Vermilion flycatcher


Common buckeye on sunflower
(Junonia coenia on *Helianthus annuus)*

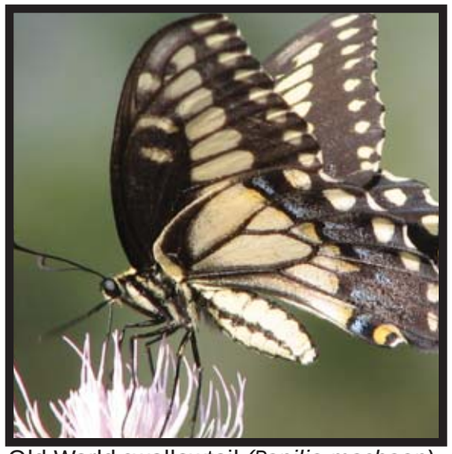

Cryptantha (*Cryptantha* sp.)


Tarantula *(Aphonopelma* spp.*)*

3.01 BIODIVERSITY

The upper Muddy River is considered one of the Mojave's most important areas of biodiversity and regionally important ecological but threatened riparian landscapes (Provencher et al. 2005). Not only does the Warm Springs Natural Area encompass the majority of Muddy River tributaries it is also the largest single tract of land in the upper Muddy River set aside for the benefit of native species in perpetuity.

The prominence of water in an otherwise barren Mojave landscape provides an oasis for regional wildlife. A high bird diversity is attributed to an abundance of riparian and floodplain trees and shrubs. Contributions to plant diversity come from the Mojave vegetation that occur on the toe slopes of the Arrow Canyon Range from the west and the plant species occupying the floodplain where they are supported by a high water table. Several marshes and wet meadows add to the diversity of plants and animals. The thermal springs and tributaries host an abundance of aquatic species, many of which are endemic. The WSNA provides a haven for the abundant wildlife that resides permanently or seasonally and provides a significant level of protection for imperiled species.


Old World swallowtail *(Papilio machaon)*


Beavertail cactus (*Opuntia basilaris*)


Coyote *(Canis latrans)*


Desertsnow *(Linanthus demissus)*


Pacific tree frog *(Pseudacris regilla)*


Damselfly *(Enallagma sp.)*


Lobe-leaved Phacelia *(Phacelia crenulata)*


Merriam's kangaroo rat
(Dipodomys merriami)


Great horned owl *(Bubo virginianus)*


Desert banded gecko *(Coleonyx variegatus)*


Spinyhair blazingstar *(Mentzelia tricuspis)*


Bighorn sheep (*Ovis canadensis*)


Turkey vulture *(Cathartes aura)*


Master blister beetle *(Lytta magister)*


Brittlebush *(Encelia farinosa)*


California kingsnake
(Lampropeltis getula californiae)


California palm *(Washingtonia filifera)*
seeds


Desert horned lizard
(Phyrnosoma platyrhinos)


Screwbean mesquite *(Prosopis pubescens)*
pods


Mesquite mistletoe
(Phoradendron californicum) fruit


Honey mesquite *(Prosopis glandulosa)*
flowers


Desert Tortoise *(Gopherus agassizii)*


Catclaw acacia *(Acacia gregii)* seed pods

3.02 SENSITIVE SPECIES OF WSNA

Endemic Species

All organisms, their niches, and their interactions with each other comprise biological resources. Because of the plentiful spring water with its unique thermal properties, the Warm Springs Natural Area (WSNA) harbors an abundance of endemic species that occur nowhere else on earth. Of all the endemic species that occur on WSNA, the Moapa dace (*Moapa coriacea*) is the most imperiled and is federally protected as an endangered species. For this reason, the priority of management attention is focused on its protection and recovery. The Moapa dace's recovery is largely dependent upon restoring stream habitat and the removal of introduced, competitive fish species.

Thermal properties of the WSNA springs and tributaries are key to the existence of the endemic and rare species.

Ecological Isolate

The WSNA is considered a ecological isolate (or island) within the dry Mojave Desert, providing quality riparian and mesquite woodlands that attract an abundance of wildlife, especially birds. The endangered Southwestern willow flycatcher (*Empidonax traillii extimus*) has been documented as nesting on the property. Protecting the nesting habitat is an important management objective to help ensure long-term population viability for this endangered species. Plant communities and their floristic composition, structure, and condition all contribute to habitat quality and preferential use by wildlife. Soil disturbance and the introduction of invasive weeds have created a threat to habitat quality and increase the risk of catastrophic wildfires.

Species Conservation

In addition to species protected under the federal Endangered Species Act (ESA), numerous other species are considered at-risk because of their local endemism or limited distribution. A critical management component on the WSNA is not only identifying threatened and/or endangered species, but also managing at-risk or rare plants and animals. It is important to monitor at-risk species in order to assess population stability. It requires less effort to protect a species from becoming endangered than recovering one once it has become such.

There are several bird species on the WSNA identified under the Partners in Flight Species Conservation Priority list. These species will be provided appropriate conservation consideration.

Some species such as the Vermilion flycatcher (*Pyrocephalus rubinus*) and Phainopepla (*Phainopepla nitens*) are signature species at the WSNA. Due to abundant and predictable population levels, they are important for recreational viewing by the birding community. Protecting at-risk and other important species is primarily a function of protecting and enhancing their respective habitats. Much of their habitat requirements overlap where multiple species are benefited from the same management practices.

Because of the oasis effect, provided by lush riparian vegetation in an otherwise harsh Mojave Desert ecosystem, WSNA supports a large and diverse population of bats. At least 15 species of bats have been documented using various habitats of the Warm Springs Natural Area. Fields, mesquite woodlands, riparian habitats, marshes, and open water offer large insect populations and foraging opportunities for bats.

Sensitive Species

28 Sensitive Species on WSNA				
Common Name	Scientific Name	USFWS	NNHP State Status	Footnotes
Fish				
1 Moapa White River springfish	*Crenichthys baileyi moapae*		critically imperiled in state	4,6,8
2 Virgin River chub	*Gila seminuda (Muddy River Population)*		globally - critically imperiled	4,5,6,8
3 Moapa dace	*Moapa coriacea*	Endangered	critically imperiled in state	1,4,5,6,8
4 Moapa speckled dace	*Rhinichthys osculus moapae*		critically imperiled in state	4,5,6,8
Invertebrates				
5 Western naucorid	*Ambrysus mormon*			7
6 Warm Springs crawling water beetle	*Haliplus eremicus*		not ranked	4
7 MacNeill sooty wing skipper	*Hesperopsis gracielae*		critically imperiled in state	4,5,6
8 Moapa naucorid	*Limnocoris moapensis*		critically imperiled in state	4,7,8
9 Moapa riffle beetle	*Microcylloepus moapus*		critically imperiled in state	4,5,7
10 Pahranagat naucorid	*Pelocoris biimpressus shoshone*			4,7
11 Moapa pebblesnail	*Pyrgulopsis avernalis*	petitioned for listing	imperiled in state due to rarity	4,7,8
12 Moapa Valley pyrg	*Pyrgulopsis carinifera*	petitioned for listing	critically imperiled in state	4,7
13 Moapa skater	*Rhagovelia becki*			7
14 Moapa Warm Springs riffle beetle	*Stenelmis moapa*		critically imperiled in state	4,5,7,8
15 Grated tryonia	*Tryonia clathrata*	petitioned for listing	imperiled in state due to rarity	4,7,8
Birds				
16 Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Candidate	globally - vulnerable to decline	3,4,5,6
17 Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	critically imperiled in state	1,4,5,6
18 Phainopepla	*Phainopepla nitens*		imperiled in state due to rarity	4,5,6
19 Vermilion flycatcher	*Pyrocephalus rubinus*			6
20 Summer tanager	*Piranga rubra*			6
Bats				
21 Townsend's big-eared bat	*Corynorhinus townsendii*		imperiled in state due to rarity	4,5,6
22 Spotted bat	*Euderma maculatum*		imperiled in state due to rarity	4,5,6
23 Western red bat	*Lasiurus blossevillii*		critically imperiled in state	4,5
24 Western yellow bat	*Lasiurus xanthinus*		critically imperiled in state	4
25 California leaf-nosed bat	*Macrotus californicus*		imperiled in state due to rarity	4,5,6
26 Fringed myotis	*Myotis thysanodes*		imperiled in state due to rarity	4,5,6
27 Big free-tailed bat	*Nyctinomops macrotis*		imperiled in state due to rarity	4,5,6
Reptiles				
28 Desert tortoise	*Gopherus agassizii*	Threatened	vulnerable to decline	2,4,5,6

FOOTNOTES:

1 Listed as Endangered under the Endangered Species Act
2 Listed as Threatened under the Endangered Species Act
3 Candidate species under the Endangered Species Act
4 State of Nevada Department of Conservation & Natural Resources. 2009
5 Bureau of Land Management - Nevada Special Status Species
6 Clark County Multiple Species Habitat Conservation Plan (MSHCP). 2000
7 Muddy River Headwaters Macroinvertebrate Report - Albrecht et al. 2008
8 U.S. Department of the Interior Fish and Wildlife Service. 1996. Recovery plan for the rare aquatic species of the Muddy River ecosystem

28 SENSITIVE SPECIES

There are **28 at-risk** or rare species including some endangered or threatened species residing on the property. The 1996 *Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem* identifies current status, threats and recovery needs for the Moapa dace and seven other rare, aquatic species (three fish, two snails and two insects).

Other species are included from the Clark County Multiple Species Habitat Conservation Plan (2000), the Nevada Natural Heritage Program at-risk tracking list and/or watch list, and rare aquatic species at WSNA identified in a survey report by Albrecht et al. (2008).

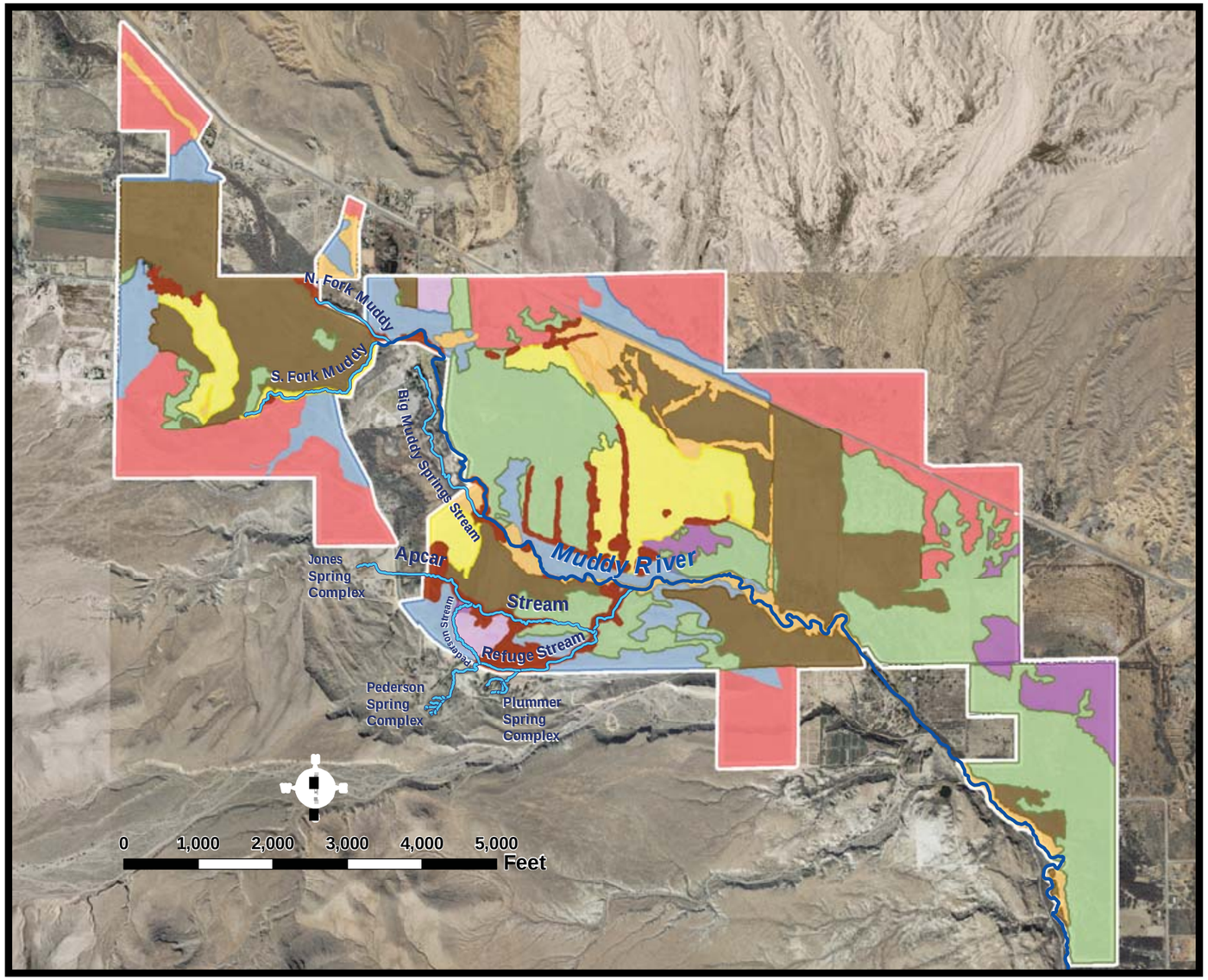
3.03 ECOLOGICAL SYSTEMS OF THE WSNA

ECOLOGICAL ASSEMBLAGES

- Muddy River Aquatic Assemblage
- Warm Springs Aquatic Assemblage
- Riparian Woodlands
- Riparian Shrubland
- Riparian Marsh/Meadow
- Mesquite Bosques

OTHER ECOLOGICAL GROUPS

- Creosote Bush Shrubland
- Saltbush Shrubland
- Alkali Meadow
- Abandoned Agricultural Fields
- Other



Six ecological systems were identified by Provencher and Andress (2004) as occurring in the upper Muddy River. Each system forms an ecologically functional assemblage that contains habitat features and a suite of organisms. All six assemblages are known to occur on the Warm Springs Natural Area and help characterize the existing ecological units that require management in order to protect wildlife, many of which are endemic or regionally rare. The Warm Springs Aquatic Assemblage and the Muddy River Aquatic Assemblage are of particular interest due to the endangered Moapa dace *(Moapa coriacea)* as well as several endemic invertebrates.

The other assemblages provide habitat for a variety of wildlife but especially for rare birds such as the Southwestern willow flycatcher *(Empidonax traillii extimus)*, Yellow-billed cuckoo *(Coccyzus americanus occidentalis)*, Vermilion flycatcher *(Pyrocephalus rubinus)*, Summer tanager *(Piranga rubra)*, and Phainopepla *(Phainopepla nitans)*. Each assemblage and its associated species that merits management consideration is discussed per assemblage. This approach emphasizes the need to manage functional systems and habitats in order to sustain and/or enhance identified recovery species. While the same species may occupy multiple ecological assemblages, each species is discussed in the assemblage where it reaches maximum prevalence.

3.04 MUDDY RIVER AQUATIC ASSEMBLAGE

The Muddy River Aquatic Assemblage encompasses the Muddy River. It is characterized by shrubby vegetation composed primarily of tamarisk and honey mesquite growing along a highly incised streambank. Water temperatures range between 80°-90° F on the WSNA. Exotic fishes such as tilapia, mollies, and mosquito fish are ubiquitous. While many aquatic animal species occur throughout the aquatic assemblages, a few reach maximum prevalence within this assemblage. Two native fishes and two aquatic invertebrates of concern primarily occur in this assemblage.

SPECIES FOR MANAGEMENT CONSIDERATION

- Virgin River chub *Gila seminuda* - Muddy River Population*
- Moapa speckled dace *Rhinichthys osculus moapae**
- Warm Springs crawling water beetle *Haliplus eremicus*
- Moapa skater *Rhagovelia becki*

** Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem (USFWS 1996)*

Virgin River chub
(Gila seminuda)

The Muddy River population of Virgin River chub has a high potential for being listed as an endangered species. It has been declining throughout the Muddy River since the 1960s. Chub decline has been attributed to changes in water and substrate quality, channelization, introduced fishes, and parasites. Since its extirpation in the Warm Springs area in about 1997, this species has not been able to recolonize these streams due to a diversion dam near Warm Springs Road. The Virgin River chub averages 8-10 inches in length. It prefers deep streams with swift water. Dietary preferences of larval and juvenile chub consist primarily of aquatic insects. Adult chub feed on both insects and algae. Management of Virgin River chub on WSNA requires reestablishing connectivity with the core population that occur downstream, eliminating introduced fishes, and restoring floodplain vegetation.

Moapa speckled dace
(Rhinichthys osculus moapae)

Moapa speckled dace populations are known to fluctuate greatly. The Moapa speckled dace averages three inches in length and typically lives for three years. The speckled dace is a close relative of the Moapa dace and has similar habitat requirements but prefers the cooler water temperatures below the Warm Springs area. Because of this thermal barrier, the two species are non-competitive. Larval speckled dace are primarily plankton feeders, while the adults feed primarily on both aquatic insects and algae. Speckled dace prefer the lower horizon of shallow, cobble riffles. They likely face similar threats from deterioration in water quality, introduction of non-native fish, and parasites. The source population of speckled dace resides downstream of WSNA below a fish barrier. Restoring a population on the WSNA will require reestablishing connectivity.

Aquatic invertebrates

The only published collection of the Moapa skater *(Rhagovelia becki)* was by Polhemus (1973) who described the species and by Huillet (1998). Several surveys since have not recorded the species (Albrecht et al. 2008, Stevens Ecological Consulting 2004, Sada and Herbst 1999), but *R. choneutes* was commonly observed in the Warm Springs area, suggesting either local extirpation or misidentification of *R. becki* (Sada and Herbst 1999). The Warm Springs crawling water beetle *(Haliplus eremicus)* was collected originally on the LDS Recreational Property as well as from Arizona (Wells 1989) and subsequently from the Muddy River on the LDS property (Huillet 1998). Current collection records include California and Utah within its range (R. Baumann, personal communication, April 2009).

Virgin River chub
(Gila seminuda)

Moapa speckled dace
(Rhinichthys osculus moapae)

Warm Springs crawling water beetle
(Haliplus eremicus)

Surveys for Virgin River chub are currently conducted in the Muddy River in Spring and Fall.

3.05 WARM SPRINGS AQUATIC ASSEMBLAGE

Moapa dace population surveys are conducted each February and August.

The Warm Springs Aquatic Assemblage is considered irreplaceable and the most important assemblage in the upper Muddy River ecoregional portfolio (Provencher and Andress 2004). This assemblage includes the thermal springs and tributaries which constitute the headwaters of the Muddy River. The endangered Moapa dace *(Moapa coriacea)* and the Moapa White River springfish *(Crenichthys baileyi moapae)* are native thermophiles dependent upon the warm springs and streams for survival. The Moapa pebblesnail *(Pyrgulopsis avernalis)* is an endemic snail species found in the headwaters of the upper Muddy River. Additionally, three thermophilic aquatic insects are endemic to the Muddy River headwaters, namely, the Moapa naucorid *(Limnocoris moapensis)*, Moapa riffle beetle *(Microcylloepus moapus)*, and Moapa Warm Springs riffle beetle *(Stenelmis moapa)* (Parker et al. 1997). All seven species are identified by the Nevada Natural Heritage Program as at-risk. Other rare species within this assemblage that occur on the WSNA and other locations in Nevada include the Western naucorid *(Ambrysus mormon)*, Pahranagat naucorid *(Pelocoris biimpressus shoshone)* (Parker et al. 1997), and Moapa Valley pyrg *(Pyrgulopsis carinifera)* (Albrecht et al. 2008). The latter two species are also listed as "at-risk" by the Nevada Natural Heritage Program.

The overall condition of the Warm Springs Aquatic Assemblage is considered "poor" due to water withdrawals, entrenchment, and exotic species (Provencher et al. 2005). Past and ongoing stream restoration has improved conditions, but until the Moapa dace population has rebounded, restoration efforts will continue. On the WSNA, stream reaches and spring heads have been identified and prioritized by the Biological Advisory Committee for restoration. The Lower Pederson has been rechanneled, and the system is currently being improved for dace habitat by installing drift stations and augmenting natural revegetation. Of the nine upper Muddy Valley stream segments identified for restoration by Provencher et al. (2005), four reside almost exclusively on the WSNA, and one other is shared with the Moapa Valley National Wildlife Refuge. The remaining reach segments would not be considered part of the Warm Springs Aquatic Assemblage but rather the Muddy River Aquatic Assemblage.

SPECIES FOR MANAGEMENT CONSIDERATION

Endemics

Moapa dace *(Moapa coriacea)**
Moapa White River springfish *(Crenichthys baileyi moapae)**
Moapa naucorid *(Limnocoris moapensis)**
Moapa riffle beetle *(Microcylloepus moapus)*
Moapa pebblesnail *(Pyrgulopsis avernalis)**
Moapa Warm Springs riffle beetle *(Stenelmis moapa)**

Rare Non-Endemics

Grated tryonia *(Tryonia clathrata)**
Moapa Valley pyrg *(Pyrgulopsis carinifera)*
Western naucorid *(Ambrysus mormon)*
Pahranagat naucorid *(Pelocoris biimpressus shoshone)*

** Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem (USFWS 1996)*

MOAPA DACE

Moapa dace
(Moapa coriacea)

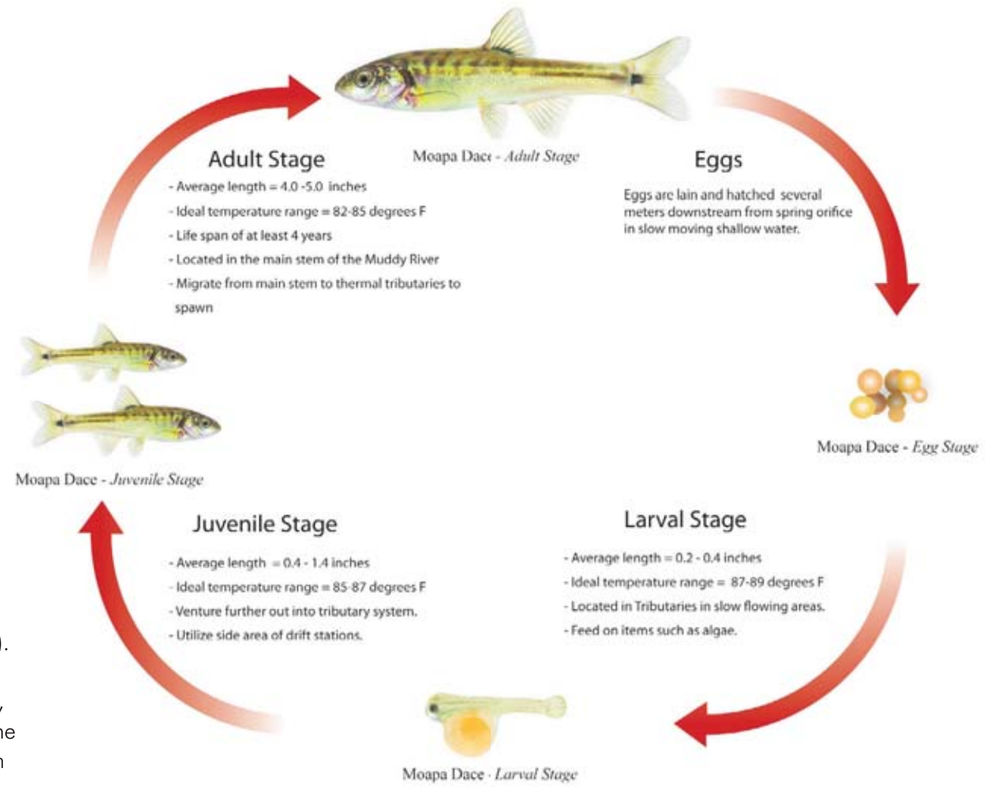
Of all the endemic species that occur on the WSNA, the Moapa dace is the most imperiled and is federally protected as an endangered species. For this reason, the highest priority management attention on the WSNA is focused on its protection and recovery. The recovery of the Moapa dace is largely dependent on restoring stream habitat quality and the removal of introduced fish species that compete with and predate upon the dace.

In 1967, the Moapa dace was listed as an endangered species under the Endangered Species Preservation Act of 1966. This fish only occurs in the warm springs, tributaries, and upper main stem of the Muddy River. Several critical springs for the dace occur on the neighboring Moapa Valley National Wildlife Refuge which feed the Refuge, Pederson, and the Apcar Streams. Those streams flow through the WSNA and provide important habitat for the dace. The WSNA also has an important spring that feeds the Refuge Stream and provides dace spawning habitat. Currently the Refuge Stream and springheads support the largest dace population, followed by the Pederson Stream. The Apcar Stream also has the potential to significantly contribute to dace recovery following the completion of restoration activities.

Life History

Adult Moapa dace are approximately four inches in length. A key identification characteristic is a large black spot near the end of the tail (Hubbs and Miller 1948). Fish typically live for four years, but can live up to approximately eight years in the main stem of the Muddy River. The Moapa dace is a warm water fish, and habitat type preferences vary with each life stage (larval, juvenile and adult). Larval Moapa dace begin their life in the warmer, slow-moving thermal spring outflows, and will venture out further and deeper into the water column of the tributaries and main stem of the river as they get larger. Adult Moapa dace return to the spring outflows from the river to reproduce. Reproduction takes place year round, but peak reproduction occurs in the spring when food sources, such as insects and plant material, are most readily available. All three habitat types (thermal springs, thermal tributaries, and the main stem river) are essential for Moapa dace reproduction and survival (Scoppettone et al. 1992).

Life Cycle of the Moapa Dace



RECOVERY GOALS FOR DELISTING

Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem (USFWS 1996)

- 6,000 adult Moapa dace present in 5 spring systems
- Restore 75% of historic habitat in 5 spring systems
- Eliminate adverse effects of non-native fish and parasites
- Protect habitat in 3 of the 5 spring systems through agreements, easements, or acquisition

STEPS TO ACHIEVE RECOVERY

Install fish barriers
Eradicate/control non-native species
Install drift stations
Restore/protect spring/stream flow dynamics
Restore riparian vegetation
Restore spring/stream connectivity

OTHER RARE AQUATIC SPECIES

Moapa White River springfish
(Crenichthys baileyi moapae)

As the most abundant native fish on WSNA and the entire upper Muddy River, the Moapa White River springfish is the least threatened. The springfish is able to tolerate high water temperatures and low dissolved oxygen making the thermal springs and streams on WSNA ideal habitat. The upper Muddy River is the source population for those downstream. The Moapa White River springfish is commonly 1.5-2.0 inches in length and typically lives three years. Springfish reproduce year-round, with peak reproduction occurring in the spring when food sources, such as algae and aquatic insects are most readily available. Protecting existing thermal and flow qualities of the upper Muddy River springs and reaches, and controlling introduced fishes is important for this species.

Aquatic Invertebrates

Several aquatic invertebrates identified for management consideration are known to reach their maximum prevalence in the Warm Springs Aquatic Assemblage. The *Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem* (1996) recognizes two snails and two insects as species of concern. They are all endemic to the Muddy River and known to occur on WSNA. The Clark County Multiple Species Habitat Conservation Plan (2000) identifies one additional snail and two additional aquatic insects as high priority species for evaluation. An aquatic invertebrate survey performed on WSNA by Albrecht et al. (2008) identified three additional rare insect species. The Nevada Natural Heritage Program adds another aquatic insect purported as occurring on WSNA on their watch list.

The Amargosa naucorid *(Pelocoris shoshone amargosus)* may have mistakenly been thought as occurring in the Muddy River due to referenced use of the common name "Amargosa naucorid." Parker et al. (1997) lists *P. shoshone* as occurring in thermal springs of the upper Muddy River, but no mention is made of the subspecies. The *Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem* (USFWS 1996) identifies *Pelocoris shoshone shoshone* as a species of concern on their recovery list but applies the common name as Amargosa naucorid. Huillet (1998) did not sample *Pelocoris shoshone* but listed *Pelocoris biimpressus shoshone* indicating taxonomic confusion among literature citing *Pelocoris* in the Muddy River.

Pelocoris biimpressus shoshone was also encountered by Sada and Herbst (1999). Albrecht et al. (2008) listed a sampled naucorid as *Pelocoris biimpressus (?shoshone)* suggesting uncertainty as to the identification at the subspecies level. It is apparent that all variations are the same species – hereafter referred to as the Pahranagat naucorid *(Pelocoris biimpressus shoshone)*.

Moapa White River springfish
(Crenichthys baileyi moapae)

Moapa Warm Springs riffle beetle
(Stenelmis moapa)

Pahranagat naucorid
(Pelocoris biimpressus shoshone)

Moapa naucorid *(Limnocoris moapensis)*

Aquatic Invertebrate Recovery

The general belief is that restoring stream habitat for Moapa dace will be beneficial for all aquatic invertebrates. Competition theory suggests niche separation will occur across the breadth of existing niches. Single species management can easily favor one group of species over another. Due to the diversity of rare aquatic species in the upper Muddy River, aquatic invertebrate sampling will be implemented for all stream restoration projects. Restoration projects will also give due consideration to habitat heterogeneity in design and implementation.

Stream restoration efforts require provisions for the full suite of endemic and rare aquatic macroinvertebrates at WSNA. Because the different species prefer different flow velocities, water depths, substrates, vegetation, coarse particulate organic matter, and bank structure, it is imperative to maintain a diversity of aquatic habitat parameters throughout the stream reaches. Sada and Herbst (1999) recommend maximizing habitat diversity to benefit the entire community.

Focusing restoration work solely on fishes may negatively impact aquatic invertebrates. Community stability, resistance, and resilience are positively related to species diversity.

Moapa pebblesnail *(Pyrgulopsis avernalis)*

Aquatic Invertebrates - Percent Occurrence per 11 Reaches from Muddy River Headwaters to NV Energy Diversion	% Reach Occurrence
Grated tryonia *(Tryonia clathrata)*	100%
Moapa Warm Springs riffle beetle *(Stenelmis moapa)*	91%
Moapa riffle beetle *(Microcylloepus moapus)*	91%
Western naucorid *(Ambrysus mormon)*	82%
Moapa pebblesnail *(Pyrgulopsis avernalis)*	73%
Moapa naucorid *(Limnocoris moapensis)*	73%
Moapa Valley pyrg *(Pyrgulopsis carinifera)*	73%
Pahranagat naucorid *(Pelocoris biimpressus shoshone)*	27%

Albrecht et al. 2008

The occurrence of rare aquatic invertebrates throughout the headwaters of the Muddy River within the Warm Springs Aquatic Assemblage indicates broad distribution with the exception of the Pahranagat naucorid which was only sampled in 3 of 11 headwater reaches (Albrecht et al. 2008). It was located in the Apcar, South Fork, and middle main stem reaches. Previous sampling by Sada & Herbst (1999) did not encounter it in the South Fork but did locate it in the Plummer and Pederson streams. They noted a habitat preference for slow backwater with fine substrates and sparse vegetation. Huillet (1998) mentioned the naucorid as commonly collected. The distribution of this species appears greater than what was sampled by Albrecht et al. (2008) and is likely an artifact of sample methodology.

3.06 DECIDUOUS RIPARIAN WOODLAND

Velvet ash woodland

SPECIES FOR MANAGEMENT CONSIDERATION

- Southwestern willow flycatcher
  Empidonax traillii extimus
- Western yellow-billed cuckoo
  Coccyzus americanus occidentalis
- Summer tanager
  Piranga rubra
- Townsend's big-eared bat
  Corynorhinus townsendii
- Western red bat
  Lasiurus blossevillii
- Western yellow bat
  Lasiurus xanthinus
- Fringed myotis
  Myotis thysanodes

The Deciduous Riparian Woodland along the Muddy River and its tributaries on WSNA have an abundance of velvet ash *(Fraxinus velutina)*, Fremont cottonwood *(Populus fremontii)*, Goodding's willow *(Salix gooddingii)*, and California fan palm *(Washingtonia filifera)*. The deciduous trees are especially important as nesting habitat for birds and as shade cover for native fish. The fan palms, while not desirable when they are impacting stream flow dynamics, do provide roosting habitat for the yellow bat and food for a variety of birds. Riparian woodlands have expanded along many irrigation ditches thereby extending the distribution of quality bird habitat. In many riparian areas, the trees alternate with or are replaced by the Riparian Shrubland Assemblage, forming an ecotone.

Management of riparian woodland entails protecting existing quality habitat from fire, exotic plant invasion, and age-related decadence, as well as restoring riparian woodland along denuded stream reaches. Velvet ash and Goodding's willow are particularly valuable riparian woodland species. Where recruitment of these species is not occurring naturally, site augmentation with propagated plants or transplants is recommended. The desired condition for this assemblage is a heterogeneous composition of age classes and tree densities throughout the riparian corridors.

Fremont cottonwood provides the largest structural component in this assemblage and is an important habitat species. It readily pioneers disturbed riparian areas and will likely not require significant restoration attention. In established groves along irrigation ditches, the trees continue to persist because their roots have reached groundwater, but recruitment of new trees is limited because of discontinued irrigation. In such areas, managed restoration may be desirable.

Because the California fan palm has invasive characteristics, develops undesirable fuel loads, and can negatively impact stream flow dynamics, it will not be purposefully planted as a component in riparian woodland restoration. In many woodland areas, the palms will be controlled in favor of more desirable native trees. Where fuel loads are not an issue, palms may be left intact. Where palm trees are removed, native tree species will be restored.

RIPARIAN SPECIES

Southwestern willow flycatcher
(Empidonax traillii extimus)

The southwestern willow flycatcher is a small, insect-eating bird that has been protected as an endangered species by the US Fish and Wildlife Service since 1995. There are estimated to be only 900 - 1,000 breeding pairs of the southwestern willow flycatcher. Southwestern willow flycatchers breed in sites that have very dense tree cover usually close to water and over saturated soil.

Resident southwestern willow flycatchers were noted on the Warm Springs Natural Area in 2004, 2005, 2007, 2008, 2009, and 2010. In 2008, nine southwestern willow flycatchers were located on WSNA north of the Apcar Stream (Braden et al. 2009). In 2009, four birds were found in dense patches of trees north of the Muddy River (Klinger & Conrad 2010). Of the four birds detected, two were a pair that fledged three young (McLeod et al. 2010).

Western yellow-billed cuckoo
(Coccyzus americanus occidentalis)

The Western yellow-billed cuckoo is a medium-sized, slender and inconspicuous bird that forages in dense, leafy trees and eats large insects such as grasshoppers and caterpillars. The Nevada Department of Wildlife has identified cuckoos in a few areas around the state in small numbers. These birds are nomadic and numbers fluctuate greatly from year to year. A significant portion of the cuckoos found in Nevada in the early 2000s were at the Warm Springs Natural Area but more recent surveys have only detected one bird each year from 2003 to 2006, zero in 2007, and three in 2008. Two detections were made in 2009 (Bruce Lund, personal communication, 2009). These birds have been observed in the large woodland north of the main stem of the Muddy River (Braden et al. 2009), but cuckoos can be found throughout the WSNA in appropriate habitats.

Summer tanager
(Piranga rubra)

The summer tanager, a Clark County Multiple Species Habitat Conservation Plan Covered Species, is a medium-sized bird with a stout bill. Males are a brilliant red color and females are a buffy orange color. Males have small crests. Summer tanagers feed on bees and wasps that they catch in the air. They are confirmed breeders on the Warm Springs Natural Area according to Great Basin Bird Observatory (Appendix 4). Management for the summer tanager is similar to management for the southwestern willow flycatcher and includes preservation and establishment of dense riparian vegetation.

Western yellow bat
(Lasiurus xanthinus)

The Western yellow bat has been recorded roosting in the palm trees *(Washingtonia filifera)* of the Warm Springs Natural Area. This is the only population of yellow bats that has been located in Nevada, and this population is disjunct and more northerly than other populations of yellow bats (O'Farrell et al. 2004).

RIPARIAN WOODLAND BAT SPECIES

- Western yellow bat
  Lasiurus xanthinus
- Townsend's big-eared bat
  Corynorhinus townsendii
- Western red bat
  Lasiurus blossevillii
- Fringed myotis
  Myotis thysanodes

Southwestern willow flycatcher
(Empidonax traillii extimus)

Western yellow-billed cuckoo
(Coccyzus americanus occidentalis)

Summer tanager *(Piranga rubra)*

Western yellow bat
(Lasiurus xanthinus)

3.07 RIPARIAN SHRUBLAND

The Riparian Shrubland at WSNA occurs along sections of the South Fork and Muddy River as well as along some irrigation ditches. Shrubs including Emory's baccharis *(Baccharis emoryi)*, arrowweed *(Pluchea sericea)*, coyote willow *(Salix exigua)* and other riparian non-obligates such as quailbush *(Atriplex lentiformis)* commonly occur in this assemblage. This riparian shrubland provides valuable habitat for birds, small mammals, and terrestrial invertebrates.

SPECIES FOR MANAGEMENT CONSIDERATION

- MacNeill sooty wing skipper
  Hesperopsis gracielae

MacNeill sooty wing skipper
(Hesperopsis gracielae)

Quailbush is a known host plant for the MacNeill sooty wing skipper. Larvae of this butterfly feed on the leaves whereas the adults forage for nectar on flowering plants. Quailbush occurs abundantly at WSNA and is not in danger of diminishing.

The MacNeill sooty wing skipper is considered common to abundant in Moapa Valley having been collected from Bowman Reservoir and Hidden Valley (Austin & Austin 1980). Hidden Valley is approximately five miles south of the WSNA and no fragmented host plant populations occur between recorded collections and the WSNA property. Adults have been recorded nectaring on tamarisk, salt heliotrope *(Heliotropium curassavicum)*, and alfalfa *(Medicago sativa)* (Austin & Austin 1980). However, Nelson (2009) did not record the MacNeill sooty-wing skipper at the WSNA during limited sampling in April and July 2009.

MacNeill sooty wing skipper
(Hesperopsis gracielae)

Quailbush
(Atriplex lentiformis)

3.08 RIPARIAN MARSH/MEADOW

Marshes and seeps provide essential habitat for amphibians, birds, invertebrates, and small mammals. Because wetland habitat is so productive, it provides the food base to support higher trophic species such as predators. Due to its rarity and resource-rich quality within an otherwise resource-scarce Mojave desert ecosystem, riparian marshes and seeps attract and harbor an abundance of wildlife.

SPECIES FOR MANAGEMENT CONSIDERATION

- Relict leopard frog *Lithobates onca*

Marshland on the Warm Springs Natural Area is primarily derived from spring outflow that may be either partially ponded or terminates in wet meadows. The amount of water varies seasonally with the greatest standing water most abundant during the winter months when the groundwater is particularly close to the surface. In some areas, riparian meadow vegetation can be found where surface water is entirely absent. Vegetation in such areas is supported by the high water table in the winter months. Riparian meadows form an important feeding ground for many of the bird species found on the natural area. Mowing in combination with periodic prescribed fire is useful to maintain the health and productivity of riparian meadows. The few marshes found on the Natural Area are largely overgrown with cattails and would benefit from the management practices that expose surface water for waterfowl and other wildlife.

Introduction of the Relict leopard frog

The relict leopard frog *(Lithobates onca)* historically occurred in springs near the Colorado, Virgin, and Muddy Rivers including the springs at the headwaters of the Warm Springs Natural Area (Bradford et al. 2004). By 1950, this frog was believed to be extinct. However, in 1991 relict leopard frogs were rediscovered in several springs near Littlefield Arizona, near Lake Mead, and below Hoover dam. Conservation efforts include monitoring existing populations, enhancing spring habitats, captive rearing, and translocating frogs into historic and new locations.

Because Warm Springs Area is within the historic range of the relict leopard frog, frogs were relocated to adjacent lands owned by Clark County in 2010. Releasing relict leopard frogs on the Warm Springs Natural Area may be part of recovery efforts for this species.


Marsh


Cattails


Relict leopard frog *(Lithobates onca)*


Yerba mansa

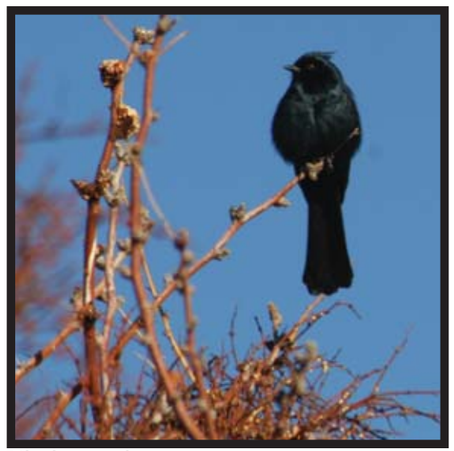
3.09 MESQUITE BOSQUE


Honey mesquite pods

Both honey mesquite *(Prosopis glandulosa)* and screwbean mesquite *(Prosopis pubescens)* comprise the mesquite woodland community type. Of the two, screwbean mesquite is regionally least common and perhaps therefore the most ecologically significant. On the WSNA screwbean mesquite forms a dense (near monotypic) woodland in some areas and provides important nesting and shelter habitat for many species of wildlife. The screwbean mesquite woodland at WSNA is the largest contiguous stand in Nevada. Both mesquite species host the parasitic mesquite mistletoe *(Phoradendron californicum)* which is an important food item for the Phainopepla. Aerial photographs of WSNA taken in 1950 reveal an absence of mesquite in the floodplain due to cultivated crops. Much of the land currently occupied by mesquite was still farmed as late as 1985. The abundance of mesquite at the present time reflects a discontinuation of farming and change to cattle grazing as the primary land use on the property since the late 1980s. While mature stands of mesquite provide positive habitat attributes, the total replacement of native grasslands by mesquite is not desirable. Ideally, a mosaic of mesquite woodland across the landscape representing different age-classes and densities is the preferred ecological state. At present, the woodland understory is dominated by non-native grasses and forbs, remnants of former pasture species. A long-term goal of restoring native understory species will only enhance the value of this vegetation type.

Phainopepla
(Phainopepla nitans)

The phainopepla is a medium-sized bird. Males are a silky black color and females are gray. Both sexes have crests. Phainopeplas feed on both berries and flying insects. The phainopepla is closely tied to the availability of the berries of mistletoe (*Phoradendron* spp.) which is a parasitic plant that grows on mesquite trees (*Prosopis* spp.). The phainopepla eats the mistletoe berries, digests them, and defecates the remaining sticky seeds on the branches of mesquite trees. The seeds sprout and the mistletoe becomes established on new mesquite trees. Management for phainopepla includes maintaining mesquite stands that are parasitized by mistletoe.


Phainopepla
(Phaninopepla nitans)

Vermilion flycatcher
(Pyrocephalus rubinus)

The Vermilion flycatcher is a small flycatcher found in the southwestern United States southward to Argentina. This species inhabits desert riparian areas but primarily nests in the screwbean woodland on the WSNA. The Warm Springs Natural Area is home to the largest breeding population of Vermilion flycatchers in Nevada. Males are a bright red color and females are gray with a peach belly. Vermilion flycatchers feed mostly on flying insects, such as bees and dragonflies that they catch on the wing. They often forage over water or meadows. Management for the Vermilion flycatcher includes keeping riparian and mesquite woodlands relatively open because they avoid densely wooded areas. These birds also occur in the riparian-agricultural interface especially near lightly cultivated or abandoned fields near open water.


Vermilion flycatcher
(Pyrocephalus rubinus)

Spotted bat
(Euderma maculatum)

The spotted bat is a large bat with extremely large ears and three large white spots on its back. This state-protected species is known to roost on cliffs and to forage in mesquite bosques in the Warm Springs Natural Area (O'Farrell et al. 2004 and Williams et al. 2006). The spotted bat eats a variety of insects but primarily feeds on moths. This species is rare and patchy in occurrence in a variety of habitats throughout the western United States. The spotted bat has one young per year in June or July. Little else is known about this elusive species. Management for the spotted bat includes protecting cliff roosting areas and maintaining insect and moth diversity by maintaining open mesquite bosque habitat.

SPECIES FOR MANAGEMENT CONSIDERATION

- Phainopepla
  Phainopepla nitans
- Vermilion flycatcher
  Pyrocephalus rubinus
- Spotted bat
  Euderma maculatum

3.10 OTHER ECOLOGICAL GROUPS

Several plant communities exist on WSNA that do not fall within TNC's six ecological "assemblages" (Provencher et al. 2005) but still harbor rare and or protected animal species. Additional plant communities include the creosote bush shrubland, saltbush shrubland, and alkali meadows.

Creosote bush shrubland

Characteristic of the Mojave Desert, this shrubland provides habitat for the threatened desert tortoise and at least two species of bats, the California leaf-nosed bat and the big free-tailed bat. Creosote bush shrubland occupies the upland areas of WSNA above the floodplain. It is also the dominant vegetation type that surrounds WSNA. Much of the plant diversity documented on the WSNA occurs in this community. The Creosote bush shrubland at the WSNA has not been heavily impacted by past agricultural practices. This area is in good condition with expansive distribution outside the WSNA boundary. Management action will likely be limited to controlling some of the common non-native weeds that increase the risk and spread of wildfire such as red brome *(Bromus rubens)* and Sahara mustard *(Brassica tournefortii)*.

Saltbush shrubland

This vegetation community is found in more saline soils of the floodplain in the upper Muddy River. In the most saline soils where a high water table exists, iodinebush *(Allenrolfea occidentalis)* can be a dominant species. Other areas on the WSNA are dominated by quailbush *(Atriplex lentiformis)* and Mojave seablite *(Suaeda moquinii)*. This community often forms a gradient with alkali meadows.

Alkali meadow

Saltgrass *(Distichlis spicata)* is the most prevalent species found within this plant community followed by alkali sacaton *(Sporobolus airoides)*. Because of the past extensive cultivation at WSNA, remnant stands of alkali meadows are considered extremely important. Much of this community type has been replaced by Bermuda grass *(Cynodon dactylon)*. These meadows also serve as foraging grounds for wildlife, especially where they border mesquite woodland.

SPECIES FOR MANAGEMENT CONSIDERATION
(Creosote bush shrubland)

- Desert tortoise
  Gopherus agassizii
- California leaf-nosed bat
  Macrotus californicus
- Big free-tailed bat
  Nyctinomops macrotis


Creosote bush shrubland


Saltbush shrubland


Alkali meadow