

## ECOLOGICAL VALUES OF THE AMARGOSA RIVER IN CALIFORNIA

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Cover photo: Grimshaw Lake near Tecopa Hot Springs. Photo: Sophie Parker, TNC, 2012.

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## Executive Summary

The 185 mile-long Amargosa River, one of only two rivers with perennial flow in the California portion of the Mojave Desert, is fed by an ancient carbonate groundwater aquifer. The aquatic habitats of the Amargosa River Watershed provide habitat for hundreds of organisms, including a unique suite of rare, endemic, and imperiled species. For nearly 50 years, the conservation of the waters, landscape, and organisms associated with the Amargosa River has occurred through the joint efforts of various agencies, institutions, and not-for-profit organizations. In 2009, Congress designated a 26.3-mile stretch of the Amargosa in California as a Wild and Scenic River, and as of 2017, most the riparian and spring-fed habitats in this region were in the public domain and managed for biodiversity values.

The ecological values of the Amargosa River in California include a variety of habitats, plant communities, and special organisms, some of which are endemic to the region. Associated wetland habitats include springs, seeps, river channels, and alkali meadows. In addition to mesquite bosque, screwbean mesquite bosque, and willow gallery forest, other rare and important habitats that are found within the Wild and Scenic River designation include herbaceous wetland plant communities, including American bulrush marsh, alkali sacaton grassland, salt grass flats, and spring-fed hanging gardens.

Many species of animals live in and around the river and its associated habitats, including the Amargosa vole (*Microtus californicus scirpensis*), which is found only within spring-fed marsh habitat containing more than 50% cover of Olney's three-square bulrush (*Schoenoplectus americanus*) near the town on Tecopa Hot Springs. Other mammals found within the region are more wide-ranging, including coyote (*Canis latrans*), bobcat (*Lynx rufus*), American badger (*Taxidea taxus*), and desert kit fox (*Vulpes macrotis arsipus*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), mountain lion (*Puma concolor*), desert bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*). Hundreds of bird species use the riparian habitat along the Amargosa River as year-round or as seasonal habitat. Three observed species of conservation concern include the Federally Endangered Least Bell's Vireo (*Vireo belli pusillus*), the Willow Flycatcher (*Empidonax trailii*), and the Southwestern Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*). Other animals of interest include reptiles and amphibians, two species of fish-- the endemic Amargosa pupfish (*Cyprinodon nevadensis amargosae*) and the speckled dace (*Rhinichthys osculus* spp.), and springsnails.

In addition to Amargosa niterwort (*Nitrophila mohavensis*) and spring-loving centaury (*Zeltnera namophila*), plant species of concern along the Amargosa River in California include Tecopa bird's-beak (*Chloropyron tecopense*), Amargosa beardtongue (*Penstemon fruticiformis* var. *amargosae*), Stephens' beardtongue (*Penstemon stephensii*), Pahrump orache (*Atriplex*

*argentea* var. *longitrichoma*), forked buckwheat (*Eriogonum bifurcatum*), Kingston Mountains bedstraw (*Galium hilendiae* ssp. *kingstonense*), Kingston Mountains ivesia (*Ivesia patellifera*), Clark Mountain monardella (*Monardella eremicola*), Parish's phacelia (*Phacelia parishii*), Rusby's desert-mallow (*Sphaeralcea rusbyi* var. *eremicola*), and alkali mariposa lily (*Calochortus striatus*).

Given that most of the lands surrounding the Amargosa River in California are managed for conservation, the biggest threat to biodiversity is reductions in spring flow caused by the lowering of the groundwater table due to pumping of groundwater from the regional aquifer for agricultural, residential, and industrial use. To maintain the biodiversity values of the Amargosa River in California, both river base flow and the sustainable and continued natural expression of groundwater as seeps and springs must be protected.

## I. Introduction to the Amargosa River

The Amargosa River is found near the center of the Mojave Desert Ecoregion. Measuring 185 miles from its headwaters on the Pahute Mesa of Nye County, Nevada to its terminus at Badwater Basin in Death Valley, California, the Amargosa is fed by springs that are in turn fed by groundwater from an ancient carbonate aquifer. The river and its associated wetlands constitute rare features in this otherwise arid landscape; it is one of only two rivers with perennial flow in the California portion of the Mojave Desert.

The Amargosa does not always flow along its entire length. In fact, in some places the river is better understood as a dry wash that floods during rain events because the groundwater is too deep to be expressed aboveground. In other places, where bedrock is close to the ground's surface and groundwater is expressed in springs, the river flows continuously throughout the year. The longest stretch of the Amargosa River that flows perennially is located in Inyo and San Bernardino counties, California. This stretch of the river flows south from the town of Shoshone, through the Amargosa Canyon to the Dumont Dunes.

The aquatic habitats in the perennially-wet parts of the Amargosa Watershed contain one of the most outstanding suites of endemic and imperiled species in the world. Since the early 1970s, The Nature Conservancy has worked in partnership with the Bureau of Land Management, the Amargosa Conservancy, and various other institutions, organizations, and agencies to protect the ecosystems found within the Amargosa River Watershed. These efforts have included land acquisition, restoration, scientific study, and conservation-focused management of lands and waters along the Amargosa River.

## II. Conservation of Groundwater for Biodiversity

The Amargosa River Watershed is far from the rapidly developing urban and suburban areas associated with Las Vegas and Victorville/Hesperia. Apart from the Pahrump and Amargosa Valley areas of Nevada, the watershed has not undergone large-scale land conversion. Direct, on-site impacts of development are therefore not the primary threat to the flora and fauna of the Amargosa River in California. Instead, dropping water levels caused by the pumping of groundwater for agricultural, residential, and industrial use constitute the biggest threat to biodiversity in this region.

The extraction of groundwater impacts the groundwater-fed Amargosa River by diminishing the flow of water from springs into the river. This can negatively impact the quantity of water in the river. It can also negatively impact water quality, as evapotranspiration is so high in this arid system that aboveground water becomes saline quickly when not replenished by fresh groundwater. Many of the species of plants and animals found along and in the Amargosa River

are completely dependent on the water in the river. Some species, such as fish and amphibians, require the freshwater in aboveground aquatic habitats to be of a certain depth and quality to complete a portion or all of their life cycles. Other species visit the river to drink or bathe, and still others are dependent on the wetland vegetation that can only grow if adequate freshwater is available. Given its extremely isolated geographic context, the freshwater systems of the Amargosa River literally provide the only place on Earth where some species, such as the Amargosa Vole (*Microtus californicus scirpensis*) and Amargosa Pupfish (*Cyprinodon nevadensis amargosae*), exist.

As of 2017, most the high-quality, riparian and spring-fed habitats along the Amargosa River in California were in public ownership, and are being managed for biodiversity values. Still, the elements of biodiversity found within these habitats depend on the presence of springs, seeps, and river flow for their survival. Because the Amargosa River is fed by alluvial and deep groundwater aquifers, it is subject to excessive groundwater pumping within the surrounding region, including the communities and businesses located near and around the towns of Pahrump and Amargosa Valley, Nevada.

To ensure that the biodiversity of the Amargosa River is maintained, we must ensure the sustainable and continued natural expression of groundwater as seeps and springs and river base flow within this region. In addition, there remain a few privately held parcels within this landscape that could be conserved to ensure both the protection of the plants and animals on site, and to prevent the initiation of unsustainable groundwater pumping that could negatively impact the expression of groundwater as springs and seeps elsewhere in the watershed.

### III. Conservation Designations and Planning

Over the past several decades, there have been several actions taken by the Federal government to protect the conservation values of the Amargosa River. In 1983, the Bureau of Land Management (BLM) designated a portion of the Amargosa River in California as an Area of Critical Environmental Concern. The BLM drafted an Area of Critical Environmental Concern (ACEC) Implementation Plan in 2006 (BLM 2006), though the Record of Decision needed to implement this plan was not signed. In 2009, Congress designated a 26.3-mile stretch of the Amargosa in California as a Wild and Scenic River. Within this stretch, 7.9 miles are designated as “Wild”, 12.1 miles as “Scenic”, and 6.3 miles as “Recreational”. In 2016, the completion of the Desert Renewable Energy and Conservation Plan’s (DRECP) Land Use Planning Amendment (CEC 2016) provides information about the ACECs in the Amargosa area, and designates most the lands surrounding the California portion of the river as California Desert National Conservation Lands.

The Wild and Scenic Rivers Act requires a determination that a river and its immediate environment possess one or more specific “outstandingly remarkable values” before that river corridor can be considered for designation as a National Wild and Scenic River. Outstandingly remarkable values (ORVs) are defined as values in a river corridor that are directly related to the river and that are rare, unique, or exemplary from a regional or national perspective. The DRECP (CEC 2016, Appendix B, Amargosa South ACEC sheets) includes information about the fish and wildlife resources, natural systems, and processes that are important to protect along the portion of the river later designated as Wild and Scenic. Below, we present an overview of the ecological values of the Amargosa River in California. Our list builds upon the list of organisms and natural systems identified through previous efforts.

## IV. Ecological Values of the Amargosa River

### 1. Amargosa Vole

The Amargosa vole (*Microtus californicus scirpensis*) is an endangered desert subspecies of the more common and widespread California vole (*Microtus californicus*, Bailey 1900), a small, herbivorous rodent with 17 recognized subspecies (Hall & Kelson 1959). The Amargosa vole was originally distinguished as a subspecies in part based on its cinnamon coloration, small skull, and relatively large zygomatic arch (Kellogg 1918).

As the most isolated subspecies of *M. californicus* (Cudworth & Koprowski 2010), the Amargosa vole has one of the most narrowly restricted natural distributions of any mammal in the world, as it is found only within spring-fed marsh habitat containing more than 50% cover of Olney's three-square bulrush (*Schoenoplectus americanus*) along a 3.2 km × 1.5 km stretch the Amargosa River, near the town on Tecopa Hot Springs (Klinger et al. 2015). The entire Amargosa vole population currently exists in only two locations: within about 30 hectares of suitable habitat in the wild (Foley et al. 2014), and in a captive breeding facility in Davis, California (Foley & Clifford 2014).

In 1980, the State of California listed the Amargosa vole as an Endangered Species (Title 14 California Administrative Code, Section 670.5), and in 1984, the U.S. Fish and Wildlife Service listed the Amargosa vole as endangered under the Endangered Species Act and designated critical habitat for the subspecies. A recovery plan followed in 1997 (USFWS 1997). The Grimshaw Lake area was designated as an Area of Critical Environmental Concern in 1997; this area was incorporated into the larger Amargosa South ACEC in 2016 (CEC 2016). Between 1997 and 2014, The Nature Conservancy, the Bureau of Land Management, and the California Department of Fish and Wildlife acquired private lands with vole habitat in the Tecopa Hot Springs area. In 2013, recognizing the need to further research, manage, and conserve the Amargosa vole, state and federal agencies formed the Amargosa Vole Working Group and included representatives from USFWS, the Bureau of Land Management, the California



Department of Fish and Wildlife, UC Davis, UC Berkeley, and the United States Geological Survey.

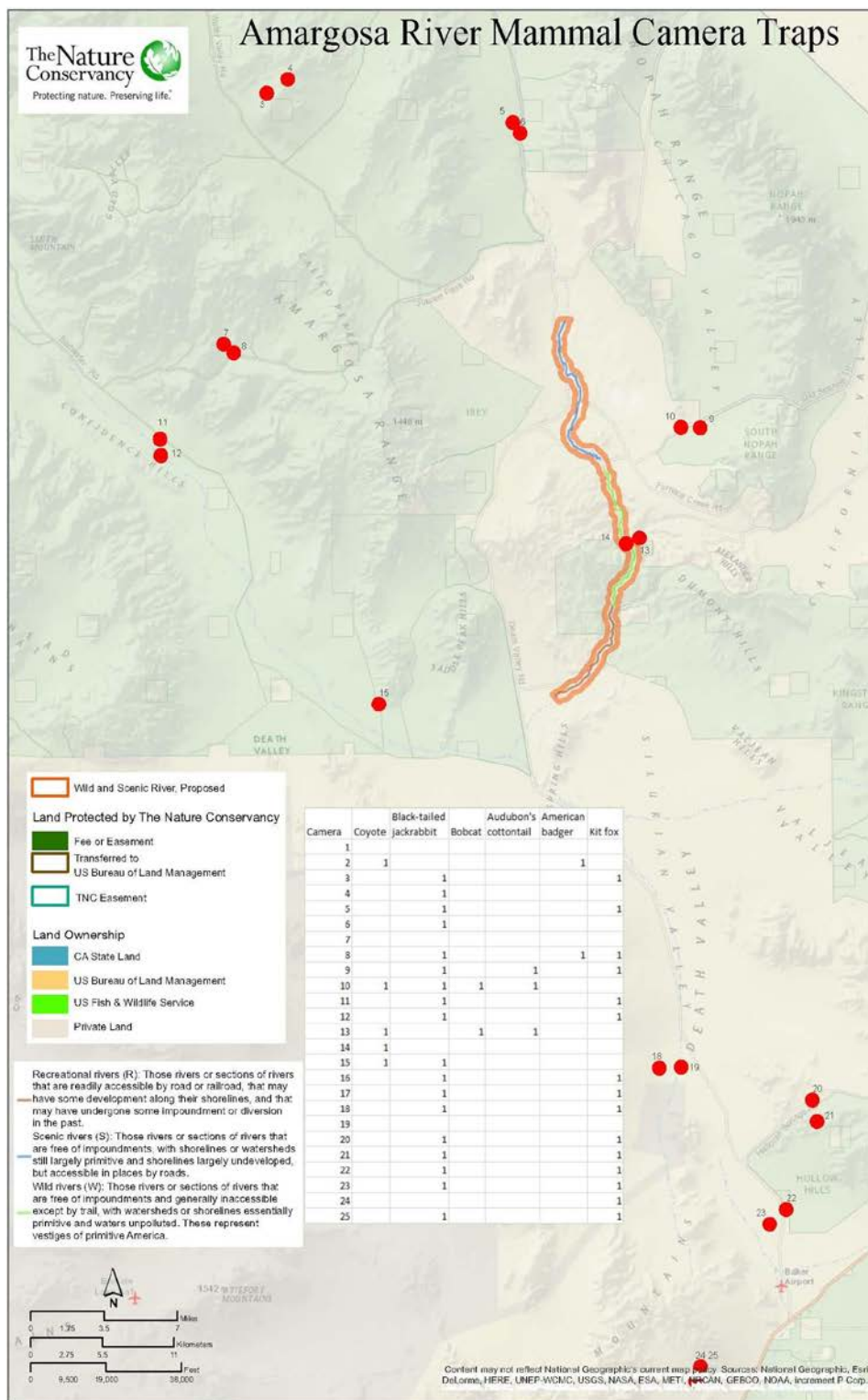
The Amargosa vole faces several threats. Its naturally narrow historic range has been further restricted over time through land use change and groundwater pumping that have degraded and eliminated the vole's bulrush habitat. Compared to the other subspecies of *M. californicus*, the Amargosa vole has low levels of genetic variation, and there is substantial subdivision and little dispersal among subpopulations (Neuwald 2010). In addition, the Amargosa vole is threatened by disease (Foley et al. 2013; Ott-Conn et al. 2014; Poulsen et al. 2017), and has a very stochastic life history with populations varying from 66 to a few hundred individuals in any given year, making it one of the most endangered species of mammal in North America. A more complete assessment of the Amargosa vole population and its habitat stressors is available in Foley et al. (2017).

## 2. Wide-Ranging Mammals

In addition to the Amargosa vole, the Amargosa River Watershed is home to several other mammal taxa, some of which are wide-ranging. Camera trap studies conducted in 2016 and 2017 by the California Department of Fish and Wildlife near the Amargosa River have revealed photographic evidence of the following wide-ranging taxa: coyote (*Canis latrans*), bobcat (*Lynx rufus*), American badger (*Taxidea taxus*), and desert kit fox (*Vulpes macrotis arsipus*) (Figure 1). Images of two other mammal taxa, black-tailed jackrabbit (*Lepus californicus*) and desert cottontail (*Sylvilagus audubonii*), have also been captured with camera traps in these studies. Other wide-ranging taxa of note which may occur in the area include mountain lion (*Puma concolor*), desert bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*).

Land managers and regulatory agencies in the California desert have long recognized that negative impacts to desert mammals may be caused by excessive pumping of wells and overdevelopment of surface water sources (Laudenslayer & Rado 1995). As pumping causes the water table to drop, surface water sources and associated riparian and marsh systems dry up, forcing dependent species to seek other water sources; if none are available, competition for limited quantities of water may intensify and wildlife may be extirpated (Laudenslayer & Rado 1995).

Some mammals, such as the desert bighorn sheep, are directly affected by over-pumping and loss of surface water resources because they require water in their diets; desert bighorn sheep are known to congregate at water sources during the summer months (Leslie & Douglas 1980; Epps et al. 2005). Other desert mammals, such as coyotes and kit foxes, obtain preformed water from their food, which requires these predators to consume substantially more prey than



**FIGURE 1. AMARGOSA RIVER MAMMAL CAMERA TRAPPING LOCATIONS AND ORGANISMS OBSERVED. CAMERAS 1, 2, 16, AND 17 WERE NOT LOCATED WITHIN THE IMMEDIATE VICINITY OF THE AMARGOSA RIVER, AND ARE NOT INCLUDED ON THIS MAP.**

that required to meet energy demands (Golightly & Ohmart 1984). Some of their prey species, such as the Amargosa vole (Neuwald 2010), are closely associated with riparian and marsh habitats.

A decline in groundwater levels and surface water availability that causes a reduction in the cover of the riparian or marsh habitat that supports prey species may result in a reduction in the population size of riparian or marsh-associated prey (Klinger et al. 2015), and may lead to population declines or prey switching on the part of predators. While prey-switching is a functional response to declining prey availability that allows predators to adapt to short-term changes in environmental conditions, such as drought, prey switching can have deleterious effects on populations targeted for conservation, such as the desert tortoise (*Gopherus agassizii*) (Peterson 1994). In an example from the Mojave Desert, badgers are known to forage opportunistically on a range of species (Novak 1987), but are specialized to excavate burrows of subterranean and fossorial mammals (Michener 2004). They can switch to hunting other prey when their preferred food sources are not available due to drought or other changes in the environment (Verts & Carraway 1998). A recent study conducted in the Barstow area by (Emblidge et al. 2015) suggests that when other prey is not available, badgers can become important predators of desert tortoise.

It is important to note that the population dynamics of large mammals can be complex and interdependent. A study by Wehausen (1996) in the Granite Mountains of the Mojave Desert, found high interannual variability in cougar predation and resulting desert bighorn sheep mortality, leading to low survival of bighorn between 1989 and 1992, but a 15% growth rate between 1993 and 1996.

### 3. Birds of Special Concern

#### a. Least Bell's Vireo

The Federally Endangered Least Bell's Vireo (*Vireo belli pusillus*) has a remarkable success story along the Amargosa River. In Shoshone and Tecopa, Least Bell's Vireo nest mainly in mesquite (*Prosopis* spp.), and occasionally in willows (*Salix* spp.) or tamarisk (*Tamarix* spp.). Least Bell's Vireo populations were low during the 1980's. Numbers of this species have increased substantially due to a combination of cowbird management, tamarisk removal, and habitat enhancement efforts.

The source population of Amargosa Canyon Bell's Vireo is at and around China Ranch. Point Blue Conservation Sciences has systematically trapped cowbirds in Shoshone, Tecopa, and China Ranch since 2007. Brood parasitism has been reduced from approximately 45% to zero.

Population extrapolations estimate that with annual Cowbird trapping, Least Bell's Vireo in Shoshone, Tecopa and China Ranch produce over 200-300 total fledglings per year (McCreedy & Warren 2016). Since 2015, Least Bells Vireo have successfully nested along the northern Amargosa River in Beatty, Nevada, at The Nature Conservancy's Parker Ranch and Torrance Ranch. It is likely but not known if these new Bell's Vireo territories are expanding from the southern Amargosa.

Least Bell's Vireo also nest at Ash Meadows wildlife refuge, located between Tecopa, California, and Beatty, Nevada.



FIGURE 2. BELL'S VIREO INCUBATING EGGS IN THE NEST. APRIL 9<sup>TH</sup>, 2015 IN HONEY MESQUITE AT THE SHOSHONE WETLANDS. PHOTO: LEONARD WARREN, TNC, 2015.

#### b. Southwestern Willow Flycatcher

Willow Flycatcher (*Empidonax traillii*) are present in the Amargosa Canyon annually during migration. Subspecies are very difficult to discern in the field; therefore, it is not possible to determine which of the Willow Flycatchers are *Empidonax traillii extimus* versus another subspecies such as *E.t. adastus*. Much of the riparian portions of the Amargosa Canyon are Federally Designated Critical Habitat for Federally Endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*).

There are occasionally apparent Southwestern Willow Flycatcher “territorial males” that stay and sing and defend territory repeatedly for ten days or more during nesting season at predictable perches. The last known breeding pair in the Amargosa region was at Ash Meadows Wildlife Refuge.

There is a substantial nearby breeding population of apparent Southwestern Willow Flycatcher along the Owens River in and around Bishop, California, but it is not yet known if this population is increasing or decreasing.

If population enhancement efforts elsewhere are successful, and Southwestern Willow Flycatcher populations increase, suitable habitat along the Amargosa River may be used for breeding in the future. If Amargosa Willow Flycatcher habitat enhancement measures are implemented, patch size and density of suitable habitat will be increased, and Willow Flycatchers may breed again in the Amargosa Canyon. At China Ranch, the confluence of Willow Creek and the Amargosa Canyon just south of and including Zellhoeffer Pond are suitable areas to be considered for enhancement.

### c. Southwestern Yellow-billed Cuckoo

Southwestern Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) populations have declined throughout the Southwest United States as suitable riparian habitat has been eliminated. Southwestern Yellow-billed Cuckoo were listed as Threatened under the Endangered Species Act in 2014.

At present, Yellow-billed Cuckoo is an occasional migrant through the Amargosa region. There are historical records of Yellow-billed Cuckoo breeding in the Amargosa Canyon at China Ranch (Table 1). Nesting reports in Amargosa have often been the only reports of the species west of the Colorado River (e.g. 1979, 1980 R.G. McCaskie).

If habitat enhancement measures elsewhere, such as those at Palo Verde Ecological Preserve in Blythe, California are successful in increasing patch size and density, and if Amargosa habitat enhancement measures occur, Southwestern Yellow-billed Cuckoo may again nest along the Southern Amargosa.

**TABLE 1. KNOWN YELLOW-BILLED CUCKOO SIGHTINGS IN THE AMARGOSA WILD AND SCENIC RIVER AREA.**

<b>Date</b>	<b>Location</b>	<b>Observer</b>	<b>Notes</b>
6/15/1976	China Ranch	J. Tarble	
6/18/1977	China Ranch	P. Henderson, J. Tarble	a pair, remained through 9/3
9/1/1977	China Ranch	J. Tarble	remained through 9/3
6/22/1979	China Ranch	J. Tarble	a pair suspected nesting. "the only report of nesting in 1979 west of the Colorado River" R.G.McCaskie
8/25/1979	China Ranch	J. Tarble	a pair remained through 9/17 nesting suspected
6/4/1980	China Ranch	J. Tarble	
7/4/1980	Tecopa	J. Tarble	"Only report w. of Colorado River" R.G.McCaskie
7/26/1982	China Ranch	J. Tarble	
7/1/1990	China Ranch	T&J Heindel	remained until the following day
7/1-3/1991	China Ranch	T&J Heindel	singing cow-cow-cow
7/2/1992	China Ranch	T&J Heindel	singing cow-cow-cow
7/13/1992	China Ranch	J. Tarble	
6/20/2000	China Ranch	M. SanMiguel Sr.	
6/24/2012	Amargosa Canyon in dense Coyote Willow 0.2 mi south of Zellhoffer Pond	L. Warren	

#### d. Other Bird Species

A checklist of bird species observed in Shosone, Tecopa, Tecopa Marsh, Amargosa Canyon, and China Ranch can be found in the Appendix to this document. Additional information about some of these species follows.

1. American White Pelican (*Pelecanus erythrorhynchos*): Occasionally uses Grimshaw Lake for stopover and rest
2. Bendire's Thrasher (*Toxostoma bendirei*): A rare visitor
3. Burrowing Owl (*Athene cunicularia*): Breeds in good numbers in surrounding creosote and shrub habitat of alluvial fans adjacent to the Amargosa River
4. Crissal Thrasher (*Toxostoma crissale*): A year-round permanent resident in dense Mesquite throughout the Wild and Scenic portions of the river. The Amargosa is one of the western-most edges of the range of this species.
5. Gray Vireo (*Vireo vicinior*): An annual migrant along through the Wild and Scenic area
6. Least Bittern (*Ixobrychus exilis*): Has inhabited "Zellhoeffler Pond" in the Amargosa Canyon area for decades. A breeding pair can usually be heard throughout the day in late May and early June.

7. Loggerhead Shrike (*Lanius ludovicianus*): A permanent year-round resident in scrub habitat adjacent to riparian areas. In June, juvenile Loggerhead Shrikes are constantly present in the Wild and Scenic portions of the river.
8. Long-eared Owl (*Asio otus*): Regularly winters in clumps of tall trees along the Amargosa. After dry winters, it shifts to cooler mountain habitats. Following rainy winter seasons, it stays and breeds. It is estimated that 10-15 pairs breed in and around the Amargosa following wet winters.
9. Lucy's Warbler (*Oreothlypis luciae*): Arrive at the Amargosa in Mid-March. It breeds in suitable habitat throughout the Wild and Scenic area. Because of recent fires, suitable habitat (i.e., trees with cavities) has decreased within the Wild and Scenic area. Lucy's Warblers are cavity nesters, and will readily nest in old Verdin nests.
10. Northern Harrier (*Circus cyaneus*): Breeds annually at Tecopa Marsh and often in Shoshone. Regularly hunts along the Wild and Scenic portion of the river.
11. Olive-sided Flycatcher (*Contopus cooperi*): An annual migrant. A large breeding population in nearby Spring Mountains.
12. Peregrine Falcon (*Falco peregrinus*): An annual visitor. Peregrines are often seen hunting throughout the area. The closest known breeding pairs are in the nearby Spring Mountains.
13. Redhead (*Aythya americana*): An annual visitor in small numbers.
14. Summer Tanager (*Piranga rubra*): Recent breeding at Shoshone, China Ranch. Habitat enhancement in the Amargosa Canyon would likely attract breeding Summer Tanagers.
15. Swainson's Hawk (*Buteo swainsoni*): An annual visitor, in small numbers. Occasionally seen resting or drinking. It is not known how many Swainson's Hawks fly over the Wild and Scenic area annually.



**FIGURE 3. THE CLIFFS AND ROCKY OUTCROPS OF THE AMARGOSA CANYON AREA PROVIDE NESTING LOCATIONS FOR SOME BIRD SPECIES. PHOTO: SOPHIE PARKER, TNC, 2009.**

16. Vaux's Swift (*Chaetura vauxi*): A rare visitor, only occasionally sighted
17. Vermilion Flycatcher (*Pyrocephalus rubinus*): Historical breeding records at China Ranch. An annual migrant, and recently wintered in Shoshone. Breeds nearby in Pahrump, NV, and occasionally in the Beatty, NV portion of the Amargosa River.
18. Yellow-breasted Chat (*Icteria virens*): Arrives in mid-April. Breeds in Shoshone, China Ranch, and throughout the willow-occupied areas of the Amargosa including the confluence of Willow Creek.
19. Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*): Migrates through the Wild and Scenic Area annually. Breeds at the Ash Meadows Wildlife Refuge.

#### 4. Reptiles and Amphibians

The reptiles and amphibians of the Amargosa River in the area bounded by the Wild and Scenic River designation are not rare, threatened, or endangered, but are of ecological value nonetheless. Woodhouse's toad (*Anaxyrus woodhousei*), Red-spotted Toad (*Bufo punctatus*), and Baja California Treefrog (*Pseudacris hypochondriaca hypochondriaca*) are remarkable for their ability to adapt to the scarcity and variability of water availability in the Mojave Desert riparian environment. They collectively are considered common and widespread species, but they represent a survival strategy unique to desert environments. They exploit times of high water availability when the river floods – taking advantage of the new wetland environments and micro-habitats to reproduce, lay eggs and develop as tadpoles into young toadlets and froglets in a rapid timeframe that strategically beats the evaporation time in this arid landscape. They utilize these flood events to distribute themselves across the riparian environment and seek out novel areas where other individuals have previously been unable to access.

Notable reptiles include the Chuckwalla (*Sauromalus ater*) found on rocky outcroppings and one of the largest reptiles in the Mojave aside from the Gila Monster (*Heloderma suspectum*) and Desert tortoise (*Gopherus agassizii*). Gopher snakes (*Pituophis catenifer deserticola*), Red Racers or Coachwhips (*Masticophis flagellum*), California Kingsnakes (*Lampropeltis getulus*), and Sidewinders (*Crotalus cerastes*) are the most commonly encountered snakes. The Common Side-Blotched Lizard (*Uta stansburiana*), Zebra-tailed Lizard (*Callisaurus draconoides*), and Desert Iguana (*Dipsosaurus dorsalis*) are the most commonly encountered lizard species. None of these can be considered as wetland dependent species, but the herbivorous species benefit from the greater abundance of vegetation, and the insectivorous species benefit from the higher diversity and abundance of insects and the availability of drinking water during particularly hot, dry days – a truly rare commodity in the Mojave Desert.

In May of 2017, The Nature Conservancy partnered with the Bureau of Land Management to conduct an Expert BioBlitz at China Ranch and along the Wild and Scenic designated portions of the Amargosa River (Table 2). As part of this event, members of the herpetological team began conducting nighttime surveys on Thursday, April 6<sup>th</sup>, 2016, and concluded their work at 5:00 pm



on Sunday, April 9<sup>th</sup>, 2017. Their surveys involved six participants conducting visual-encounter surveys for reptiles and amphibians throughout the study area. Areas with three-dimensional structure, whether from man-made structures or surrounding woody vegetation, were especially closely examined because these are preferred habitats for lizards. Photographs were taken and iNaturalist used to document the locations of herpetofauna.

**TABLE 2. REPTILES AND AMPHIBIANS OBSERVED DURING AMARGOSA RIVER EXPERT BIOBLITZ HELD BETWEEN APRIL 6 AND APRIL 9TH, 2017. OBSERVATIONS WERE ALSO RECORDED ON iNATURALIST AT: [HTTPS://WWW.INATURALIST.ORG/PROJECTS/2017-AMARGOSA-RIVER-BIOBLITZ](https://www.inaturalist.org/projects/2017-amargosa-river-bioblitz)**

	Scientific Name	Common Name	Total Observations
1	<i>Anaxyrus sp.</i>	North American Toad	1
2	<i>Anaxyrus boreas</i>	Western Toad	2
3	<i>Anaxyrus punctatus</i>	Red-spotted Toad	14
4	<i>Anaxyrus woodhousii</i>	Woodhouse's Toad	16
5	<i>Lithobates catesbeianus</i>	American Bullfrog	2
6	<i>Pseudacris hypochondriaca</i>	Baja California Treefrog	1
7	<i>Aspidoscelis tigris</i>	Western Whiptail	2
8	<i>Callisaurus draconoides</i>	Zebra-tailed Lizard	5
9	<i>Coleonyx variegatus</i>	Western Banded Gecko	1
10	<i>Coleonyx variegatus variegatus</i>	Desert Banded Gecko	2
11	<i>Coluber flagellum</i>	Coachwhip	3
12	<i>Crotalus cerastes</i>	Sidewinder	1
13	<i>Dipsosaurus dorsalis</i>	Desert Iguana	3
14	<i>Lampropeltis californiae</i>	California King Snake	1
15	<i>Pituophis catenifer deserticola</i>	Great Basin Gopher Snake	1
16	<i>Rena humilis</i>	Western Blind Snake	1
17	<i>Uta stansburiana</i>	Common Side-blotched Lizard	10
<b>Sum of all observations</b>			<b>66</b>

In addition to surveying China Ranch and the Wild and Scenic portions of the Amargosa River, the BioBlitz participants made incidental observations in the communities of Shoshone Village, and Tecopa Hot Springs, and surrounding areas during the event.

## 5. Fish

Fish are completely dependent on aquatic habitat for all phases of their life cycle, and the waters on which they depend must be of adequate quantity and sufficient quality to ensure survival. There are two native species of fish that are of interest within the Amargosa Wild and Scenic River designation: the endemic Amargosa pupfish (*Cyprinodon nevadensis amargosae*) and the speckled dace (*Rhinichthys osculus* spp.). Hereford (2016) provides an excellent overview of the distribution and abundance of these two species in this part of the Amargosa River.

The Amargosa pupfish is fairly common in an around Tecopa and the Amargosa Canyon area (Scoppottone et al. 2011), and is found as far downstream as Death Valley National Park (Humphrey et al. 2017). The Amargosa pupfish is the most widespread of any *C. nevadensis* subspecies, and the extinct Tecopa pupfish (*Cyprinodon nevadensis calidae*) (Miller et al. 1989) and the nearby Shoshone pupfish (*Cyprinodon nevadensis shoshone*) are closely related subspecies. While abundance records prior to 1982 are lacking, survey data for the Amargosa pupfish (Scoppettone et al. 2011) suggest that the populations of this subspecies have been relatively stable over the past few decades. The Amargosa River pupfish may be less abundant now than in the past given groundwater pumping and diversions.

Apart from a population that occurs along the Colorado River Drainage, the Amargosa Canyon area is the southernmost extent of the range for speckled dace; most populations of the species are found further north in California and Nevada (Sada et al. 1995).

## 6. Springsnails

Springsnails have been observed in the springs in the Amargosa Canyon area. The systematics and biogeography of these organisms is discussed in Hershler and Liu (2008) and Hershler et al. (2013). Springsnails are one of the first bellwethers of water quality or quantity degradation in freshwater spring systems, particularly in the Mojave and Great Basin Deserts (Don Sada, pers. comm. 1991). They are especially sensitive to changes in pH and dissolved minerals present in the waters emanating from the spring systems. Due to the typically very constricted size of spring systems in the deserts, springsnails have few strategies to deal with the reduction in flow from groundwater sources and, if the springs cease flowing altogether, even if only for a brief period, this usually leads to the immediate extirpation of the springsnails dependent on the presence of water and the vegetation it supports. Therefore, it has been recognized that if a springsnail population is present and vibrant in any spring system, this is a good indicator that the spring has persisted for millennia and has not changed rapidly in either water quantity or quality since the springsnails first evolved there in response to site-specific conditions.

## 7. Rare Plants and Riparian Vegetation

Several rare plant taxa and special vegetation types are known to occur in the Amargosa Watershed, and some of these may be found along the Wild and Scenic portions of the river. Amargosa Niterwort (*Nitrophila mohavensis*) and Spring-loving Centaury (*Zeltnera namophila*) were originally named by the Bureau of Land Management as two plant taxa that should be considered for potential inclusion in the Wild and Scenic River Plan. In addition, Mesquite Bosques and Willow Gallery Forest are two natural communities that are important to include.

Between January 19 and May 30, 2017, botanists from the Rancho Santa Ana Botanic Garden, led by Naomi Fraga, completed a suite of surveys along the Wild and Scenic portions of the Amargosa River. During field surveys, the crew attempted to survey as much of the designated

Amargosa Wild and Scenic River as possible including any prominent geographic features and special habitat types. What follows here is a description of their findings and recommendations.

### a. Habitats of Rare and Endemic Plants

The rare and endemic plant species that occur within the Amargosa Wild and Scenic River generally occur within two kinds of habitats: wetland habitats or arid upland habitats. Below is a summary of these habitat types and the endemic species that are associated with them.

#### i. Wetlands

The wetland habitats associated of the Amargosa Wild and Scenic River include: springs, seeps, river channels, and alkali meadows. The exceptional water resources available in these habitats provide unique opportunities for isolated wetland species to occur in the vast, arid Mojave Desert. Rare and endemic species of the Amargosa River that rely on perennially wet habitats include: alkali marsh aster (*Almutaster pauciflorus*), Tecopa bird's beak (*Chloropyron tecopense*), California saw grass (*Cladium californicum*), short-pedicelled cleomella (*Cleomella brevipes*), fiddleleaf hawksbeard (*Crepis runcinata*), white flowered rabbit brush (*Ericameria albida*), copperwort (*Euphrosyne acerosa*), hot springs fimbriostylis (*Fimbristylis thermalis*), Ash Meadows gumplant (*Grindelia fraxinipratensis*), Cooper's rush (*Juncus cooperi*), and Amargosa niterwort (*Nitrophila mohavensis*); CNPS (2017). These species typically flower in the heat of the summer between the months of May to September. Annual species that occur in seasonally wetland habitat like playas and alkali flats include Pahrump Valley buckwheat (*Eriogonum bifurcatum*), and Parish's phacelia (*Phacelia parishii*), these species flower in the early spring between the months of February to May. Alkali mariposa lily (*Calochortus striatus*), desert popcorn flower (*Plagiobothrys salsus*), and spring loving centaury (*Zeltnera namophila*) are not currently known to occur within the designated Amargosa Wild and Scenic River, however they do occur along the Amargosa River in California near lower Carson Slough, and have potential to occur within the Wild and Scenic River designation.

#### ii. Arid upland species

The arid upland slopes are diverse in topography and geologic composition. Notable substrates include calcareous soils such as marble and limestone; these substrates frequently support endemic plant species such as white bear poppy (*Arctomecon merriamii*) and Death Valley sage (*Salvia funerea*); (CNDDDB 2017; Fig. 4). Borrego milkvetch (*Astragalus lentiginosus* var. *borreganus*) is adapted to sandy habitats and is known from one occurrence on the Dumont Dunes in San Bernardino County. Many of the species in arid upland habitats have adaptations such as succulence that aid in drought tolerance [e.g. Johnston's beehive cactus (*Sclerocactus johnstonii*)], or they may evade drought by completing their life cycle early like the annual plants Ripley's aliciella (*Aliciella ripleyi*), little desert trumpet (*Eriogonum trichopes*), ribbed cryptantha (*Johnstonella costata*), and winged cryptantha (*J. holoptera*). Species that occur in

arid upland habitats typically bloom in the early spring between the months of March to April (CNPS 2017, CCH 2017).

## b. Notable Geographic Locations for Plant Diversity

There are notable geographic locations for endemic plant diversity within the Amargosa Wild and Scenic River. These locations have specialized habitats such as wetlands that support rare and endemic taxa and are summarized below.

### i. Shoshone Wetlands

The wetlands just south of the village of Shoshone supports extensive alkali meadow habitat that occurs on both sides of Highway 127. There is one unconfirmed occurrence of the Federally Threatened species, Ash Meadows Gumplant (*Grindelia fraxinoprattensis*), in the village of Shoshone that needs to be verified. Fiddleleaf hawksbeard (*Crepis runcinata*) and hot springs fimbriatylis (*Fimbristylis thermalis*) are known from historical occurrences in the vicinity Shoshone, but need to be further documented. These species bloom in the summer months and surveys by the Rancho Santa Ana Botanic Garden staff are ongoing. Just south of Shoshone is an extensive alkali meadow that supports large populations of Tecopa bird's beak (*Chloropyron tecopense*), white flowered rabbitbrush (*Ericameria albida*), copperwort (*Euphrosyne acerosa*), Cooper's rush (*Juncus cooperi*), and potential habitat for Amargosa niterwort (*Nitrophila mohavensis*).

### ii. Tecopa Marsh

The marshlands in the vicinity of Tecopa and Tecopa Hot Springs support extensive wetlands and rare plant species including alkali marsh aster (*Almutaster pauciflorus*), Tecopa bird's beak (*Chloropyron tecopense*), and Amargosa niterwort (*Nitrophila mohavensis*). Surveys to map the current extent of Amargosa niterwort in this region are ongoing.

### iii. Hanging gardens south of Tecopa

South of Tecopa, along the Amargosa River, there are seeps and springs that emerge high up on the walls of the Amargosa Canyon. These seeps form large hanging gardens dominated by California saw grass (*Cladium californicum*). These unique habitats support a rich suite of wetland species including Nevada blue eyed grass (*Sisyrinchium halophilum*) which was newly documented in the region as a result of the botanical work conducted in 2017.

## c. Floristic Summary

The botanist team documented 43 plant families, 127 genera, and 194 total taxa (including subspecies and varieties) within the study area. Of the 194 taxa documented, 176 (90%) are native, 19 (10%) are not native (including plants persisting from cultivation). Most of the taxa

are verified by voucher specimens (152 or 78% of taxa), and 42 taxa are reported from observations only.

#### d. Vegetation

The Amargosa River Basin includes diverse vegetation associations in both wetland and arid upland habitats. Important vegetation alliances that have been observed within the Amargosa Wild and Scenic River are summarized below. The alliances outlined here follow vegetation classifications described in Sawyer et al. (2008).

##### i. Woodland Associations

**Mesquite bosque.**—Dominated by honey mesquite (*Prosopis glandulosa*), the tree canopy may be open or continuous. This vegetation alliance may occur on the edges of playas, along the river, and floodplains. Honey mesquite trees grow in areas with access to permanent underground water, and have deep roots to tap into water supplies below the surface. Significant stands of Mesquite bosque occur along the Amargosa River from south of Tecopa to south to Sperry Wash.

**Mesquite bosque.**—Dominated or co-dominated by screw bean mesquite (*Prosopis pubescens*), this vegetation alliance is more restricted to riparian habitats than honey mesquite (*Prosopis glandulosa*) and is relatively rare in California. Health and density of screw bean mesquite has been substantially reduced along the Amargosa River in the last decade due to “die-off”. This species has experienced die-off throughout the desert southwest as well (Anderson 2007; Foldi 2014). The cause of Screwbean Mesquite die-off is not known, but there is speculation that it is pathogen-derived. There is also speculated that the die-off has been caused by poisoning after Tamarisk removal.

**Black Willow thickets.**—Dominated by Goodding's black willow (*Salix goodingii*), and often associated with arroyo willow (*Salix lasioplepis*), narrowleaf willow (*Salix exigua*), arrow weed (*Pluchea sericea*), and Fremont's cottonwood (*Populus fremontii*). This vegetation alliance is usually found along the river, near springs, and in canyon bottoms.

##### ii. Scrub Associations

**Bush seepweed scrub.**—Dominated by bush seepweed (*Suaeda nigra*), this vegetation alliance typically occurs on flat valley bottoms, at the edge of playas, and in saline and alkaline soils.

**Saltbush scrub alliances.**— There is a high diversity of *Atriplex* species within the Amargosa River Basin. Several species of salt bush (*Atriplex* spp.) form the dominant component of vegetation in areas that are influenced by alkali soils and occur primarily on flats. Common salt bush alliances include four-wing saltbush scrub (*Atriplex canescens*), shad-scale scrub (*A. confertifolia*), desert holly scrub (*A. hymenelytra*), quailbush scrub (*A. lentiformis*), and allscale scrub (*A. polycarpa*).

**Creosote bush scrub.**—Dominated by creosote bush (*Larrea tridentata*) and often in association with burro bush (*Ambrosia dumosa*), desert holly (*A. hymenelytra*), and brittlebush (*Encelia farinosa*), this vegetation type typically occurs on alluvial fans, bajadas, upland slopes and small washes.

i. **Herbaceous Wetland Associations**

**American bulrush marsh.**—Dominated by American bulrush (*Schoenoplectus americanus*), this vegetation association co-occurs with other herbaceous species including yerba mansa (*Anemopsis californica*), salt grass (*Distichlis spicata*), Cooper’s rush (*Juncus cooperi*), and common reed (*Phragmites australis*), this vegetation association occurs along streams, ponds, and fresh water marshes.

**Alkali sacaton grassland.**—Dominated by alkali sacaton (*Sporobolus airoides*) and associated with salt grass (*Distichlis spicata*), boraxweed (*Nitrophila occidentalis*), four-wing saltbush (*Atriplex canescens*) and honey mesquite (*Prosopis glandulosa*), this alliance typically occurs along alluvial flats, streams, swales, and is usually associated with alkaline soils.



**FIGURE 4.** *JUNCUS COOPERI* AND *EUPHROSYNE ACEROSA* GROWING IN AN ALKALI MEADOW DOMINATED BY SALT GRASS (*DISTICHLIS SPICATA*), SOUTH OF SHOSHONE VILLAGE WITHIN THE AMARGOSA WILD AND SCENIC RIVER DESIGNATION. PHOTO: NAOMI FRAGA, RSABG, 2017.

**Salt grass flats.**—Dominated by salt grass (*Distichlis spicata*), this association co-occurs with (arrowgrass), *Ericameria* white flowered rabbitbrush (*Triglochin maritima albida*), Cooper's rush (*Juncus cooperi*), and alkali sacaton (*Sporobolus airoides*). Salt grass is a rhizomatous, warm season grass, and is adapted to saline environments.

#### e. Discussion and Recommendations for Future Research

In addition to Amargosa niterwort (*Nitrophila mohavensis*) and spring-loving centaury (*Zeltnera namophila*), the DRECP has the following listed as species of concern in the South Amargosa South ACEC (CEC 2016): Tecopa bird's-beak (*Chloropyron tecopense*), Amargosa beardtongue (*Penstemon fruticiformis* var. *amargosae*), Stephens' beardtongue (*Penstemon stephensii*), Pahrump orache (*Atriplex argentea* var. *longitrichoma*), forked buckwheat (*Eriogonum bifurcatum*), Kingston Mountains bedstraw (*Galium hilendiae* ssp. *kingstonense*), Kingston Mountains ivesia (*Ivesia patellifera*), Clark Mountain monardella (*Monardella eremicola*), Parish's phacelia (*Phacelia parishii*), and Rusby's desert-mallow (*Sphaeralcea rusbyi* var. *eremicola*), and alkali mariposa lily (*Calochortus striatus*). Additional rare plant taxa could be found in this area, but not all have been observed (Table 3, Figure 5).

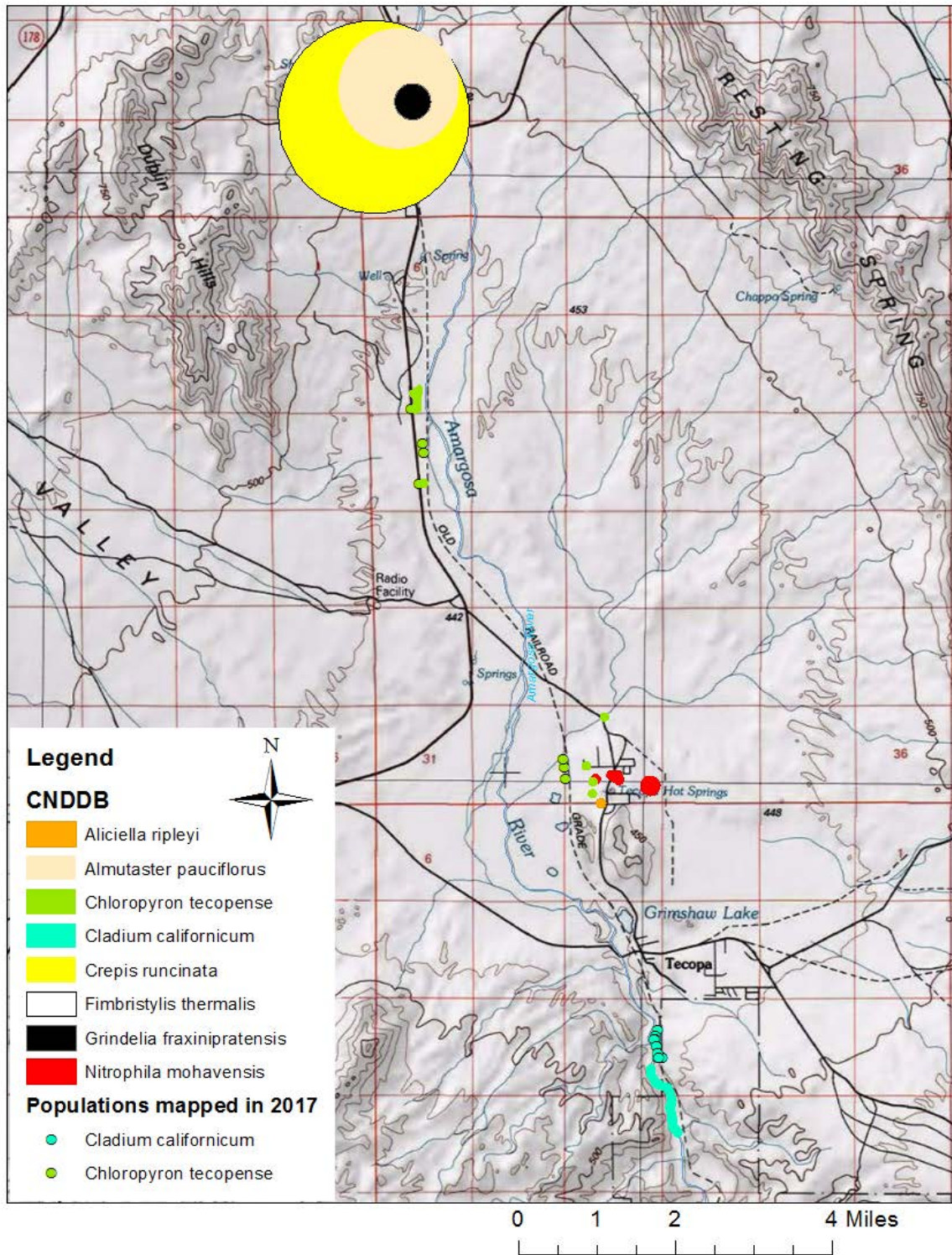
In addition to mesquite bosque, screwbean mesquite bosque and willow gallery forest, other rare and important habitats that are found within the Wild and Scenic River designation include herbaceous wetland plant communities, including American bulrush marsh, alkali sacaton grassland, and salt grass flats. The spring-fed hanging gardens south of Tecopa are an important location for rare plants along the river as well.

Amargosa niterwort (*Nitrophila mohavensis*) was first documented in Tecopa Hot Springs in 1963 by Louis C. Wheeler (CCH 2017). The plants occurring in and around Tecopa Hot Springs are the least well-studied and documented throughout the species range and have not been surveyed systematically. The current status of the Amargosa niterwort plants in the vicinity of Tecopa Hot Springs is currently unknown; additional surveys are needed within historically occupied and potential habitat to map populations, and assess baseline numbers on BLM lands and private property where RSABG staff have been granted permission to survey. In addition, though some surveys of Amargosa niterwort have occurred at lower Carson Slough, it would be beneficial to set up a long-term monitoring program using protocols developed by the BLM to monitor the population (Willoughby 2014). The Amargosa niterwort occurrence at Tecopa Hot Springs is at the southern end of the distribution for the species. Plants at this location may be most susceptible to disturbance and hydrological alteration, therefore assessment of this population is important to developing a range wide, long term conservation strategy.

**TABLE 3. RARE PLANT TAXA THAT MAY BE FOUND ALONG THE WILD AND SCENIC PORTIONS OF THE AMARGOSA RIVER (CNDDDB 20017, CNPS 2017). LIST COMPILED BY NAOMI FRAGA, RANCHO SANTA ANA BOTANIC GARDEN.**

Scientific Name	Common Name	Rare Plant Rank	State Rank	Global Rank	CESA	FESA	Bloom Period	Habitat
<i>Aliciella ripleyi</i>	Ripley's aliciella	2B.3	S2	G3	None	None	May-Jul	Mojavean desert scrub (carbonate)
<i>Almutaster pauciflorus</i>	Alkali marsh aster	2B.2			None	None	Jul-Oct	mesic, alkaline.
<i>Arctomecon merriamii</i>	white bear poppy	2B.2	S3	G3	None	None	Mar-May	Mojavean desert scrub
<i>Astragalus lentiginosus</i> var. <i>borreganus</i>	Borrego milk-vetch	4.3	S4	G5T5?	None	None	Feb-May	desert dunes
<i>Calochortus striatus</i>	alkali mariposa lily	1B.2	S3	G3	None	None	Apr-Jun	mesic, alkaline
<i>Chloropyron tecopense</i>	Tecopa bird's-beak	1B.2	S1	G2	None	None	Jul-Oct	mesic, alkaline.
<i>Cladium californicum</i>	California sawgrass	2B.2	S2	G4	None	None	Jun-Sep	marshes and swamps
<i>Cleomella brevipes</i>	short-pedicelled cleomella	4.2	S3	G4	None	None	May-Oct	playas, marshes
<i>Crepis runcinata</i>	fiddleleaf hawksbeard	2B.2	S3	G5	None	None	May-Aug	mesic, alkaline.
<i>Ericameria albida</i>	white-flowered rabbitbrush	4.2	S3	G4	None	None	Jun-Nov	saline or alkaline
<i>Eriogonum bifurcatum</i>	forked buckwheat	1B.2	S3	G3	None	None	Apr-Jun	chenopod scrub, playas
<i>Eriogonum contiguum</i>	Reveal's bunchwheat	2B.3	S2	G3	None	None	Mar-May	Mojavean desert scrub
<i>Euphosyne acerosa</i>	copperwort	4.2	S3	G4G5	None	None	May-Dec	meadows and seeps
<i>Fimbristylis thermalis</i>	hot springs fimbristylis	2B.2	S1S2	G4	None	None	Jul-Sep	meadows and seeps
<i>Grindelia fraxinipratensis</i>	Ash Meadows gumplant	1B.2	S1	G2	None	FT	Jun-Oct	meadows and seeps
<i>Johnstonella costata</i>	ribbed cryptantha	4.3	S4	G4G5	None	None	Feb-May	desert dunes
<i>Johnstonella holoptera</i>	winged cryptantha	4.3	S4	G4G5	None	None	Mar-Apr	mesic, alkaline
<i>Juncus cooperi</i>	Cooper's rush	4.3	S3	G4	None	None	Apr - Aug	meadows and seeps
<i>Nitrophila mohavensis</i>	Amargosa nitrophila	1B.1	S1	G1	CE	FE	May-Oct	playas (mesic, clay)
<i>Phacelia parishii</i>	Parish's phacelia	1B.1	S1	G2G3	None	None	Apr-May	mesic, alkaline
<i>Plagiobothrys salsus</i>	desert popcornflower	2B.2	S1	G2G3	None	None	May-Aug	mesic, alkaline
<i>Salvia funerea</i>	Death Valley Sage	4.3	S4	G4	None	None	Mar-May	Mojavean desert scrub (carbonate)
<i>Sclerocactus johnsonii</i>	Johnson's bee-hive cactus	2B.2	S2	G3	None	None	Apr-May	Mojavean desert scrub (granitic)
<i>Zelterna namophila</i>	spring-loving centauray	None	S2 (NV)	G2	None	FT	July-Sep	mesic, alkaline





**FIGURE 5. MAP OF RARE PLANT TAXA OCCURRING ALONG THE WILD AND SCENIC AMARGOSA RIVER. THE SIZE OF THE CIRCLES INDICATES LOCATION PRECISION; SMALLER POLYGONS INDICATE PRECISELY MAPPED LOCATIONS AND LARGER POLYGONS ARE BUFFERED TO INDICATE PRECISION UNCERTAINTY. OCCURRENCE DATA WERE FROM THE CALIFORNIA NATURAL DIVERSITY DATABASE (CNDDDB) AND FROM FIELD SURVEYS CONDUCTED BY NAOMI FRAGA OF THE RANCHO SANTA ANA BOTANIC GARDEN BETWEEN JANUARY 19, 2017 AND MAY 30, 2017. NOTE THAT NOT ALL SPECIES LISTED IN TABLE 3 HAVE BEEN FOUND TO OCCUR WITHIN THIS AREA, AND NOT ALL PLANTS ARE ACTIVELY MAPPED BY CNDDDB.**

The botanical team from RSABG recommend that additional botanical surveys be conducted in the wetlands south Shoshone between the months of June-August. This region is likely to yield additional rare plant occurrences and it also potential habitat for the Amargosa niterwort. Further surveys are needed to verify the unconfirmed occurrence of Ash Meaows gumplant (*Grindelia fraxinipratensis*) and to relocate historical occurrences of fiddleleaf hawksbeard (*Crepis runcinata*) and hot springs fimbristylis (*Fimbristylis thermalis*). Continued floristic surveys and surveys of potential habitat for rare and endemic species will provide much needed baseline data to inform long term management.

## V. Conclusion

The Amargosa River in California contains an outstanding suite of rare, endemic, and imperiled species. Here we detail some of the species, taxonomic groups, and plant community types which may be prioritized for additional research, monitoring, and conservation action.

The wetland habitats of the Amargosa River are groundwater dependent. To ensure the sustainable and continued natural base flow of the river, we must ensure the expression of groundwater as seeps and springs and within this region. It is these springs and seeps that support the Amargosa River and maintain its biodiversity.

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# Appendix

## Checklist of Birds of the Amargosa

Courtesy of Shoshone Village, California

Compiled for Shoshone Village by Len Warren

<b>Includes:</b>	Area 3: Grimshaw Lake & Tecopa
Wetlands	
Area 1: Shoshone Village	Area 4: Amargosa Canyon
Area 2: Shoshone/Amargosa Wetlands	Area 5: China Ranch
* breeds here	

*This checklist is a work in progress. Additions and reports are welcome*

### Geese & Swans

Greater White-fronted Goose  
 Snow Goose  
 Ross's Goose  
 Canada Goose  
Trumpeter Swan (probably a released)  
Tundra Swan

### Ducks

Wood Duck  
 Gadwall\*  
 American Wigeon  
 Mallard\*  
 Blue-winged Teal  
 Cinnamon Teal  
 Northern Shoveler  
 Northern Pintail  
 Green-winged Teal\*  
 Canvasback  
 Redhead  
 Ring-necked Duck  
Greater Scaup  
 Lesser Scaup  
 Bufflehead  
 Common Goldeneye  
 Hooded Merganser  
 Common Merganser  
Red-breasted Merganser  
 Ruddy Duck

### Upland Game Birds

Gambel's Quail\*  
 Chukar\*

### Loons and Grebes

Pacific Loon  
 Common Loon  
 Pied-billed Grebe\*  
Horned Grebe  
 Eared Grebe  
 Western Grebe  
 Clark's Grebe

### Pelicans and Cormorants

Double-crested Cormorant  
 American White Pelican

### Hérons & Egrets

American Bittern\*  
Least Bittern\*  
 Great Blue Heron  
 Great Egret  
 Snowy Egret  
 Cattle Egret  
 Green Heron\*  
 Black-crowned Night-Heron

### Ibis

White-Faced Ibis

### Raptors

Turkey Vulture  
 Osprey  
 Northern Harrier\*  
 Sharp-shinned Hawk  
 Cooper's Hawk\*  
 Red-shouldered Hawk  
 Swainson's Hawk  
Zone-tailed Hawk  
 Red-tailed Hawk\*  
 Ferruginous Hawk  
 Golden Eagle  
 American Kestrel\*  
 Merlin  
Peregrine Falcon  
 Prairie Falcon\*

### Gruiformes

Virginia Rail\*  
 Sora  
Common Moorhen  
 American Coot\*

### Plovers, Stilts & Avocets

Black-bellied Plover  
 Snowy Plover\*  
 Semipalmated Plover  
 Killdeer\*  
Mountain Plover  
 Black-necked Stilt\*  
 American Avocet\*

**Sandpipers**

Spotted Sandpiper  
 Solitary Sandpiper  
 Greater Yellowlegs  
 Willet  
 Lesser Yellowlegs  
Whimbrel  
 Long-billed Curlew  
 Marbled Godwit  
Sanderling  
Semipalmated Sandpiper  
 Western Sandpiper  
 Least Sandpiper  
 Baird's Sandpiper  
Pectoral Sandpiper  
 Dunlin  
Short-billed Dowitcher  
 Long-billed Dowitcher  
 Wilson's Snipe  
 Wilson's Phalarope  
 Red-necked Phalarope

**Gulls & Terns**

Sabine's Gull  
 Bonaparte's Gull  
Franklin's Gull  
 Ring-billed Gull  
 California Gull  
 Black Tern  
 Least Tern  
 Forster's Tern

**Pigeons & Doves**

Band-tailed Pigeon  
 Eurasian Collared-Dove\*  
White-winged Dove  
 Mourning Dove\*  
Inca Dove  
Common Ground-Dove  
 Ruddy Ground-Dove  
 Rock Dove

**Cuckoos & Roadrunners**

Yellow-billed Cuckoo\*  
 Greater Roadrunner\*

**Owls**

Barn Owl  
Flammulated Owl  
 Western Screech Owl  
 Great Horned Owl\*  
 Burrowing Owl\*  
 Long-eared Owl\*  
 Northern Saw-whet Owl

**Goatsuckers**

Lesser Nighthawk\*  
 Common Nighthawk  
 Common Poorwill\*

**Swifts**

Vaux Swift  
 White-throated Swift\*

**Hummingbirds**

Black-chinned Hummingbird\*  
 Anna's Hummingbird\*  
 Costa's Hummingbird\*  
 Calliope Hummingbird  
Broad-tailed Hummingbird  
 Rufous Hummingbird

**Kingfishers**

Belted Kingfisher

**Woodpeckers**

Lewis's Woodpecker  
Williamson's Sapsucker  
Yellow-bellied Sapsucker  
 Red-naped Sapsucker  
 Red-breasted Sapsucker  
 Ladder-backed Woodpecker\*  
 Northern (Yellow-shafted) Flicker  
 Northern (Red-shafted) Flicker

**Flycatchers**

Olive-sided Flycatcher  
 Western Wood-Pewee  
 Willow Flycatcher\*  
Least Flycatcher  
 Hammond's Flycatcher  
 Gray Flycatcher  
 Dusky Flycatcher  
 Pacific-slope Flycatcher  
 Western Flycatcher  
 Black Phoebe  
Eastern Phoebe  
 Say's Phoebe\*  
Vermilion Flycatcher\*  
 Ash-throated Flycatcher\*  
Brown-crested Flycatcher\*  
Dusky-capped Flycatcher  
Cassin's Kingbird  
 Western Kingbird\*  
Eastern Kingbird  
Scissor-tailed Flycatcher

**Shrikes**

Loggerhead Shrike\*

**Vireos**

White-eyed Vireo  
 Bell's Vireo\*  
Gray Vireo  
Yellow-throated Vireo  
 Plumbeous Vireo  
 Cassin's Vireo  
Blue-headed Vireo  
Hutton's Vireo  
Warbling Vireo  
Philadelphia Vireo  
Red-eyed Vireo



**Jays & Crows**

Pinyon Jay  
Western Scrub-Jay  
Black-billed Magpie  
American Crow  
Common Raven\*

**Larks**

Horned Lark

**Swallows**

Tree Swallow  
Violet-green Swallow  
Northern Rough-winged Swallow\*  
Bank Swallow  
Cliff Swallow  
Barn Swallow

**Remizidae (Penduline Tit)**

Verdin\*

**Aegithalidae**

Bushtit

**Chickadees & Titmice**

Juniper Titmouse

**Nuthatches & Creepers**

Red-breasted Nuthatch  
White-breasted Nuthatch  
Brown Creeper

**Wrens**

Cactus Wren  
Rock Wren\*  
Canyon Wren  
Bewick's Wren\*  
House Wren  
Pacific Wren  
Marsh Wren

**Gnatcatchers & Kinglets**

Blue-gray Gnatcatcher\*  
Black-tailed Gnatcatcher\*  
Golden-crowned Kinglet  
Ruby-crowned Kinglet

**Thrushes**

Western Bluebird  
Mountain Bluebird  
Townsend's Solitaire  
Swainson's Thrush  
Hermit Thrush  
American Robin  
Varied Thrush  
Wood Thrush

**Mimic Thrushes**

Gray Catbird  
Northern Mockingbird\*  
Sage Thrasher  
Brown Thrasher  
Bendire's Thrasher  
Crissal Thrasher\*  
Le Conte's Thrasher

**Starlings & Mynas**

European Starling\*

**Pipits & Wagtails**

Red-throated Pipit  
American Pipit

**Waxwings**

Bohemian Waxwing  
Cedar Waxwing

**Silky Flycatchers**

Phainopepla\*

**Longspurs**

Chestnut-collared Longspur

**Warblers**

Blue-winged Warbler  
Tennessee Warbler  
Orange-crowned Warbler  
Nashville Warbler  
Virginia's Warbler  
Lucy's Warbler\*  
Northern Parula  
Yellow Warbler\*  
Magnolia Warbler  
Black-throated Blue Warbler  
Yellow-rumped (Audubon's) Warbler  
Yellow-rumped (Myrtle) Warbler  
Black-throated Gray Warbler  
Townsend's Warbler  
Hermit Warbler  
Pine Warbler  
Bay-breasted Warbler  
Blackpoll Warbler  
Black-and-white Warbler  
American Redstart  
Prothonotary Warbler  
Ovenbird  
Northern Waterthrush  
Kentucky Warbler  
Connecticut Warbler  
MacGillivray's Warbler  
Common Yellowthroat\*  
Hooded Warbler  
Wilson's Warbler  
Painted Redstart  
Yellow-breasted Chat\*

**Towhees**

Green-tailed Towhee  
Spotted Towhee

**Sparrows**

Chipping Sparrow  
Clay-colored Sparrow  
Brewer's Sparrow  
Vesper Sparrow  
Lark Sparrow  
Black-throated Sparrow\*  
Sage Sparrow  
Lark Bunting  
Savannah Sparrow  
Grasshopper Sparrow  
Le Conte's Sparrow  
Nelson's Sparrow  
Fox Sparrow  
Song Sparrow\*  
Lincoln's Sparrow  
Swamp Sparrow  
White-throated Sparrow  
Harris's Sparrow  
White-crowned (Gambel's) Sparrow  
White-crowned (Mountain) Sparrow  
Golden-crowned Sparrow

**Juncos**

Dark-eyed (Pink-sided) Junco  
Dark-eyed (Slate-colored) Junco  
Dark-eyed (Oregon) Junco  
Dark-eyed (Gray-headed) Junco

**Tanagers**

Summer Tanager\*  
Western Tanager

**Cardinals, Grosbeaks & Buntings**

Northern Cardinal  
Rose-breasted Grosbeak  
Black-headed Grosbeak  
Blue Grosbeak\*  
Lazuli Bunting\*  
Indigo Bunting\*  
Indigo X Lazuli Bunting Hybrid  
Painted Bunting

**Open Field Birds**

Dickcissel  
Bobolink  
Lark Bunting

**Blackbirds**

Red-winged Blackbird\*  
Western Meadowlark\*  
Yellow-headed Blackbird\*  
Brewer's Blackbird\*  
Great-tailed Grackle\*  
Bronzed Cowbird  
Brown-headed Cowbird\*

**Orioles**

Orchard Oriole  
Hooded Oriole\*  
Bullock's Oriole  
Baltimore Oriole  
Scott's Oriole

**Finches**

Purple Finch  
Cassin's Finch  
House Finch\*  
Red Crossbill  
Pine Siskin  
Lesser Goldfinch\*  
Lawrence's Goldfinch  
American Goldfinch  
Evening Grosbeak

**Passeridae (introduced)**

House Sparrow\*