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Appendix I:

A list of native spring-dependent species known from the area of projected groundwater decline in Nevada, California, Utah, and Arizona

Table 1. Twenty federally-listed spring-dwelling and riparian species of southern and central Nevada that are dependent upon groundwater for habitat maintenance. NWR = National Wildlife Refuge.

Common Name	Scientific Name	Federal Status	Habitat	Special Federal Designation Lands
Amargosa vole	<i>Microtus californicus scirpensis</i>	E	Spring-fed wetland areas	
Southwestern Willow Flycatcher	<i>Empidonax trailii extrimus</i>	E	Riparian areas of spring-fed streams	Pahrnagat NWR; Ash Meadows NWR
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	E	Riparian areas of spring-fed streams	
Woundfin	<i>Plagopterus argentissimus</i>	E	Spring-fed streams	
Virgin River chub	<i>Gila seminuda</i>	E	Spring-fed streams	
Ash Meadows speckled dace	<i>Rhinichthys osculus nevadensis</i>	E	Springs	Ash Meadows NWR
Moapa dace	<i>Moapa coriacea</i>	E	Springs	Moapa Valley NWR
Pahrump poolfish	<i>Empetrichthys latos</i>	E	Spring pools	Desert National Wildlife Range
Ash Meadows Amargosa pupfish	<i>Cyprinodon nevadensis mionectes</i>	E	Springs	Ash Meadows NWR
Devils Hole pupfish	<i>Cyprinodon diabolis</i>	E	Spring pool	Death Valley National Park
Warm springs pupfish	<i>Cyprinodon nevadensis pectoralis</i>	E	Springs	Ash Meadows NWR
Big Spring spinedace	<i>Lepidomeda mollispinis pratensis</i>	T	Springs and spring-fed marshes	
White River spinedace	<i>Lepidomeda albivallis</i>	E	Springs and spring-fed creeks	
Hiko White River springfish	<i>Crenichthys baileyi grandis</i>	E	Springs	
Railroad Valley springfish	<i>Crenichthys nevadae</i>	T	Springs	
White River springfish	<i>Crenichthys b. baileyi</i>	E	Springs	
Ash Meadows naucorid so it's	<i>Ambrysus amargosus</i>	T	Springs and spring-fed streams	Ash Meadows NWR
Spring-loving centauray	<i>Centarium namophilum</i>	T	Spring-fed riparian areas	Ash Meadows NWR
Ash Meadows ivesia	<i>Ivesia kingii</i> var. <i>eremica</i>	T	Spring-fed riparian areas	Ash Meadows NWR
Amargosa niterwort	<i>Nitrophila mohavensis</i>	E	Spring-fed riparian areas	Ash Meadows NWR

Table 2. Native, spring-dependent species (n = 137) known from the area of projected groundwater decline, including those in Lincoln, Clark, White Pine, Nye and eastern Esmeralda counties, Nevada; eastern portions of Inyo and San Bernardino counties, California; western portions of Washington, Iron, Beaver, Millard, and Juab counties, Utah; and northwestern Mohave County, Arizona (see Figure 1, Deacon et al. 2007). Federally-listed species are included in Table 1 and not repeated here.

Common Name	Scientific Name	Location	Reference
Ash Meadows montane vole	<i>Microtus montanus nevadensis</i>	Nye Co., Ash Meadows NWR	Sada 1990
Pahranaget Valley montane vole	<i>Microtus montanus fucosus</i>	Lincoln Co., Pahranaget NWR	www.fws.gov
Railroad Valley belostoman	<i>Belostoma bakeri</i>	Nye Co.	Sada and Deacon 1994
Devils Hole riffle beetle	<i>Stenelmis calida calida</i>	Nye Co., Ash Meadows NWR	Sada 1990
Moapa warm springs riffle beetle	<i>Stenelmis calida moapa</i>	Clark Co., Moapa NWR	www.fws.gov
Ash Springs riffle beetle	<i>Stenelmis lariversi</i>	Lincoln Co.	Sada and Deacon 1994
Pahranaget Valley riffle beetle	<i>Microcyloepus moapus fraxinus</i>	Lincoln Co., Pahranaget NWR	Sada and Deacon 1994
Moapa riffle beetle	<i>Microcyloepus moapus moapus</i>	Clark Co., Moapa NWR	Sada and Deacon 1994
Ash Meadows skater	<i>Rhagovelia distincta</i>	Nye Co., Ash Meadows NWR	Sada and Deacon 1994
Moapa skater	<i>Rhagovelia becki</i>	Clark Co., Moapa NWR	Sada and Deacon 1994
Amargosa naucorid	<i>Pelocoris shoshone amargosus</i>	Nye Co.	Nevada Natural Heritage Program
Pahranaget Valley naucorid	<i>Pelocoris shoshone shoshone</i>	Lincoln Co., Pahranaget NWR	Sada and Deacon 1994
Moapa naucorid	<i>Usingerina moapensis</i>	Clark Co., Moapa NWR	Usinger 1956; www.fws.gov
Naucorid	<i>Ambrysus relictus</i>	Clark Co., Ash Meadows NWR	Polhemus and Polhemus 1994
Mormon naucorid	<i>Ambrysus mormon</i>	Lincoln Co.	Sada and Deacon 1994
White River naucorid	<i>Ambrysus woodburyi</i>	Nye Co.	Sada and Deacon 1994
Ash Meadows assiminea	<i>Assimineia</i> sp.	Nye Co., Ash Meadows NWR	Sada and Deacon 1994
Sportinggoods tryonia	<i>Tryonia angulata</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990; Hershler 2001

Tryonia	<i>T. clathrata</i>	Clark Co., Moapa NWR	Hershler 2001
Point of Rocks tryonia	<i>T. elata</i>	Nye Co., Ash Meadows NWR	Hershler 2001
Minute tryonia	<i>T. ericae</i>	Nye Co., Ash Meadows NWR	Hershler 2001
Monitor Valley tryonia	<i>T. monitorae</i>	Nye Co.	Hershler 2001
Amargosa tryonia	<i>T. variegata</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Hershler 2001
Ash Meadows pebblesnail	<i>Pyrgulopsis erythropoma</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990
Crystal springsnail	<i>P. crystalis</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990
Distal-gland springsnail	<i>P. nanus</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990

Elongate-gland springsnail	<i>P. isolatus</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990
Fairbanks springsnail	<i>P. fairbankensis</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990
Longstreet springsnail	<i>P. sp.</i> (possibly extinct)	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990
Median-gland springsnail	<i>P. pisteri</i>	Nye Co., Ash Meadows NWR	Hershler and Sada 1987; Sada 1990
Oasis Valley springsnail	<i>P. micrococcus</i> [†]	Nye Co., Ash Meadows NWR	Sada 1990; Hershler 1998; Liu et al. 2003
Corn Creek pyrg	<i>P. fausata</i>	Clark Co., Desert National Wildlife Range	Hershler 1998
Spring Mountains pyrg	<i>P. deaconi</i>	Clark and Nye Cos.	Hershler 1998
Blue Point pyrg	<i>P. coloradensis</i>	Clark Co., Lake Mead National Recreation Area	Hershler 1998
Pyrg	<i>P. avernalis</i>	Clark Co., Moapa NWR	Hershler 1998
Pyrg	<i>P. carinifera</i>	Clark Co., Moapa NWR	Hershler 1998
Pyrg	<i>P. merriami</i>	Nye Co.	Hershler 1998
Camp Valley pyrg	<i>P. montana</i>	Lincoln Co.	Hershler 1998
Hubbs pyrg	<i>P. hubbsi</i>	Lincoln Co.	Hershler 1998
White River Valley pyrg	<i>P. sathos</i>	Nye, Lincoln and White Pine Cos.	Hershler 1998
Flagg pyrg	<i>P. breviloba</i>	Nye Co.	Hershler 1998
Butterfield pyrg	<i>P. lata</i>	Nye Co.	Hershler 1998
Emigrant pyrg	<i>P. gracilis</i>	Nye Co.	Hershler 1998

Hardy pyrg	<i>P. marcida</i>	Nye, Lincoln and White Pine Cos.	Hershler 1998
Southeast Nevada pyrg	<i>P. turbatrix</i>	Clark and Nye Cos.	Hershler 1998
Sterile basin pyrg	<i>P. sterilis</i>	Nye Co.	Hershler 1998
Lake Valley pyrg	<i>P. sublata</i>	Lincoln Co.	Hershler 1998
Lockes pyrg	<i>P. lockensis</i>	Nye Co.	Hershler 1998
Big Warm Spring pyrg	<i>P. papillata</i>	Nye Co.	Hershler 1998
Carinate Duckwater pyrg	<i>P. carinata</i>	Nye Co.	Hershler 1998
Duckwater pyrg	<i>P. aloba</i>	Nye Co.	Hershler 1998
Duckwater Warm Springs pyrg	<i>P. villacampae</i>	Nye Co.	Hershler 1998
Southern Duckwater pyrg	<i>P. anatine</i>	Nye Co.	Hershler 1998
Flat-topped Steptoe pyrg	<i>P. planulata</i>	White Pine Co.	Hershler 1998
Southern Steptoe purg	<i>P. sulcata</i>	White Pine Co.	Hershler 1998
Sub-gulose Steptoe Ranch pyrg	<i>P. orbiculata</i>	White Pine Co.	Hershler 1998
Neritiform Steptoe Ranch pyrg	<i>P. neritella</i>	White Pine Co.	Hershler 1998
Landyes pyrg	<i>P. landyei</i>	White Pine Co.	Hershler 1998

Common Name	Scientific Name	Location	Reference
Columbia spotted frog	<i>Rana luteiventris</i>	NV, UT	NNHP (July 2005)
Arizona toad	<i>Bufo microscaphus</i>	NV	NNHP (July 2005)
Relict leopard frog	<i>Rana onca</i>	NV	NNHP (July 2005)
Amargosa toad	<i>Bufo nelsoni</i>	NV	NNHP (July 2005)
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	NV	NNHP (July 2005)
Bonneville cutthroat trout	<i>Oncorhynchus clarkii utah</i>	NV, UT	Behnke 2002
Oasis Valley speckled dace	<i>Rhinichthys osculus</i> ssp.	NV	NNHP (July 2005)
Hot Creek Valley tui chub	<i>Gila bicolor</i> ssp.	NV	NNHP (July 2005)
Kate Spring tui chub	<i>Gila bicolor</i> ssp.	NV	Deacon and Williams 1984
Blue Eagle Spring tui chub	<i>Gila bicolor</i> ssp.	NV	Deacon and Williams 1984
Bull Creek tui chub	<i>Gila bicolor</i> ssp.	NV	Deacon and Williams 1984
Green Springs tui chub	<i>Gila bicolor</i> ssp.	NV	Deacon and Williams 1984
Railroad tui chub	<i>Gila bicolor</i> ssp.	NV	Deacon and Williams 1984
Big Smoky Valley tui chub	<i>Gila bicolor</i> ssp.	NV	Deacon and Williams 1984
Charnock Springs tui chub	<i>Gila bicolor</i> ssp.	NV	Deacon and Williams 1984
Moapa roundtail chub	<i>Gila robusta</i> ssp.	NV	Deacon and Williams 1984
Least chub	<i>Iotichthys phlegothonis</i>	UT	Sigler and Sigler 1987
Big Smoky Valley speckled dace	<i>Rhinichthys osculus lariversi</i>	NV	Deacon and Williams 1984
Moapa River speckled dace	<i>Rhinichthys osculus moapae</i>	NV	Deacon and Williams 1984
Preston speckled dace	<i>Rhinichthys osculus</i> ssp.	NV	Deacon and Williams 1984
Meadow Valley speckled dace	<i>Rhinichthys osculus</i> ssp.	NV	Deacon and Williams 1984
Monitor Valley speckled dace	<i>Rhinichthys osculus</i> ssp.	NV	Deacon and Williams 1984
Amargosa Valley speckled dace	<i>Rhinichthys osculus</i> ssp.	NV	Deacon and Williams 1984
Amargosa Canyon speckled dace	<i>Rhinichthys osculus</i> ssp.	CA	Moyle et al. 1995

Colorado River speckled dace	<i>Rhinichthys osculus yarrowi</i>	NV, UT	Deacon and Williams 1984
Preston White River springfish	<i>Crenichthys baileyi albivallis</i>	NV	Deacon and Williams 1984
Morman White River springfish	<i>Crenichthys baileyi thermophilus</i>	NV	Deacon and Williams 1984
Amargosa pupfish	<i>Cyprinodon nevadensis amargosae</i>	CA	Moyle et al. 1995
Shoshone pupfish	<i>Cyprinodon nevadensis shoshone</i>	CA	Moyle et al. 1995
Mottled sculpin	<i>Cottus bairdi semiscaber</i>	NV, UT	Deacon and Williams 1984
Flannelmouth sucker	<i>Catostomus latipinnis</i>	AZ, NV	NNHP (July 2005)
White River desert sucker	<i>Catostomus clarkii intermedius</i>	NV	Deacon and Williams 1984
Meadow Valley desert sucker	<i>Catostomus clarkii</i> ssp.	NV	Deacon and Williams 1984
Virgin River desert sucker	<i>Catostomus clarkii utahensis</i>	AZ, NV	Deacon and Williams 1984
Bonneville mountain sucker	<i>Catostomus p. platyrhynchus</i>	NV, UT	Deacon and Williams 1984
Virgin River spinedace	<i>Lepidomeda mollispinis mollispinis</i>	AZ, NV	NNHP (July 2005)
(Snake Valley) springsnail	<i>Pyrgulopsis peculiaris</i>	NV	Hershler and Sada 2002
(Bonneville Basin) springsnail	<i>Pyrgulopsis kolobensis</i>	NV, UT	Hershler and Sada 2002
Hamlin Valley pyrg	<i>Pyrgulopsis hamlinensis</i>	UT	Hershler 1998
Longitudinal gland pyrg	<i>Pyrgulopsis anguina</i>	UT	Hershler 1998
Sub-globose Snake pyrg	<i>Pyrgulopsis saxatilis</i>	UT	Hershler 1998
ncn tryonia	<i>Tryonia margae</i>	CA	Hershler 2001
ncn tryonia	<i>Tryonia rowlandsi</i>	CA	Hershler 2001
California floater	<i>Anodonta californiensis</i>	UT	
White River belostoman	<i>Belostoma flumineum</i>	NV	Polhemus and Polhemus 2002
Amargosa River belostoman	<i>Lethocerus augustipes</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Cenocorixa wileyae</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Corisella decolor</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Corisella edulis</i>	NV	Polhemus and Polhemus 2002

ncn water boatmen	<i>Corisella inscripta</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Graptocorixa serrulata</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Hesperocorixa laevigata</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Sigara alternata</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Sigara omani</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Trichocorixa calva</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Trichocorixa reticulata</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Trichocorixa whleri</i>	NV	Polhemus and Polhemus 2002
ncn water boatmen	<i>Trichocorixa verticalis saltoni</i>	NV	Polhemus and Polhemus 2002
ncn toad bug	<i>Nerthra martini</i>	NV	Polhemus and Polhemus 2002
ncn water strider	<i>Aquarius remigis</i>	NV	Polhemus and Polhemus 2002
ncn water strider	<i>Gerris gillettei</i>	NV	Polhemus and Polhemus 2002
ncn velvet water bug	<i>Hebrus hubbardi</i>	NV	Polhemus and Polhemus 2002
ncn velvet water bug	<i>Merragata hebroides</i>	NV	Polhemus and Polhemus 2002
ncn water measurer	<i>Hydrometra australis</i>	NV	Polhemus and Polhemus 2002
ncn water treaders	<i>Mesovelia amoena</i>	NV	Polhemus and Polhemus 2002
ncn water treaders	<i>Mesovelia mulsanti</i>	NV	Polhemus and Polhemus 2002
ncn naucorid	<i>Ambrysus funebris</i>	NV	Polhemus and Polhemus 2002
ncn backswimmer	<i>Buenoa margaritacea</i>	NV	Polhemus and Polhemus 2002
ncn backswimmer	<i>Buenoa omani</i>	NV	Polhemus and Polhemus 2002
ncn backswimmer	<i>Buenoa scimitra</i>	NV	Polhemus and Polhemus 2002
ncn backswimmer	<i>Notonecta kirbyi</i>	NV	Polhemus and Polhemus 2002
ncn backswimmer	<i>Notonecta undulata</i>	NV	Polhemus and Polhemus 2002

ncn backswimmer	<i>Notonecta unifasciata</i>	NV	Polhemus and Polhemus 2002
ncn velvety shore bug	<i>Ochterus barberi</i>	NV	Polhemus and Polhemus 2002
ncn ripple bug	<i>Microvelia beameri</i>	NV	Polhemus and Polhemus 2002
ncn ripple bug	<i>Microvelia cerifera</i>	NV	Polhemus and Polhemus 2002
ncn ripple bug	<i>Microvelia gerhardi</i>	NV	Polhemus and Polhemus 2002
ncn ripple bug	<i>Microvelia hinei</i>	NV	Polhemus and Polhemus 2002
ncn ripple bug	<i>Microvelia torquata</i>	NV	Polhemus and Polhemus 2002

¹ Recent mitochondrial DNA sequencing has revealed that *Pyrgulopsis micrococcus* contains multiple, genetically distinct and geographically restricted lineages (Liu et al. 2003).

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