and drought; and 6) cumulative interaction of the individual factors listed above. For a thorough discussion of threats see the USFWS 12-month finding (75 FR 35398, June 22, 2010) and most recent CNOR (77 FR 70103, November 22, 2013).

Despite these identified threats, stable population levels and juvenile recruitment have been documented in the wild and introduced populations over the past several years through intensive monitoring efforts by UDWR (see Population Dynamics and Status above for more information) and the numerous conservation actions outlined in the LCCAS. By addressing these threats with

the additional conservation measures provided through this amendment (Table 3) the conservation committee anticipates that juvenile least chub recruitment and stable or increasing trends in the wild populations will continue.

## **PREVIOUSLY IMPLEMENTED CONSERVATION ACTIONS**

The partnership established under the LCCAS has committed and has been successful at implementing conservation measures to protect least chub. Some of these actions include the acquisition and purchase of occupied habitat, creation of enclosures to limit grazing or full removal of grazing at wild population sites, an agreement with the mosquito abatement districts to limit the introduction and use of mosquitofish, establishing refuge and reintroductions of least chub within historical habitat, Memorandums of Understanding (MOU) with grazing operators on private lands, restoration of habitats (e.g. bank stabilization, non-native vegetation removal, dredging of springheads), fencing to exclude grazing, and groundwater monitoring within wild population sites. A summary of these actions, by site, are described below, while the efforts in their entirety are presented in Table 2, documenting the level of effort and commitment of LCCAS signatories.

- (1) **Mona Springs:** Habitat in the vicinity of Mona Springs was originally privately owned, but the URMCC acquired 34.6 ha (85.5 ac) in 1998 and an additional 7.2 ha (17.7 ac) in 2006 for the protection of least chub (Hines et al. 2008, p. 34). The URMCC has recently purchased and protected an additional 18 ha (44.5 ac) of land on the north end of the spring complex (Wilson 2009c, pers. comm.). Livestock grazing was removed from the site in 2005, and habitat enhancement projects to deepen the springs and remove Russian olive (and other non-native vegetation) commenced in 2011. Since 2000, UDWR continues to conduct nonnative fish removals at Mona, with successful recruitment documented in 2013.
- (2) **Leland Harris Spring Complex:** Land ownership for least chub occupied habitat is a combination of private (50 per cent) and UDWR (40 per cent) lands (now managed by UDWR following a land swap with SITLA in 2014), with about 10 per cent owned by the BLM (Hines et al. 2008, pp. 41-42). Miller Spring (located in this complex) and its surrounding wetlands (approximately 20.2 ha (50 ac)) are privately owned but are under a grazing management plan and agreement between UDWR and the private landowner. Paddocks for rotational grazing and enclosures to reduce springhead access by cattle were completed at Miller Spring in 1998.
- (3) **Gandy Marsh:** Land ownership includes BLM (70 per cent), private lands (30 per cent) and SITLA (one per cent). 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). Some springheads on the privately owned parcel were voluntarily exclosed by the landowner, significantly reducing the entrainment rate of livestock. Degraded springheads are restored on an annual, rotating basis to counteract the historical livestock damage, and have resulted in increased least chub occupancy post-restoration.

- (4) Bishop Springs Complex: Land ownership is primarily BLM (50 per cent), but includes SITLA (40 per cent) and private lands (10 per cent). In 2006, UDWR entered into a CCAA with the landowner to purchase water rights for Foote Reservoir and Bishop Twin Springs (Wilson 2009, 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, providing for instream flow on 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). Fencing around Foote Reservoir to exclude livestock, and Russian olive removal are recently completed projects.
- (5) Mills Valley: Nearly 80 per cent of the occupied habitat at Mills Valley is privately owned, the remaining 20 per cent (80 ac) is owned by UDWR as the Mills Meadow WMA (Wilson 2009, pers. comm.). UDWR has been working with landowners to improve the current grazing management plans (Hines et al. 2008, p. 43). Livestock grazing rights at this WMA are provided to adjacent landowners in exchange for public and UDWR access to their property (Stahli and Crockett 2008, p. 5).
- (6) Clear Lake: This population occurs on the Clear Lake WMA, which is managed by UDWR. Between 2003 and 2013, the Clear Lake Aquatic Control Plan implementation has removed over 1,600 adult (and over 1,600 young-of-year) common carp from Clear Lake.

**Table 2. Implemented and completed conservation actions to address threats to the least chub as identified in the 1998 and revised in the 2005 LCCAS.**

GOALS	Implemented and Completed Actions
Determine baseline population, life history, and habitat requirements	<ol style="list-style-type: none"> <li>1. Discovered Mills Valley population in 1998.</li> <li>2. In 2000, a study was funded to assess the ecological integrity and condition of Utah's desert wetlands, several west desert sites showed that they were minimally impacted and were classified as reference sites (Keleher and Rader 2008).</li> <li>3. In 2003, discovered the Clear Lake WMA population from thorough surveys, habitat evaluations, and aerial videography.</li> <li>4. Additional life history information determined through research, including mosquitofish studies, and structural biodiversity of the wild sites.</li> <li>5. In 2004, the process to evaluate range expansion sites was completed.</li> <li>6. In 2004, an evaluation of monitoring methods resulted in new sampling protocols.</li> <li>7. 2004-2006, BIO-West conducted ecological evaluations of aquatic ecosystems within Snake Valley, including least chub habitats (submitted to SNWA).</li> <li>8. Coordination with UGS to install and monitor a series of deep groundwater monitoring wells and flow gauges at springheads within Snake Valley wetlands.</li> <li>9. Installed and coordinated with UGS to monitor shallow wetland piezometers throughout least chub sites in Snake Valley to establish seasonal and interannual wetland trends.</li> <li>10. 2010, conducted baseline physical habitat conditions study of wetlands in Snake Valley with corresponding LIDAR data (3PPI; 2010)</li> </ol>
Genetic integrity	<ol style="list-style-type: none"> <li>11. 2005, determined the genetic structure of 6 wild and 2 refuge populations</li> <li>12. Revised the Hatchery Production Plan for genetic backup through 2035.</li> </ol>

	<p>13. Evaluated genetic divergence in refuge populations: The results indicated that the translocation programs, using large numbers of individuals to establish refuge populations, have been successful in maintaining the genetic identity of the source populations.</p>
Habitat enhancement, (including restoration, land acquisition, grazing removal and exclosures)	<p>14. From 1998 to 1999 UDWR and URMCC acquired the Mona Springs Complex to protect least chub, Columbia spotted frog, and California floater.</p> <p>15. In 2000, UDWR enhanced habitat at Mona and in 2005, removed grazing from the site.</p> <p>16. Habitat enhancement at Mona from 2011-2013 deepened spring systems and removed Russian olive and other nonnative vegetation.</p> <p>17. Russian olive and tamarisk removal at Leland Harris, Miller Springs, and Bishop.</p> <p>18. Restoration: Springhead restoration, by means of manually removing sediment and vegetation, has proven to be a cost-efficient and effective way to improve least chub habitat and improve the population at Gandy Marsh. Led to successful reestablishment of least chub in newly restored springheads.</p> <p>19. UDWR purchased water rights for beneficial instream use at Foote Reservoir, USFWS drafted a CCAA with the landowner for these water rights</p> <p>20. From 1998-current, livestock grazing impacts at Miller Springs and the surrounding wetlands (approximately 50 acres) are reduced through a grazing management plan, wetland enhancement project and exclosures around multiple springheads.</p> <p>21. In 2005, Pilot Springs, a reintroduction site, was fenced</p> <p>22. In 2012, 28 acres around Foote Spring cleared of Russian olive. Led to documented increase in flow to Bishop Springs wetland.</p> <p>23. Mechanical removal of purple loosestrife from Gandy Marsh between 2011-2013</p> <p>24. In 2011, drilled well at Clear Lake to study feasibility of pumping to increase habitat (although it was determined that groundwater was too deep to effectively pump).</p> <p>25. In 2014, the SITLA property at Leland was part of a landswap with UDWR, transferring ownership and management of the parcel to UDWR.</p>
Nonnative control	<p>26. In 1999, prior to nonnative fish removal at Mona, a wooden drop structure was constructed to prevent re-invasion of nonnative fishes after the project.</p> <p>27. In 1999, rainbow trout were removed from Miller Spring.</p> <p>28. In 2000 and 2011-2013, Funded by the BOR, UDWR conducted a nonnative fish removal project at the Mona spring complex.</p> <p>29. In 2001, a study was funded to evaluate interactions between mosquitofish and least chub, as well as examine least chub growth rates using otoliths.</p> <p>30. In 2002, the MOU between the Division and the Mosquito Abatement District was finalized to reduce the spread of mosquitofish in Utah.</p> <p>31. From 1999-ongoing, UDWR follows the Policy for Fish Stocking and Transfer Procedures, includes specific protocols for the introduction of nonnative species into Utah waters.</p> <p>32. From 2000-ongoing, mechanical removal of nonnatives from Mona.</p> <p>33. In 2003 and 2004, Red Knolls Pond and Pilot spring were chemically treated to prepare them as introduction sites.</p> <p>34. The Clear Lake Aquatic Control Plan written and implemented; between 2003 and 2013, over 1,600 adult (and over 1,600 young-of-year) common carp removed from Clear Lake.</p> <p>35. In 2008, chemical treatment conducted to remove nonnative carp and bass from Foote Spring in Bishop Springs wetland.</p>
Reintroduction	<p>36. In 2006, the LCCT drafted reintroduction and transplant protocols to establish genetic backup/refuge sites for each wild population to protect them from extinction due to demographic and environmental stochasticity or random catastrophes.</p> <p>37. By 2013, 26 introduction and experimental sites had been established.</p> <p>38. The Mona Springs population augmented from the hatchery population.</p>
Monitoring	<p>39. Least chub populations have been monitored annually since 1994, producing presence/absence and some juvenile recruitment data.</p>

## CONSERVATION ACTIONS UNDER THIS AMENDMENT

The conservation actions described in this Amendment were developed to address the threats identified in the USFWS 12-month finding. This section appends the conservation strategy section of the LCCAS with additional conservation actions, for example, a Candidate Conservation Agreement with Assurances (CCAA) with private landowners, the purchase of grazing rights, funding for a Population Viability Analysis (PVA) to evaluate wild and introduced populations, nonnative fish management plans, additional fencing and habitat restoration of key sites, maintenance and monitoring of introduced populations and evaluation of how they offset threats, and a bathymetry study of a wild population site. These actions are needed to better understand how certain threats may affect least chub and ensure continued protection of least chub from ongoing threats. Conservation actions are categorized by identified threats and are described below, with specific actions that will be enacted to address them presented in Table 3.

### Livestock grazing

Although efforts to control and minimize damage are ongoing, livestock grazing occurs on a portion of habitat at most wild least chub sites. A few instances of localized extensive livestock grazing-related damage have occurred in the last couple of years, and livestock grazing on private lands where least chub occur remains partially unregulated. Grazing damage is not always severe where it occurs, and livestock are effectively excluded from portions of occupied habitat through previous conservation actions under the LCCAS. UDWR is pursuing several proactive measures to reduce grazing impacts (e.g., UDWR 2012a, pp. II-18) and the success of these and similar measures will reduce the remaining impacts of grazing. Such actions include the purchase of grazing rights on UDWR owned land at Mills Valley, encouragement of grazing operator landowners to minimize grazing-related impacts to least chub through enrollment in the Programmatic CCAA, and active restoration of habitats impacted by grazing.

Under CCAA enrollment, modified grazing regimes would minimize impacts to least chub at Mills Valley, a wild population site where more than 80 per cent of the land is privately owned. Additionally, the fencing and nonnative vegetation removal at severely impacted sites, such as Twin Springs (at Bishop), will minimize the direct impacts of grazing activities near these least chub occupied water sources. For those sites with springheads that have been heavily impacted, restoration of the springheads has proven to be successful, with least chub returning to unoccupied springheads in as little as two months post-restoration. Furthermore, the Population Viability Analysis decision model, currently in preparation, will provide guidance and recommendations on grazing regimes for specific rest times for each habitat type (e.g. shallow and deep springs), that will thus inform grazing operators and aid in further minimizing livestock impacts.

## Groundwater withdrawal and inadequacy of existing mechanisms to regulate groundwater withdrawal

Water levels of springs have been identified as important in the life history of least chub (Lamarra 1981; Crist and Holden 1990). These springs are dependent on underground water sources that flow from the mountains into the low-lying valleys. Local and regional groundwater-development projects in eastern Nevada and western Utah have the potential to lower groundwater levels and reduce groundwater-fed spring flow at sites populated by least chub.

Effects on least chub from the SNWA Clark, Lincoln, and White Pine Counties Groundwater Development Project, under the selected alternative, were identified by the BLM as unlikely (BLM FEIS 2012, p. 3.7-48), and the project alternative selected by the BLM in the Record of Decision (December 18, 2012) does not include groundwater pumping by SNWA in Snake Valley. In addition, through Federal legislation, the Lincoln County Conservation, Recreation, and Development Act of 2004 (Public Law 108-424, 118 Statute 2403, November 30, 2004), has stated under § 301(3), that:

*Prior to any transbasin diversion from ground-water basins located within both the State of Nevada and the State of Utah, the State of Nevada and the State of Utah shall reach an agreement regarding the division of water resources of those interstate ground-water flow system(s) from which water will be diverted and used by the project. The agreement shall allow for the maximum sustainable beneficial use of the water resources and protect existing water rights.*

To date, no agreement between Utah and Nevada has been signed, and thus no transbasin groundwater diversions are expected until after an agreement is met; however, in-state diversions within Utah and Nevada are and can still occur within Snake Valley. In response, USFWS, UDWR, and BLM have agreed to continue to petition and formally protest new water rights applications that infringe on USFWS, UDWR, and BLM water rights and their lands that contain least chub. In addition, SNWA is a signatory to this Amendment and is committed to avoiding and/or mitigating impacts on least chub from groundwater withdrawal within the constraints of SNWA policy and authority.

In an effort to monitor current groundwater levels and associated withdrawals in the Snake Valley, U.S. Geological Survey under a cooperative funding agreement with SNWA, Utah Geological Survey and UDWR have installed and actively maintain a surface and groundwater monitoring network throughout the Snake Valley, including piezometers within or adjacent to wild least chub populations. Through this continuous monitoring, interannual and seasonal variation can be tracked to establish baseline conditions. Potential changes to baseline conditions, either as a result of current or future water development or climate change, will be detectable with this monitoring network and adaptive management strategies will be employed when changes to baseline conditions present a concern for least chub.

## Nonnative fishes

Although nonnative fishes occur in several of the wild least chub populations, the mosquitofish poses a direct threat to the least chub because of its known aggressive predation on eggs and young of other fishes (Meffe 1985; Sigler and Sigler 1987). A recent study found least chub juveniles to be the most vulnerable to mosquitofish predation (Mills et al. 2004). For this reason, UDWR under the LCCAS persuaded the mosquito abatement districts in Utah to restrict stocking of mosquitofish for the protection of least chub through a signed MOU. A Nonnative Management Plan (NMP) has been developed for Clear Lake and while there is not a plan in place for Mona, active habitat management, nonnative fish removal, and least chub stocking have taken place to maintain the least chub population at this site. To date, the Clear Lake WMA NMP has been successful at controlling common carp from the site, which pose a lesser threat to least chub than do mosquitofish. In the fall of 2013, mosquitofish were detected during annual sampling at Mills Valley. The likely source is overland sheet flow from the Sevier River during a recent flood event. The LCCAS Amendment’s conservation actions specifically include the development of a NMP for this site. An adaptive management approach will be employed where nonnative control efforts will be monitored for their effectiveness and information gained through these monitoring efforts will be incorporated into future nonnative control strategies.

**Table 3. Threats to the least chub as identified in the June 22, 2010, 12-month finding, and planned actions to address those threats through this amendment to the 2005 LCCAS.**

Threat	Planned Action
<p><b>Livestock grazing</b></p>	<p><u>Rationale:</u> Overgrazing by livestock can impact aquatic spring habitats by eroding banks, compacting soils, increasing sedimentation, increasing organic waste inputs, and decreasing water quality. In some cases, livestock can become entrained in soft spring deposits, die, decompose and pollute spring habitats.</p> <p><u>Conservation Actions:</u></p> <ul style="list-style-type: none"> <li>• UDWR agrees to complete the purchase of grazing rights for Mills Valley to remove current grazing activities on the 80 acre UDWR-owned parcel by September 2015. If future land use by UDWR includes grazing activities, it will be adaptively managed for the protection of least chub.</li> <li>• UDWR and BLM agree to ensure fencing on their respective lands is functioning properly and in good working order and also agree to allow UGS access to monitoring wells and piezometers on an annual recurring basis.</li> <li>• UDWR agrees to encourage private landowners at Mills Valley, Leland, Gandy and Bishop to enroll in the Programmatic Candidate Conservation Agreement with Assurances (CCAA). Through enrollment, UDWR and USFWS would incorporate applicable conservation strategies which may include, but are not limited to, a grazing management plan that outlines a rotational grazing schedule, establishes a maximum number of grazing units, key rest periods, livestock turn-out dates and a monitoring and evaluation plan.</li> <li>• UDWR will finalize a land-swap package that includes the 739 acre SITLA property at Leland Harris, and ensure once acquired, the property will be managed by UDWR to benefit least chub.</li> </ul>

	<ul style="list-style-type: none"> <li>• BLM agrees to continue implementation of the Utah Guidelines for Grazing Management (BLM 2011) for the Partoun Grazing Allotment (which is 9 ac of the Leland site) when issuing grazing operator permits. This will ensure that a rotational grazing schedule is implemented, active grazing dates to minimize impacts to least chub and its habitat are set, and establish a maximum number of grazing units. BLM will monitor operators to ensure the guidelines are met on an annual basis and before issuing or renewing grazing permits.</li> <li>• BLM agrees to continue to implement the Gandy Allotment Management Plan permit stipulations that protect least chub habitat when issuing or renewing grazing permits within the Gandy Allotment.</li> <li>• BLM agrees to continue to manage the Area of Critical Environmental Concern (ACEC) at Gandy for least chub and other priority values.</li> <li>• UDWR agrees to purchase the privately owned parcel at the Gandy site if the landowner remains a willing seller, and funds are available for the purchase. Upon purchase of the privately owned parcel, UDWR agrees to adaptively manage grazing or remove grazing completely for the protection of least chub following the land purchase. If land purchase is not feasible, other methods, such as a landswap with BLM, inclusion in the CCAA with a GMP to protect least chub habitat, or conservation easements could be pursued to minimize livestock grazing activities to levels suitable for least chub.</li> <li>• BLM agrees to complete the fencing, watering access project and nonnative vegetation removal at South Twin Spring no later than 1 year following the signature of this agreement.</li> <li>• UDWR will continue to enhance habitat of degraded areas due to current or historical ungulate damage (or vegetation overgrowth in exclosures) within the least chub population sites through restoration activities, including, but not limited to the dredging of springheads on an annual reoccurring basis, by targeting a minimum of one location annually, through a prioritization list and schedule. Introduced population sites will be monitored for grazing related impacts and enhanced/restored on an as needed basis.</li> <li>• UDWR agrees to submit an annual report to the conservation team documenting activities implemented and status of all least chub habitats.</li> <li>• The conservation team will adaptively manage grazing at the wild sites (and applicable introduced sites) based on monitoring results of the current management actions, and modify actions as necessary to minimize grazing impacts at wild and applicable introduced sites. The conservation team will also use the decision model as guidance for grazing management and implement the grazing recommendations based on the model, where authority exists and as deemed necessary.</li> </ul>
<p><b>Groundwater withdrawal &amp; inadequacy of existing mechanisms to regulate groundwater withdrawal</b></p>	<p><u>Rationale:</u> Water development activities near least chub sites have the potential to lower the water level or dry up springs and seasonal wetlands occupied by least chub if groundwater levels are not monitored and regulatory mechanisms are not in place to limit groundwater development.</p> <p><u>Conservation Actions:</u></p> <ul style="list-style-type: none"> <li>• UDWR agrees to continue to monitor least chub populations and incorporate recommendations from the OSU model for Snake Valley sites on an annual basis (or at a frequency determined by the Conservation Team); these data will also be used to evaluate the effect of groundwater withdrawal on least chub populations if the Snake</li> </ul>

	<p>Valley groundwater is developed beyond current levels.</p> <ul style="list-style-type: none"> <li>• USFWS, UDWR and BLM agree to protest new water rights application through the formal protest process with the Utah State Engineer if the applications for water infringe on USFWS, UDWR, and BLM owned water rights and lands with least chub.</li> <li>• UDWR agrees to continue annual monitoring of water levels for all introduced sites and provide regular maintenance of water sources (e.g. pipes) at applicable introduced sites that both those that meet the refuge establishment criteria and those that are considered experimental populations.</li> <li>• UDWR agrees to coordinate with Utah Geological Survey and U.S. Geological Survey to assess current piezometer data and monitor groundwater levels at Snake Valley least chub population sites. UDWR will also coordinate with these agencies to install additional piezometers, as needed.</li> <li>• The conservation team will review the <i>Groundwater Conditions in Utah Report</i> produced annually by U.S. Geological Survey and the <i>West Desert Monitoring Report</i> to be produced annually by UGS beginning in 2014, to understand the current status of groundwater in the basins in which least chub populations occur (USGS report information for those sites outside of the Snake Valley).</li> <li>• The conservation team will evaluate the decision model being developed by OSU to assess the continued stability and suitability of habitats to support least chub and assess the potential risks, such as extinction due to fragmentation and isolation.</li> <li>• The conservation team will develop a means to integrate new and existing monitoring data into the decision model being developed to reduce key uncertainties and improve future decision-making. A summary report of the actions will be provided and reviewed on an annual basis.</li> <li>• UDWR in cooperation of the conservation team (and assistance of the Utah Geological Survey, if available) will use the in-depth habitat and bathymetry evaluation of the Leland Harris study in the development of a model that shows how water level at the least chub Snake Valley sites change in relation to the piezometer readings to establish a relationship between surface water level and wetland inundation. UDWR agrees to use the in-depth habitat and bathymetry evaluation of Leland Harris wild population site as a representative study to further understand and identify important least chub habitat use. The success of the pilot study at Leland Harris will determine its utility in applying similar methodology to other least chub wild sites; or, whether information from the Leland Harris study can be extrapolated or applied to other sites. The Leland study report will be made available to the conservation team by September 2015.</li> <li>• The Southern Nevada Water Authority agrees to consider possible impacts of SNWA activities and plans on least chub and their habitat, and avoid and/or mitigate such impacts within the constraints of SNWA policy and authority.</li> </ul>
<p><b>Nonnative fishes</b></p>	<p><u>Rationale:</u> Least chub are not an effective resource competitor in the presence of some nonnative fish species, and the specific nonnative fish species and their density in least chub habitat determine the degree of the threat to least chub.</p> <p><u>Conservation Actions:</u></p> <ul style="list-style-type: none"> <li>• Nonnative fishes are known to occur at three of the wild least chub sites, therefore UDWR agrees to continue to implement the Clear Lake WMA site-specific Nonnative Management Plan and develop and implement a Mills Valley and Mona Nonnative</li> </ul>

	<p>Management Plan until the threats associated with the nonnative species are minimized at all sites. UDWR agrees to implement the management plans as needed at each site. The Mona and Mills Valley plans will be drafted within 1 year following signature of the agreement. If it is determined that these sites can no longer be managed for least chub due to the presence of nonnative fishes, the conservation team will use an adaptive management process to decide the future use of these sites and whether additional introduced sites are needed to offset the loss.</p> <ul style="list-style-type: none"> <li>• UDWR agrees to provide documentation on current nonnative removal efforts and the effectiveness of their efforts, as shown by least chub response, in order for the conservation team to evaluate and adaptively manage for nonnative fish species.</li> <li>• UDWR agrees to maintain and enforce current UDWR code regulations that prohibit the collection, possession, transportation, and importation of nonnative fish species in order to limit stocking of species that could have a potentially negative impact to least chub.</li> <li>• UDWR agrees to distribute educational information on least chub and the negative impacts of introducing nonnative fishes to areas containing sensitive species to help limit the introduction of exotic fishes to least chub habitats.</li> <li>• The recommendations and restrictions identified through the above conservation actions will be used in adaptive management planning to accommodate changes necessary to improve the effectiveness of nonnative fish removal activities within occupied habitat. The conservation team will review these measures on an annual basis for their implementation and effectiveness.</li> </ul>
<p><b>Climate change and drought</b></p>	<p><u>Rationale:</u> The groundwater and surface water flow systems encompassing least chub habitat are affected by changes in natural climatic conditions which may result in significant decreases to precipitation and significant increases in temperature. Under future climate conditions the seasonally inundated, ephemeral spring-fed wetlands that least chub require for portions of their life history (spawning, nursery niches, and feeding), could be reduced to only a small portion of available habitat surrounding the springheads under such conditions.</p> <p><u>Conservation Actions:</u></p> <ul style="list-style-type: none"> <li>• The UDWR agrees to coordinate with Utah Geological Survey and United States Geological Survey to monitor piezometers and surface flow gages at the Snake Valley wild population sites in order to evaluate the changes in groundwater levels and spring discharge rates, respectively, and to correlate weather patterns with groundwater and surface water elevations to least chub distribution and abundance when datasets are robust enough to provide these correlations. Understanding the effects of weather patterns on least chub populations and habitat will help us develop adaptive management strategies by identifying important habitat use areas and limitations during particularly dry or warm years.</li> <li>• UDWR agrees to use the in-depth habitat and bathymetry evaluation of Leland Harris wild population site as a representative study to further understand and identify important least chub habitat use areas during particularly dry or warm years. The success of the pilot study at Leland Harris will determine its utility in applying the same methodology to other least chub wild sites. The Leland study report will be made available to the conservation team by September 2015.</li> <li>• The conservation team will receive the Population Viability Analysis and Decision</li> </ul>

	<p>Support Tool Model developed by Oregon State University to guide our past, present and future assessment of population demographics. This model coupled with the in-depth bathymetry study at Leland Harris (conducted by UDWR) will guide our management of the species under changes in drought and climate change conditions by providing the relationship of water body dimensions to seasonal precipitation, temperature, and ground and surface water levels.</p> <ul style="list-style-type: none"> <li>• The conservation team will analyze current information (and data provided through the bathymetry study at Leland) to better understand seasonal spring habitat and hydrological connectivity within population sites as they relate to least chub occupation and habitat use over time. Knowledge of seasonal and annual changes in habitat size and connectivity will be used in adaptive management planning to locate areas with limited connectivity due to prolonged drought or climate change and these areas will be prioritized for restoration or habitat modification, so that habitat corridors remain open for least chub.</li> <li>• The USFWS will evaluate current and newly established introduced populations for conservation value and UDWR agrees to continue establishing new refuge populations that meet conservation criteria until the stated refuge population goals have been met, to the extent that introduced populations can offset effects of climate change and/or extreme drought at the wild population sites.</li> <li>• Russian olive removal was successful at Foote Reservoir (Bishop Springs), where UGS was able to measure an increase in discharge from the spring due to a decrease in evapotranspiration from the nonnative vegetation. BLM and UDWR agree to additional Russian olive removal at Twin Springs (Bishop) within 1 year after signature of the agreement.</li> </ul>
<p><b>Cumulative effects of climate change, groundwater withdrawal &amp; drought</b></p>	<p><u>Rationale:</u> Addressing the threats listed above independently will prevent these threats from acting cumulatively.</p>

## MONITORING AND ADAPTIVE MANAGEMENT

Least chub conservation includes four levels of monitoring and management: 1) population assessment and environmental correlates (habitat); 2) effectiveness of conservation actions; 3) adaptive management; and 4) compliance with regulatory mechanisms.

1) *Population Assessment and Environmental Correlates.* Population assessment monitoring for least chub has been ongoing under the LCCAS. Habitat condition and adult and juvenile abundance (breeding success) and distribution within the spring complexes are monitored on a regular basis and there is a commitment through this amendment to continue monitoring into the foreseeable future (see Table 3).

2) *Effectiveness of Conservation Actions.* Initially formalized in 1998, and revised in 2005, the LCCAS is an established and ongoing partnership for collaboration and implementation of conservation measures to protect least chub and its habitat under an adaptive management framework. Actions intended to promote the conservation of least chub have been implemented

under the LCCAS. A summary of accomplishments under the LCCAS are included in Table 2, and show that the partnership established under the LCCAS is committed to and has been successful at implementing conservation measures to protect least chub. This demonstrated track record provides a high level of certainty that conservation efforts will continue and the conservation actions identified in this Amendment (see Table 3) will be implemented.

3) *Adaptive Management*. The U.S. Department of the Interior defines adaptive management as a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a ‘trial and error’ process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals; increases scientific knowledge; and reduces tensions among stakeholders.

Grazing activities, nonnative fishes, groundwater withdrawal, weather conditions, and other factors are dynamic and interacting forces that continually affect least chub and their habitat. Because of uncertainties associated with future conditions, or the effectiveness of conservation actions, conservation strategies need to be adaptable to address habitat changes and emerging threats and to take advantage of new information based on research findings and the results of prior conservation efforts. Successful conservation requires flexibility to adapt strategies based on lessons learned and to accommodate habitat shifts associated with this changing environment. Whether responding to the dynamics of the spring system it occupies, or based on population responses to conservation actions, adaptive management as it pertains to least chub conservation is an ongoing activity at many levels. For example, springhead restoration, by manual removal of sediment and vegetation, has proven to be a cost-efficient and effective way to improve least chub habitat and increase least chub occupation of springheads at Gandy Marsh. Of the 21 sites restored between 2006 and 2011, 14 have been re-colonized by least chub; and many of the sites were occupied within days post-restoration (Wheeler, 2011). By monitoring and prioritizing sites on a regular basis, relatively simple activities, such as the removal of sediment and encroaching vegetation from springheads, can occur as needed.

Operating under an adaptive management framework is essential for least chub conservation to be successful. The dynamic nature of spring habitats require routine monitoring and adjustments to conservation actions to ensure the habitat is protected as grazing regimes shift, groundwater levels change or nonnative fishes, such as mosquitofish, are discovered in least chub habitats. Information gained from monitoring and research efforts will be reviewed by the LCCT on an annual basis and conservation planning and actions will be adjusted accordingly.

4) *Compliance with Regulatory Mechanisms*. In addition to monitoring population status, habitat and effectiveness of conservation actions, compliance monitoring associated BLM grazing permits, CCAAs, conservation easements and other MOUs, have been implemented

under the existing conservation agreement and will continue under this amendment. UDWR will ensure that nonnative fishes are not introduced to wild or introduction sites.

## **COORDINATING CONSERVATION ACTIVITIES**

The least chub conservation committee will consist of a designated representative from each signatory to this agreement, and technical advisors (i.e. species experts, recreational planners, and others as deemed necessary by the conservation committee). The conservation committee will meet at least once annually to review the status of least chub, develop yearly conservation action schedules, review the conservation strategy, and modify the strategy as appropriate. Annual reports will be prepared to ensure that research and monitoring results are evaluated and conservation strategies and actions are implemented and modified, as needed. Summaries of discussions held by the conservation team will be prepared and available to all interested parties.

## **FUNDING CONSERVATION ACTIONS**

From the time of the signing of the 1998 Conservation Agreement and Strategy through 2013, funding and in-kind services to enact conservation actions has been provided by a variety of sources including the BLM, the USFWS, and the UDWR (through the Endangered Species Mitigation Fund), and URMCC. Funding and agency staff time has been made available on an annual basis to monitor the status of least chub populations, conduct research, implement conservation actions and monitor results, provide protection, enforce compliance with regulations, and maintain conservation area boundaries (Table 3). In-kind contributions in the form of personnel, field equipment, and supplies have also been provided by participants. While it is understood that all funding and other agency resource commitments made under this Amendment are contingent upon appropriations by the respective entities, through this amendment, partners anticipate maintaining prior and ongoing funding levels and in-kind contributions until which time conservation partners agree to having achieved, or partially achieved, the conservation goals for least chub to the extent that this level of funding is no longer needed.

Specifically, the BLM and USFWS are committed to continue to fund monitoring and research efforts. The UDWR will coordinate internally in regards to state wildlife grant funding priorities, and with the Department of Natural Resources Endangered Species Mitigation Fund program office to prioritize least chub funding and conservation needs within the context of statewide Wildlife Action Plan Species of Greatest Conservation Need priorities.

**Table 4. Prior costs demonstrating a track record for funding commitment and implementation of least chub conservation actions under the Conservation Agreement, and anticipated future expenditures to enact the conservation actions in this amendment.**

<b>Year</b>	<b>BLM</b>	<b>UDWR (ESMF)</b>	<b>USFWS (SWG)</b>	<b>URMCC</b>
2005		35,700	35,700	22,300
2006		38,000	38,000	
2007		55,000	55,000	4,700
2008	10,000	58,900	38,900	
2009	10,000	61,300	26,300	
2010	8,000	64,200	56,200	
2011	109,800*	66,600	66,600	
2012	24,000	49,600	33,600	
2013	67,000	39,500	59,500*	
<b>Anticipated Future Expenditures</b>				
2014	35,000	35,000	35,000	
2015	10,000	35,000	35,000	
2016	10,000	35,000	35,000	
2017	10,000	35,000	35,000	
2018	10,000	35,000	35,000	

\*Funded least chub specific projects supported with additional funds beyond base sources.

## **DURATION OF AGREEMENT**

This Agreement shall be effective as of the date of the last signature and shall remain in force for a period of ten years or until such time as the participating parties agree to terminate this Agreement. Any party may withdraw from this Agreement on ninety days written notice to the other parties. The original conservation agreement and strategy was signed in April 1998. The Conservation Agreement and Strategy was updated and resigned in 2005. This document updates and amends the 2005 document.

## **NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE**

This Conservation Agreement is being developed for planning purposes. Before any on-the-ground actions can occur on federally managed lands, a determination must be made whether or not the conservation actions are consistent with the applicable agency's land use or land management plan and whether or not additional NEPA analysis is required. If conservation actions are determined not to be consistent with a land management plan, then these actions must be incorporated into the applicable agency's land use or land management plan through an amendment or maintenance process before they can be implemented. Actions on lands administered by the State or private lands may not be subject to NEPA analysis.

## **FEDERAL AGENCY COMPLIANCE**

During the performance of this agreement, the participants agree to abide by the terms of Executive Order 11246 on non-discrimination and will not discriminate against any person because of race, color, religion, sex, or national origin.

No member of delegate to Congress or resident commissioner shall be admitted to any share or part of this agreement, or to any benefit that may arise there from, but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

## **AGREEMENT MODIFICATION**

Modification of this agreement requires written consent off all involved parties.

If these measures prove inadequate for species conservation, the USFWS reserves all obligations required by, and options offered by the Endangered Species Act of 1973, as amended, including listing under the provisions of Section 4 of the Act.

## **PRINCIPAL CONTACTS**

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Shane Mower  
Bureau of Reclamation  
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302 East 1860 South  
Provo, Utah 84606

Aaron Ambos  
Southern Nevada Water Authority  
PO Box 99956  
Las Vegas, NV 89193

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## U.S. Fish and Wildlife Service

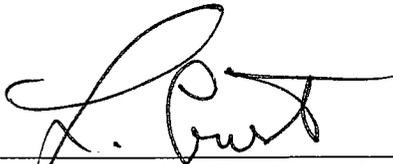
### LEAST CHUB CONSERVATION AGREEMENT AMENDMENT

The U.S. Fish and Wildlife Service hereby states its intent and commitment to assist with and participate in the implementation of the Least Chub Conservation Agreement Amendment (Agreement Amendment), as prepared by the Least Chub Conservation Team.

Performance of activities is contingent on adequate funds being made available and allocated to the signatory agency. This Agreement Amendment shall not prohibit the signatory agency from engaging in management actions regarding least chub conservation beyond those described in this Agreement Amendment. Such management actions should be coordinated with the Least Chub Conservation Team.

This Agreement Amendment shall become effective on the date of signature by the participating party, and shall remain in effect until the signatory party withdraws from the Agreement Amendment in whole or in part, or the Agreement Amendment is terminated by consent of the Least Chub Conservation Team. Either the signatory party may terminate their participation in or all signatories may terminate the Agreement Amendment by providing 90 days written notification to the other parties.

By signing this document below, the U.S. Fish and Wildlife Service acknowledges that it is also signing as a party and participant to the whole of the Least Chub Conservation Agreement Amendment attached hereto.



\_\_\_\_\_  
Larry Crist, Field Office Supervisor  
U.S. Fish and Wildlife Service

2/25/14  
\_\_\_\_\_  
Date

**U.S. Bureau of Reclamation**

LEAST CHUB  
CONSERVATION AGREEMENT AMENDMENT

The U.S. Bureau of Reclamation hereby states its intent and commitment to assist with and participate in the implementation of the Least Chub Conservation Agreement Amendment (Agreement Amendment), as prepared by the Least Chub Conservation Team.

Performance of activities is contingent on adequate funds being made available and allocated to the signatory agency. This Agreement Amendment shall not prohibit the signatory agency from engaging in management actions regarding least chub conservation beyond those described in this Agreement Amendment. Such management actions should be coordinated with the Least Chub Conservation Team.

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By signing this document below, the U.S. Bureau of Reclamation acknowledges that it is also signing as a party and participant to the whole of the Least Chub Conservation Agreement Amendment attached hereto.

  
\_\_\_\_\_  
Kent Kofford, Acting Provo Area Office Manager  
U.S. Bureau of Reclamation

2/26/14  
Date

# Utah Reclamation Mitigation and Conservation Commission

## LEAST CHUB CONSERVATION AGREEMENT AMENDMENT

The Utah Reclamation Mitigation and Conservation Commission hereby states its intent and commitment to assist with and participate in the implementation of the Least Chub Conservation Agreement Amendment (Agreement Amendment), as prepared by the Least Chub Conservation Team.

Performance of activities is contingent on adequate funds being made available and allocated to the signatory agency. This Agreement Amendment shall not prohibit the signatory agency from engaging in management actions regarding least chub conservation beyond those described in this Agreement Amendment. Such management actions should be coordinated with the Least Chub Conservation Team.

This Agreement Amendment shall become effective on the date of signature by the participating party, and shall remain in effect until the signatory party withdraws from the Agreement Amendment in whole or in part, or the Agreement Amendment is terminated by consent of the Least Chub Conservation Team. Either the signatory party may terminate their participation in or all signatories may terminate the Agreement Amendment by providing 90 days written notification to the other parties.

By signing this document below, the Utah Reclamation Mitigation and Conservation Commission acknowledges that it is also signing as a party and participant to the whole of the Least Chub Conservation Agreement Amendment attached hereto.

  
\_\_\_\_\_  
Michael Weland, Executive Director  
Utah Reclamation Mitigation and Conservation Commission

2/27/14  
Date

**Utah Division of Wildlife Resources**

**LEAST CHUB  
CONSERVATION AGREEMENT AMENDMENT**

The Utah Division of Wildlife Resources hereby states its intent and commitment to assist with and participate in the implementation of the Least Chub Conservation Agreement Amendment (Agreement Amendment), as prepared by the Least Chub Conservation Team.

Performance of activities is contingent on adequate funds being made available and allocated to the signatory agency. This Agreement Amendment shall not prohibit the signatory agency from engaging in management actions regarding least chub conservation beyond those described in this Agreement Amendment. Such management actions should be coordinated with the Least Chub Conservation Team.

This Agreement Amendment shall become effective on the date of signature by the participating party, and shall remain in effect until the signatory party withdraws from the Agreement Amendment in whole or in part, or the Agreement Amendment is terminated by consent of the Least Chub Conservation Team. Either the signatory party may terminate their participation in or all signatories may terminate the Agreement Amendment by providing 90 days written notification to the other parties.

By signing this document below, the Utah Division of Wildlife Resources acknowledges that it is also signing as a party and participant to the whole of the Least Chub Conservation Agreement Amendment attached hereto.



ACTING DIRECTOR

\_\_\_\_\_  
Gregory Sheehan, Director  
Utah Division of Wildlife Resources

3/6/14

\_\_\_\_\_  
Date

## U.S. Bureau of Land Management

### LEAST CHUB CONSERVATION AGREEMENT AMENDMENT

The U.S. Bureau of Land Management hereby states its intent and commitment to assist with and participate in the implementation of the Least Chub Conservation Agreement Amendment (Agreement Amendment), as prepared by the Least Chub Conservation Team.

Performance of activities is contingent on adequate funds being made available and allocated to the signatory agency. This Agreement Amendment shall not prohibit the signatory agency from engaging in management actions regarding least chub conservation beyond those described in this Agreement Amendment. Such management actions should be coordinated with the Least Chub Conservation Team.

This Agreement Amendment shall become effective on the date of signature by the participating party, and shall remain in effect until the signatory party withdraws from the Agreement Amendment in whole or in part, or the Agreement Amendment is terminated by consent of the Least Chub Conservation Team. Either the signatory party may terminate their participation in or all signatories may terminate the Agreement Amendment by providing 90 days written notification to the other parties.

By signing this document below, the U.S. Bureau of Land Management acknowledges that it is also signing as a party and participant to the whole of the Least Chub Conservation Agreement Amendment attached hereto.

  
\_\_\_\_\_  
Juan Palma, State Director  
U.S. Bureau of Land Management

3-21-2014  
Date

## Central Utah Water Conservancy District

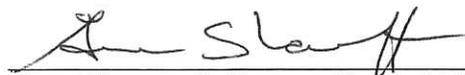
### LEAST CHUB CONSERVATION AGREEMENT AMENDMENT

The Central Utah Water Conservancy District hereby states its intent and commitment to assist with and participate in the implementation of the Least Chub Conservation Agreement Amendment (Agreement Amendment), as prepared by the Least Chub Conservation Team.

Performance of activities is contingent on adequate funds being made available and allocated to the signatory agency. This Agreement Amendment shall not prohibit the signatory agency from engaging in management actions regarding least chub conservation beyond those described in this Agreement Amendment. Such management actions should be coordinated with the Least Chub Conservation Team.

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By signing this document below, the Central Utah Water Conservancy District acknowledges that it is also signing as a party and participant to the whole of the Least Chub Conservation Agreement Amendment attached hereto.



Gene Shawcroft, Deputy General Manager  
Central Utah Water Conservancy District

3 Apr '14  
Date

## Southern Nevada Water Authority

### LEAST CHUB CONSERVATION AGREEMENT AMENDMENT

The Southern Nevada Water Authority hereby states its intent and commitment to assist with and participate in the implementation of the Least Chub Conservation Agreement Amendment (Agreement Amendment), as prepared by the Least Chub Conservation Team.

Performance of activities is contingent on adequate funds being made available and allocated to the signatory agency. This Agreement Amendment shall not prohibit the signatory agency from engaging in management actions regarding least chub conservation beyond those described in this Agreement Amendment. Such management actions should be coordinated with the Least Chub Conservation Team.

This Agreement Amendment shall become effective on the date of signature by the participating party, and shall remain in effect until the signatory party withdraws from the Agreement Amendment in whole or in part, or the Agreement Amendment is terminated by consent of the Least Chub Conservation Team. Either the signatory party may terminate their participation in or all signatories may terminate the Agreement Amendment by providing 90 days written notification to the other parties.

By signing this document below, the Southern Nevada Water Authority acknowledges that it is also signing as a party and participant to the whole of the Least Chub Conservation Agreement Amendment attached hereto.

  
\_\_\_\_\_  
John J. Entsminger, General Manager  
Southern Nevada Water Authority

5.14.14  
Date