

# SURVEY OF SELECTED SPRINGS OF BEARS EARS NATIONAL MONUMENT



***By: Marc Coles-Ritchie***

*mcolesritchie@grandcanyontrust.org*

***Grand Canyon Trust***

***April 28, 2017***



GRAND CANYON  
TRUST

## Contents

Introduction .....	3
Hydrology .....	5
Vegetation .....	5
Disturbance .....	7
Condition .....	7
Site Summaries.....	8
Spring 7 .....	9
Spring 4 .....	10
Spring 12 .....	11
Maverick Spring (Spring 136) .....	12
Todie Spring.....	13
Dripping Springs Wetland.....	14
Spring 13 .....	15
Spring 11 .....	16
Spring 14 .....	17
Side Canyon of Dripping Springs Stream .....	18
Spring 54 .....	19
Dripping Springs .....	20
Spring 1 .....	21
Spring 46 .....	22
Spring 46 East.....	23
Spring 44 East.....	24
Spring 46 South .....	25
Spring 55 Upper.....	26
Spring 44 North .....	27
Spring 55 North .....	28
Navajo Spring .....	29
Appendices.....	30
Appendix 1. Plant list sorted by scientific name, within life form groups.....	30
Appendix 2. Plant list sorted by common name, within life form groups.....	32
Appendix 3. List of plants observed at each spring.....	34

## Introduction

A survey of 21 springs in the Bears Ears National Monument, in southeastern Utah, was conducted by Sarah Dunn (Whitman College student) and Marc Coles-Ritchie (Grand Canyon Trust) during March 20-22, 2017. These springs are a subset of hundreds of springs that are in Bears Ears Monument. The survey and this report focus on basic conditions observed at each of the 21 springs.

The locations of known springs were determined from the following databases:

- Geographic Names Information System (<https://nhd.usgs.gov/gnis.html>);
- National Hydrography Dataset (<https://nhd.usgs.gov/>); and
- Springs Stewardship Institute (<http://springstewardshipinstitute.org/>).

Because the survey was undertaken early in the season, lower elevation sites were selected to visit, rather than higher elevation sites where snow or mud would make access difficult. In order to maximize the number of springs surveyed, we chose to visit springs that were accessible (a short walk) from roads (paved or dirt). As we visited previously identified springs, we found six additional springs that had not been listed in the databases. In total, twenty-one spring sites were surveyed (map in Fig. 1). At each spring, basic data were collected on flow, vegetation, disturbance, wildlife evidence and overall condition. Numerous photos were taken at each site, some of which are included below (others are available upon request to Grand Canyon Trust). Twenty of these sites were on land managed by the BLM; one site (Maverick Spring) was on Forest Service land. All were within the boundaries of Bears Ears National Monument.

The conditions at nearly all of the 21 springs would benefit from better protection, particularly from livestock, and restoration. The potential for recovery, given the presence of water, is high. Springs are critically important for water, spring-dependent plants and wildlife, humans, and our shared future amid climate change. Establishment of the Bears Ears National Monument encourages us all to take a fresh look at springs and the roles they play in our lives and the lives of all who depend upon them.

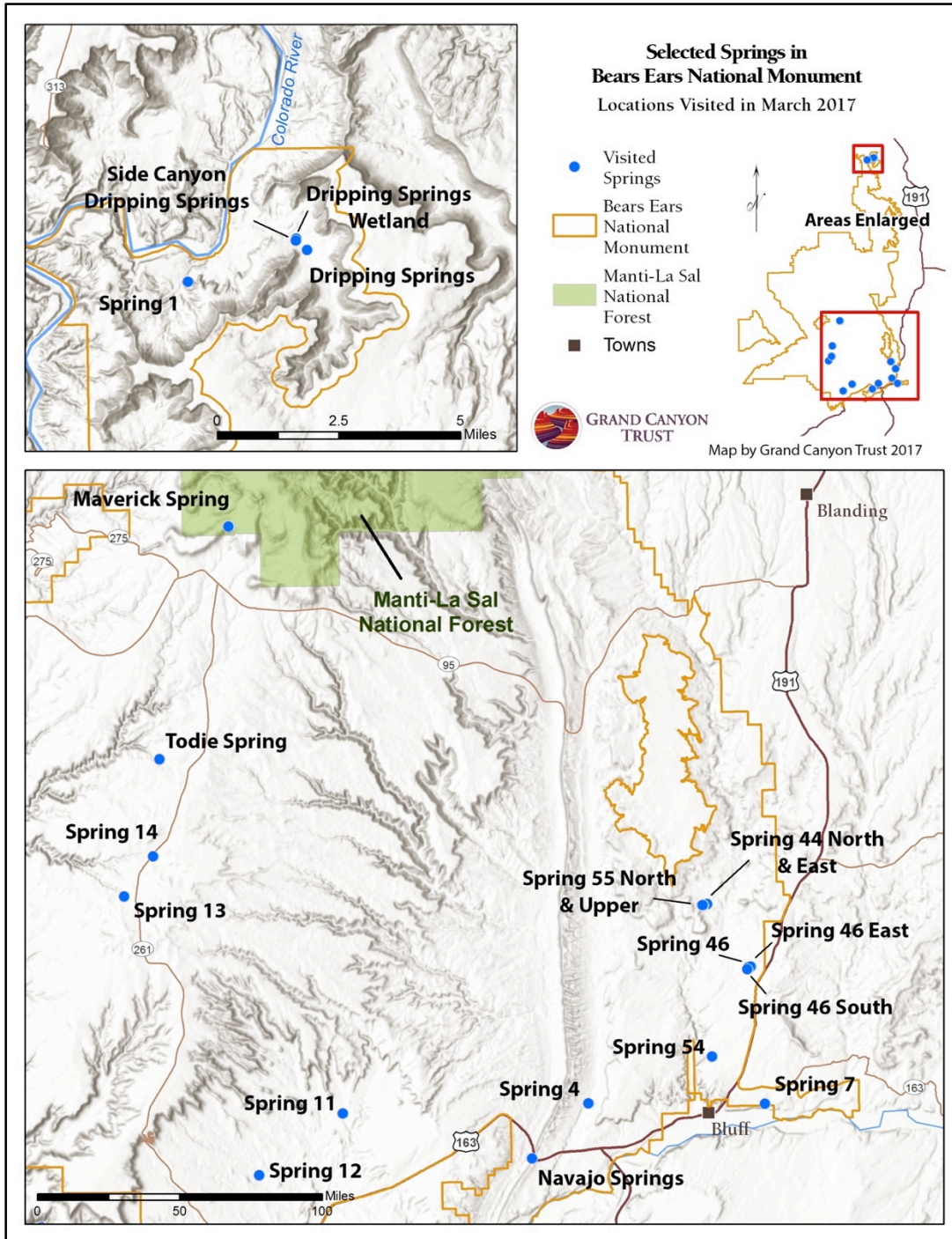


Fig. 1. Map of 21 springs in Bears Ears National Monument visited in March 2017.



## Hydrology

In the semi-arid setting of low-elevation southeastern Utah, the springs tend to be relatively small in terms of both flow and the wetland that the groundwater discharge supports. When there was visible flow, it was just a trickle. In some cases (Spring 7, Spring 4, Spring 12) there seemed to be diffuse groundwater discharge over a broad area, creating a significant wetland. A summary of hydrology (groundwater discharge and the presence of surface water) of the sites is described in Table 1.

**Table 1. Hydrologic characteristics of surveyed springs.**

Hydrologic Characteristics	Number of Sites
Groundwater discharge (flow) and standing water.	9
Standing water in pools, but no visible groundwater discharge.	3
Puddles, but no visible groundwater discharge.	6
No standing water; no visible groundwater discharge; but evidence of wet soil or past flow.	3

## Vegetation

Many of the sites had a limited amount of native wetland vegetation cover. The most common woody species were the following: tamarisk (non-native); greasewood (native, but not a wetland species); and species of willow (native, wetland species) which were narrowleaf (or coyote willow), arroyo willow and Goodding's willow. Narrowleaf willow is the only clonal (rhizomatous) willow that grows at lower and mid-elevations in Utah. Fremont cottonwoods were at seven of the sites, but in most cases there was only one old tree that was in poor condition and seemed to be dying. Only one site (Spring 4) appeared to have any cottonwood regeneration (a few young trees in addition to the old or dying tree).

Many of the sites had only a minimal amount of herbaceous cover, probably due to livestock grazing. At the few sites that had abundant herbaceous vegetation, the species were usually cattail (*Typha latifolia*) and common reed (*Phragmites australis*). The common reed observed at these sites is the native subspecies (*Phragmites australis ssp. americanus*), not the non-native, invasive subspecies (*Phragmites australis ssp. australis*) that is a problem in northern Utah (such as around the Great Salt Lake). Arctic (or Baltic) rush (*Juncus arcticus*; formerly *Juncus balticus*) was somewhat abundant at a few sites and dominant at one site (Maverick Spring).

A complete list of all plants observed at the springs is in Appendix 1 and Appendix 2. Lists of all plants observed at each site are in Appendix 3.

The vegetation observed at the springs was categorized according to vegetation associations listed in the US National Vegetation Classification (<http://usnvc.org/explore-classification>). The

number of sites where those associations were the dominant vegetation is listed in the table below.

**Table 2. Vegetation associations (from US National Vegetation Classification) of surveyed springs.**

Common Name of Vegetation Association	Scientific Name of Vegetation Association	Number of Sites
Greasewood / Rubber Rabbitbrush Wet Shrubland	<i>Sarcobatus vermiculatus</i> / <i>Ericameria nauseosa</i> Wet Shrubland	6
Tamarisk species Ruderal Riparian Shrubland	<i>Tamarix</i> spp. Ruderal Riparian Shrubland	6
Narrowleaf Willow / Mesic Graminoids Western Wet Shrubland	<i>Salix exigua</i> / Mesic Graminoids Western Wet Shrubland	3
Arroyo Willow / Barren Ground Wet Shrubland	<i>Salix lasiolepis</i> / Barren Ground Wet Shrubland	1
Baltic Rush Wet Meadow	<i>Juncus balticus</i> Wet Meadow	1
(Broadleaf Cattail, Narrowleaf Cattail) Western Marsh	<i>Typha (latifolia, angustifolia)</i> Western Marsh	1
Common Reed Western Ruderal Wet Meadow	<i>Phragmites australis</i> Western Ruderal Wet Meadow	1
Goodding's Willow / Narrowleaf Willow Riparian Woodland	<i>Salix gooddingii</i> / <i>Salix exigua</i> Riparian Woodland	1
Stretchberry Wet Shrubland	<i>Forestiera pubescens</i> Wet Shrubland	1

Note: "ruderal" refers to plants that colonize disturbed lands.

A few sites had secondary vegetation associations, which were mainly those listed above. One site (Spring 7) had a vigorous wet wall association of Mancos Columbine - Eastwood's Monkeyflower Hanging Garden (*Aquilegia micrantha* - *Mimulus eastwoodiae* Hanging Garden). A few other sites (Spring 54 and Todie Spring) had wet walls with very sparse vegetation, presumably due to disturbance.

Plants classified as noxious weeds by the State of Utah (<http://ag.utah.gov/divs-progs/50-plants-and-pests/hay-grain-seed/599-noxious-weed-list.html>) were recorded at 17 of the 21 sites. The noxious plant species observed were:

- Five-stamen tamarisk (*Tamarix chinensis*) at 17 sites;
- Russian olive (*Elaeagnus angustifolia*) at 1 site; and
- Hardheads or Russian knapweed (*Acroptilon repens*) at 1 site.

Other non-native species observed, generally at low abundance, were:

- African mustard (*Malcolmia africana*);
- Alfalfa (*Medicago sativa*);
- Cheatgrass (*Bromus tectorum*);
- Crested wheatgrass (*Agropyron cristatum*); and

- Prickly Russian thistle (*Salsola tragus*).

Other noxious species and certainly other non-native plants were likely present but not detected because this was a rapid survey conducted early in the season (March). At this time of year many plants did not have leaves or flowers, making plant detection and identification difficult in some cases.

## **Disturbance**

The most common disturbance was livestock grazing, which was evident from hoof prints, trampling, trails, grazed vegetation, scat, and streambank erosion at nearly all sites. Only Spring 7 (high condition) and Navajo Spring (poor condition, near road) did not have evidence of livestock.

Seven sites had visible hydrologic alteration in the form of pipes, troughs or earthen dams. Nearly all sites had evidence of livestock that had altered the hydrology through erosion and/or downcutting. One site (Maverick Spring) had a functional fence around a small (~25' x 75') spring-fed wetland. Another site (Spring 54) had a fence (~20' x 40') that seemed partially effective at keeping livestock away from a wet wall and the pool that it fed.

Two sites (Spring 1 and Spring 44 East) had earthen dams that were designed to pond water for livestock access, although there was no standing water at the time of our visit. Some other sites had evidence of earthen dams that have eroded away.

Native ungulate tracks were present at some spring sites, contributing to some disturbance. However, livestock evidence (tracks and scat) was much greater than that of wild ungulates.

One site (Navajo Spring) seemed to be impacted by rock that fell down the slope, into the spring area from highway construction. This site was dry, and it is near roads and ORV routes, and probably had other impacts that we could not discern.

## **Condition**

The general condition of each spring site was rated based on hydrology, vegetation, soil stability, and level of disturbance (Table 3). Sites were given high condition scores if they were closer to these characteristics.

- Flowing water and no hydrologic alteration.
- Native wetland vegetation that was abundant.
- No erosion or downcutting.
- Minimal impacts from livestock and other disturbances.

**Table 3. Spring condition of spring sites.**

Spring Condition	Number of Sites
High	1
Medium	5
Low	7
Very Low	8

Based on our observation, factors that likely contributed to sites being in better condition and less vulnerable to livestock impacts, and higher condition, included:

- Large size of wetland, with abundant forage, and significant water.
- More forage in surrounding area.
- Difficult access, such as a deep ravine.

Sites that appeared to be in better condition had more evidence of wildlife, such as tracks. Logically, wildlife would be attracted to spring sites that had significant water and vegetation (good habitat) more than sites that had minimal water and/or vegetation (poor quality habitat).

Factors that likely contributed to negative impacts to sites, and lower condition included:

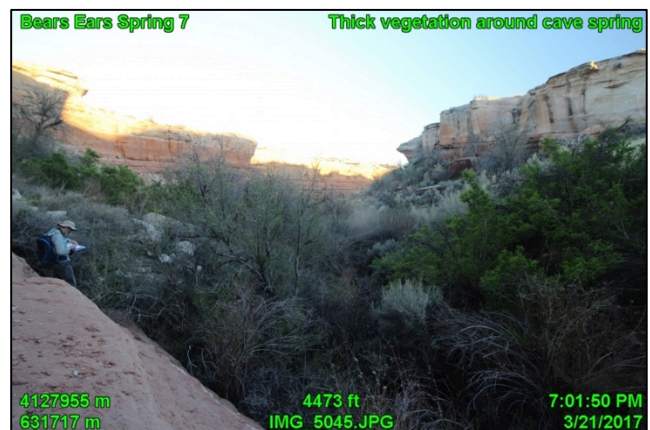
- Small size of wetland, so not a lot of forage or water; hence animals have a relatively high impact on those small areas.
- Minimal vegetation in surrounding area.
- Easy ungulate access.

These condition assessments were based on a brief survey, early in the growing season; they are not a detailed baseline assessment for monitoring trend.


## Site Summaries

Summaries for each of the 21 sites are presented in the following pages. The sites are listed from highest (best) condition to lowest condition. These summaries list the common plants at each site. Complete lists of plants observed at each site can be found in Appendix 3. The coordinates (NAD 83 UTM) of each spring (the orifice) are listed with each site summary; and a list of all sites and coordinates is in Appendix 4.





### Spring 7

<b>Spring 7</b>	
<b>Location</b>	On the east edge of town of Bluff, above St. Christopher's Episcopal Mission.
<b>UTM (at source)</b>	4127942 N, 631746 E.
<b>Hydrology</b>	There is a long, linear, wet wall with a small area of visible discharge. Below the wall, water comes out of a cave and flows as a stream.
<b>Common woody species</b>	Narrowleaf willow ( <i>Salix exigua</i> ).
<b>Other woody species</b>	Stretchberry ( <i>Forestiera pubescens</i> ), singleleaf ash ( <i>Fraxinus anomala</i> ).
<b>Common herbaceous species</b>	On wet wall: cavedwelling primrose ( <i>Primula specuicola</i> ), which is endemic to SE Utah (see photo); in broader spring area is common reed ( <i>Phragmites australis</i> ).  <i>Cavedwelling primrose</i>
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ) and Russian olive ( <i>Eleagnus angustifolia</i> ).
<b>Vegetation association</b>	Mancos Columbine - Eastwood's Monkeyflower Hanging Garden; and Stretchberry Wet Shrubland.
<b>Wildlife</b>	Rodent droppings and tracks.
<b>Disturbance</b>	None observed.
<b>Condition</b>	High condition. Much vegetation and diversity of species. No evidence of erosion or other human impacts. Wet wall has endemic plants. This is an impressive spring and riparian area. There are some non-native plants. Private land is below the site, which may have prevented access by livestock or other disturbances.

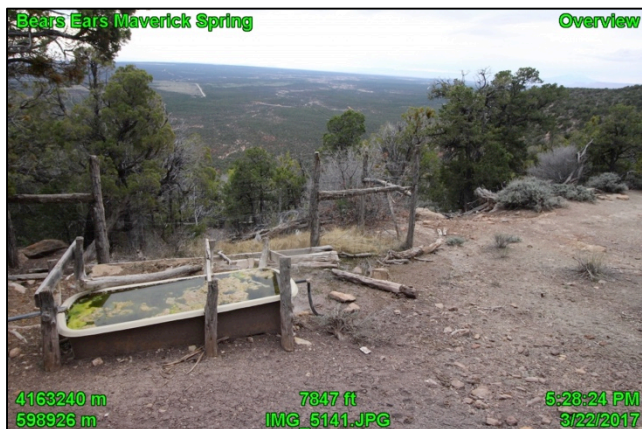


<b>Spring 4</b>	
<b>Location</b>	West of town of Bluff, near Comb Ridge.
<b>UTM (at source)</b>	4127952 N, 620940 E.
<b>Hydrology</b>	There is a pool and some flow in the stream. Water seems to be close to surface over a large area.
<b>Common woody species</b>	Narrowleaf willow ( <i>Salix exigua</i> ); a very large Fremont cottonwood ( <i>Populus fremontii</i> ) and a few small trees.
<b>Other woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Common herbaceous species</b>	Common reed ( <i>Phragmites australis</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Wildlife</b>	Canid tracks, rodent scat, bird observed (maybe flycatcher) and nest.
<b>Vegetation association</b>	Narrowleaf Willow / Mesic Graminoids Western Wet Shrubland; and Common Reed Western Ruderal Wet Meadow.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Medium condition. This spring supports a lot of wetland vegetation. Apparently there is much water close to the surface. It is in a canyon that is somewhat difficult to access, which may protect it from overgrazing. Abundant riparian vegetation is present along the stream for miles, so that also may have reduced pressure from livestock on this site.



<b>Spring 12</b>	
<b>Location</b>	In Valley of the Gods.
<b>UTM (at source)</b>	4123559 N, 600810 E.
<b>Hydrology</b>	Standing water and wetland vegetation are present; and some flow in the channel.
<b>Common woody species</b>	Narrowleaf willow ( <i>Salix exigua</i> ).
<b>Other woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ), singleleaf ash ( <i>Fraxinus anomala</i> ).
<b>Common herbaceous species</b>	Broadleaf cattail ( <i>Typha latifolia</i> ) and hardstem bulrush ( <i>Schoenoplectus acutus</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Narrowleaf Willow / Mesic Graminoids Western Wet Shrubland; and Broadleaf Cattail Marsh.
<b>Wildlife</b>	No signs observed.
<b>Disturbance</b>	Livestock; non-functioning, old trough.
<b>Condition</b>	Medium condition. The spring is in a channel setting, with significant water that supports a lot of wetland vegetation at this site and downstream. Livestock have removed much vegetation especially on the margins, but dense vegetation remains. A terrace above the channel is significantly disturbed by livestock, with salt crusts, much bare ground, and saltgrass. The site is degraded, but still a functional spring and wetland. Robust biocrusts (pinnacled with dark cyanobacteria, crustose and gelatinous lichens, and moss) are nearby.





### Maverick Spring (Spring 136)

<b>Location</b>	Along road (Elk Mountain FR 0088) to Bears Ears buttes, above Natural Bridges National Monument.
<b>UTM (at source)</b>	4163242 N, 598931 E.
<b>Hydrology</b>	A pipe from the ground sends flow into the tank (looks like a bathtub) which overflows to a fenced wetland.
<b>Common woody species</b>	Wetland is mostly herbaceous vegetation.
<b>Other woody species</b>	Rubber rabbitbrush ( <i>Ericameria nauseosa</i> ), two-needle pinyon ( <i>Pinus edulis</i> ), Utah juniper ( <i>Juniperus osteosperma</i> ), Woods' rose ( <i>Rosa woodsii</i> ).
<b>Common herbaceous species</b>	Arctic (or Baltic) rush ( <i>Juncus arcticus</i> ).
<b>Noxious weeds</b>	None observed.
<b>Wildlife</b>	Bear scat; other scat.
<b>Vegetation association</b>	Baltic Rush Wet Meadow.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Medium condition. This spring is developed to provide water to livestock. A pipe feeds a tank that overflows and supports a rush wetland that is fenced. Outside the fence the vegetation is heavily grazed, with much bare ground. Rose and rabbitbrush are heavily browsed outside the fence. The fenced area is in good condition.

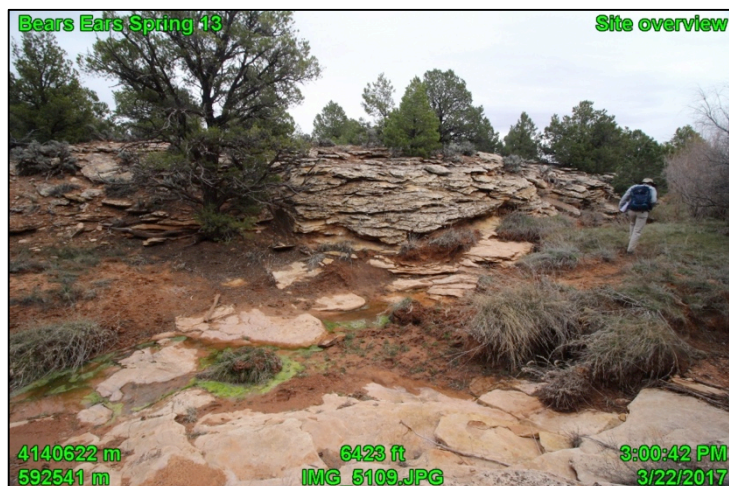




<b>Todie Spring</b>	
<b>Location</b>	Cedar Mesa, off Highway 261, near Todie Spring Trailhead.
<b>UTM (at source)</b>	4149013 N, 594722 E.
<b>Hydrology</b>	A small pool of still water of about 15 square ft is present. There is no visible flow.
<b>Common woody species</b>	Narrowleaf willow ( <i>Salix exigua</i> ) and arroyo willow ( <i>Salix lasiolepis</i> ).
<b>Other woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Common herbaceous species</b>	Almost no herbaceous vegetation.
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Arroyo Willow / Barren Ground Wet Shrubland.
<b>Wildlife</b>	Pellet scat; and birds observed.
<b>Disturbance</b>	Livestock and broken, old water tank.
<b>Condition</b>	Medium condition. Livestock seem to have removed much of the herbaceous vegetation and caused erosion. A rock face to the north is about 15' tall; water seeps from there. Willows dominate the site but there is significant bare ground. Robust biocrusts (pinnacled with dark cyanobacteria, crustose and gelatinous lichens, and moss) are nearby -- between trailhead parking area and the spring.



<b>Dripping Springs Wetland</b>	
<b>Location</b>	East of Colorado River, South of Hurrah Pass. This is toward the lower end of the Dripping Springs complex.
<b>UTM (at source)</b>	4255694 N, 618176 E.
<b>Hydrology</b>	No surface water is visible, but common reed indicates water is in the soil. The spring is not part of the stream channel where Dripping Springs flows, but it contributes to the Dripping Springs stream.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Fragrant sumac ( <i>Rhus aromatica</i> ).
<b>Common herbaceous species</b>	Common reed ( <i>Phragmites australis</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Common Reed Western Ruderal Wet Meadow.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	None obvious.
<b>Condition</b>	Medium condition. This hillslope wetland has abundant vegetation, but no surface water is visible.



### Spring 13

<b>Spring 13</b>	
<b>Location</b>	Cedar Mesa, off Cigarette Springs Road.
<b>UTM (at source)</b>	4140624 N, 592547 E.
<b>Hydrology</b>	Small pools of still water are visible, but no visible flow.
<b>Common woody species</b>	Narrowleaf willow ( <i>Salix exigua</i> ).
<b>Other woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Common herbaceous species</b>	Arctic rush ( <i>Juncus arcticus</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Narrowleaf Willow / Mesic Graminoids Western Wet Shrubland; and Tamarisk species Ruderal Riparian Shrubland.
<b>Wildlife</b>	Ungulate (deer or pronghorn), rodent, and canine tracks.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Low condition. This spring has standing water and some wetland vegetation. There is significant erosion and downcutting (especially in the upper part), much bare ground and trampling. Non-native vegetation is abundant, in addition to some native vegetation. Robust biocrusts (pinnacled with dark cyanobacteria, crustose and gelatinous lichens, and moss) are nearby.





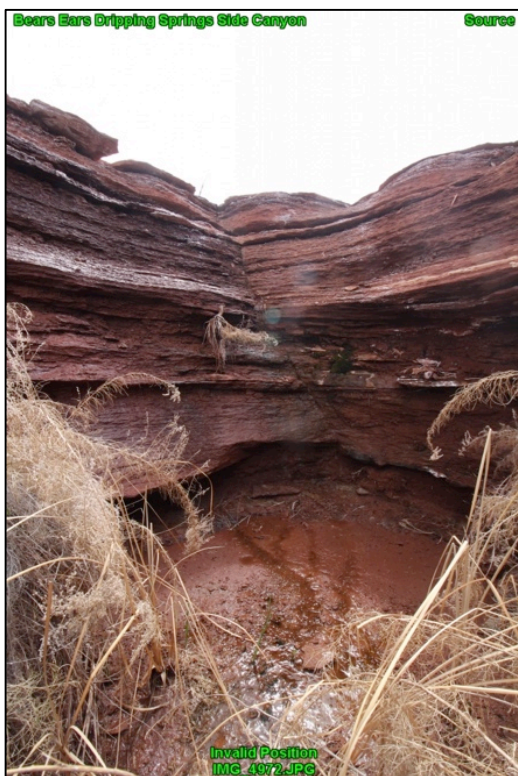
<b>Spring 11</b>	
<b>Location</b>	Near Valley of the Gods.
<b>UTM (at source)</b>	4127337 N, 605929 E.
<b>Hydrology</b>	There are numerous small pools, with a little flow between pools. Downstream the stream drips over rock ledge (15' drop) into a large pool.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Fragrant sumac ( <i>Rhus aromatica</i> ), singleleaf ash ( <i>Fraxinus anomala</i> ).
<b>Common herbaceous species</b>	Arctic rush ( <i>Juncus arcticus</i> ), swordleaf rush ( <i>Juncus ensifolius</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Wildlife</b>	Rodent or rabbit scat/pellets; canid tracks and scat; aquatic organisms observed in water (water bug, caddisfly, water shrimp, eggs, mayfly, tadpole, snail).
<b>Vegetation association</b>	Tamarisk species Ruderal Riparian Shrubland.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Low condition. This spring discharges into the stream channel. There are ungulate impacts (likely livestock) such as grazing of vegetation and bank disturbance. There are small patches of rushes. This is a surprising little wet oasis in the desert. There is not a lot of vegetation, and much bare ground, probably because of ungulate grazing. There are some native, wetland plant species, and numerous aquatic organisms.





### Spring 14

<b>Spring 14</b>	
<b>Location</b>	On Cedar Mesa, along highway 261, above a culvert.
<b>UTM (at source)</b>	4143073 N, 594318 E.
<b>Hydrology</b>	Water is in small pools in the channel with a bit of flow.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Minimal woody vegetation.
<b>Common herbaceous species</b>	Arctic rush ( <i>Juncus arcticus</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Wildlife</b>	Birds (multiple species) observed; canid track; rodent track; wild horse scat.
<b>Vegetation association</b>	Tamarisk species Ruderal Riparian Shrubland.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Low condition. Spring site has significant erosion and downcutting, probably due to livestock. There is not much cover of riparian vegetation. The site is mostly bare, eroded soil. It seems that water seeps out between rock layers along this stream for a few hundred feet at least, above and below a culvert under Highway 261. There are multiple headcuts (erosion drops) both above and below the culvert.



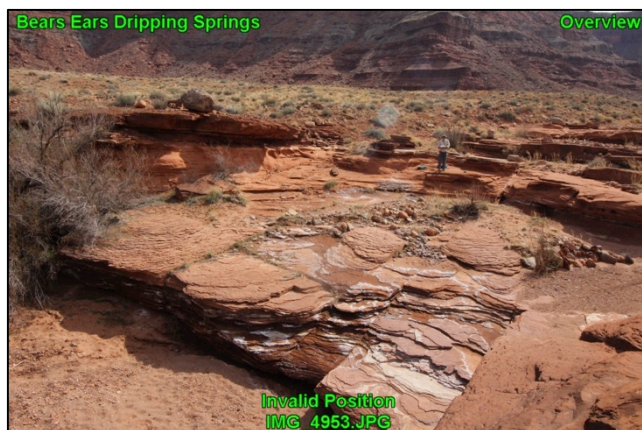
### Side Canyon of Dripping Springs Stream

<b>Location</b>	South of Hurrah Pass. This is a side canyon of the Dripping Springs complex.
<b>UTM (at source)</b>	4255626 N, 618167 E.
<b>Hydrology</b>	A small but steady flow for about 80 ft.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Fragrant sumac ( <i>Rhus aromatica</i> ).
<b>Common herbaceous species</b>	Saltgrass ( <i>Distichlis spicata</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Tamarisk species Ruderal Riparian Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Low condition. This spring is tucked away, up a narrow side canyon, with a small cliff/water drop at the upper end, so it is a bit more protected than the main part of the Dripping Springs complex. There is still much bare ground.



<b>Spring 54</b>	
<b>Location</b>	Just north of Bluff, off powerline road.
<b>UTM (at source)</b>	4130834 m, 628514 m
<b>Hydrology</b>	Some large pools total about a few hundred square ft, with stagnant water. A small amount of flow from the wet wall feeds the pool at the base.
<b>Common woody species</b>	Goodding's willow ( <i>Salix gooddingii</i> ).
<b>Other woody species</b>	None.
<b>Common herbaceous species</b>	None evident.
<b>Noxious weeds</b>	None observed.
<b>Vegetation association</b>	Goodding's Willow / Narrowleaf Willow Riparian Woodland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	There is a fence around the spring source. Livestock are a significant impact.
<b>Condition</b>	Low condition. The site is in a narrow canyon with vertical walls so the only access is from the downstream end. The spring is a wet wall, forming a pool at the base. Surprisingly there is no herbaceous vegetation; cows apparently have eaten it all. It is mostly bare ground and old willow trees, which are breaking and falling. Cow dung is abundant. A fence blocks access to the spring source (wet wall) and most of the pool, but some cow dung is inside the fence. The wet wall has some hanging garden vegetation, but it was not possible to get close enough to identify it, due to the fence and pool.





<b>Dripping Springs</b>	
<b>Location</b>	East of Colorado River, South of Hurrah Pass. This is the upper-most point of the Dripping Springs complex.
<b>UTM (at source)</b>	4255325 N, 618535 E.
<b>Hydrology</b>	Water drips from rock layers at various points and accumulates in the channel. There is much salt encrusted soil and rock. Both small (3 square ft) and larger (20 square ft) pools are present, and there is some flow between pools in the stream channel.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Fragrant sumac ( <i>Rhus aromatica</i> ), narrowleaf willow ( <i>Salix exigua</i> ).
<b>Common herbaceous species</b>	Saltgrass ( <i>Distichlis spicata</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Tamarisk species Ruderal Riparian Shrubland.
<b>Wildlife</b>	Hawk flying, deer tracks.
<b>Disturbance</b>	Livestock and native ungulates.
<b>Condition</b>	Low condition. There is little vegetation at this spring and riparian area, with a lot of bare ground and a significant amount of invasive species. This site appears to be heavily impacted by livestock based on tracks, trails, browse and scat.



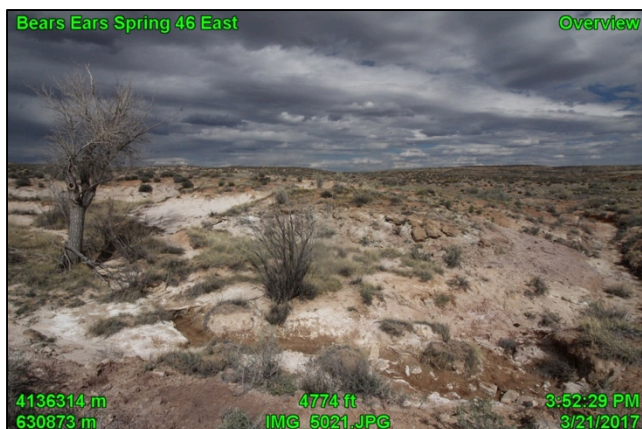
### Spring 1

<b>Spring 1</b>	
<b>Location</b>	East of Colorado River, South of Hurrah Pass and south of the Dripping Springs stream, along a well-traveled road.
<b>UTM (at source)</b>	4254264 N, 614587 E.
<b>Hydrology</b>	This appears to be a pond dug out behind an earthen dam created as a livestock water source. No surface water is visible, but abundant wetland vegetation indicates soil moisture.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Greasewood ( <i>Sarcobatus vermiculatus</i> ).
<b>Common herbaceous species</b>	Broadleaf cattail ( <i>Typha latifolia</i> )
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Tamarisk species Ruderal Riparian Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Berm, dug from pond; vehicles, livestock.
<b>Condition</b>	Low condition. This site is heavily impacted by the creation of an artificial pond and use by livestock. Water is seeping down past the pond berm, creating moist soil below. This site is adjacent to a dirt road with parking area and garbage can. Bare ground predominates.



<b>Spring 46</b>	
<b>Location</b>	North of Bluff and west of Hwy 191.
<b>UTM (at source)</b>	4136290 N, 630731 E.
<b>Hydrology</b>	Water trickles from a pipe and flows down a degraded channel.
<b>Common woody species</b>	Greasewood ( <i>Sarcobatus vermiculatus</i> ).
<b>Other woody species</b>	Fragrant sumac ( <i>Rhus aromatica</i> ), rubber rabbitbrush ( <i>Ericameria nauseosa</i> ).
<b>Common herbaceous species</b>	Minimal herbaceous vegetation.
<b>Noxious weeds</b>	None observed.
<b>Vegetation association</b>	Greasewood / Rubber Rabbitbrush Wet Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Livestock, pipe, old trough (log).
<b>Condition</b>	Very low condition. This is a highly degraded hillslope spring. There is erosion and downcutting of ~3' in depth in some places. A lone cottonwood is not healthy or vigorous. Bare ground predominates.





<b>Spring 46 East</b>	
<b>Location</b>	North of Bluff and west of Hwy 191.
<b>UTM (at source)</b>	4136321 N, 630876 E.
<b>Hydrology</b>	Tiny puddles of water are present, but no visible flow.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Rubber rabbitbrush ( <i>Ericameria nauseosa</i> ).
<b>Common herbaceous species</b>	Alkali sacaton ( <i>Sporobolus airoides</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Tamarisk species Ruderal Riparian Shrubland.
<b>Wildlife</b>	Canid tracks, deer observed.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Very low condition. This is a highly impacted hillslope spring with minimal vegetation. There are patches of grass and one dying cottonwood. Bare ground and erosion are extensive.



### Spring 44 East

<b>Location</b>	North of Bluff and west of Hwy 191.
<b>Coordinates (if not on photo)</b>	4140156 N, 628212 E.
<b>Hydrology</b>	Puddles of water are in hoof prints in the mud.
<b>Common woody species</b>	Greasewood ( <i>Sarcobatus vermiculatus</i> ).
<b>Other woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Common herbaceous species</b>	Minimal herbaceous vegetation.
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Greasewood / Rubber Rabbitbrush Wet Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Livestock trampling and grazing (cows observed at site); earthen dam and dry pond; a barbed wire fence is down; old pipes.
<b>Condition</b>	Very low condition. This hillslope spring is highly disturbed. It is mostly bare ground, and eroding soil. An earthen dam has been constructed to create a pond, but the pond site is dried, mud-cakes of hoof prints. This is a heavily degraded site.





<b>Spring 46 South</b>	
<b>Location</b>	North of Bluff and west of Hwy 191.
<b>UTM (at source)</b>	4136172 N, 630658 E.
<b>Hydrology</b>	The soil is wet, with small puddles in hoof prints.
<b>Common woody species</b>	Greasewood ( <i>Sarcobatus vermiculatus</i> ).
<b>Other woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Common herbaceous species</b>	Alkali sacaton ( <i>Sporobolus airoides</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Greasewood / Rubber Rabbitbrush Wet Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Very low condition. This is a highly degraded hillslope spring with minimal vegetation. The site is close to a dirt road. Cow trails and bare ground are common. A lone cottonwood is not vigorous. There are many salt crusts. Even the tamarisk is struggling to stay alive here.



<b>Spring 55 Upper</b>	
<b>Location</b>	North of Bluff and west of Hwy 191.
<b>UTM (at source)</b>	4140088 N, 627933 E.
<b>Hydrology</b>	The soil is wet, with small puddles in hoof prints.
<b>Common woody species</b>	Greasewood ( <i>Sarcobatus vermiculatus</i> ).
<b>Other woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Common herbaceous species</b>	Minimal herbaceous vegetation.
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Greasewood / Rubber Rabbitbrush Wet Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Livestock; an old log trough and piping are not functional.
<b>Condition</b>	Very low condition. This is a highly degraded spring and stream channel. Almost no live vegetation is present along the stream. The site is heavily trampled, with bare ground predominating.



<b>Spring 44 North</b>	
<b>Location</b>	North of Bluff and west of Hwy 191.
<b>UTM (at source)</b>	4140095 N, 627987 E.
<b>Hydrology</b>	Muddy puddles of water are in hoof prints. About 200' downstream additional puddles of water are present.
<b>Common woody species</b>	Greasewood ( <i>Sarcobatus vermiculatus</i> ).
<b>Other woody species</b>	Rubber rabbitbrush ( <i>Ericameria nauseosa</i> ), Utah serviceberry ( <i>Amelanchier utahensis</i> ).
<b>Common herbaceous species</b>	Minimal herbaceous vegetation.
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Vegetation association</b>	Greasewood / Rubber Rabbitbrush Wet Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Livestock.
<b>Condition</b>	Very low condition. This is a highly degraded hillslope spring with minimal riparian vegetation. It is heavily trampled and there is much bare ground. There are a few cottonwoods but they are dead or dying.





<b>Spring 55 North</b>	
<b>Location</b>	North of Bluff and west of Hwy 191.
<b>UTM (at source)</b>	4140093 N, 627893 E.
<b>Hydrology</b>	There are salt crusts and small puddles in the mud.
<b>Common woody species</b>	Greasewood ( <i>Sarcobatus vermiculatus</i> ).
<b>Other woody species</b>	None observed.
<b>Common herbaceous species</b>	Minimal herbaceous vegetation.
<b>Noxious weeds</b>	None observed.
<b>Vegetation association</b>	Greasewood / Rubber Rabbitbrush Wet Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Livestock, trough (old log), pipes.
<b>Condition</b>	Very low condition. This is a highly degraded spring that is part of stream channel. Hardly any vegetation remains, and the soil is heavily trampled and eroded.





<b>Navajo Spring</b>	
<b>Location</b>	West of Bluff, where Comb Ridge intersects Highway 163.
<b>UTM (at source)</b>	4124601 N, 617493 E.
<b>Hydrology</b>	There is no sign of water, other than some salt crust on the rocks.
<b>Common woody species</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ).
<b>Other woody species</b>	Fremont cottonwood ( <i>Populus fremontii</i> ), rubber rabbitbrush ( <i>Ericameria nauseosa</i> ).
<b>Common herbaceous species</b>	Russian knapweed ( <i>Acroptilon repens</i> ).
<b>Noxious weeds</b>	Five-stamen tamarisk ( <i>Tamarix chinensis</i> ) and Russian knapweed ( <i>Acroptilon repens</i> ).
<b>Vegetation association</b>	Tamarisk species Ruderal Riparian Shrubland.
<b>Wildlife</b>	None observed.
<b>Disturbance</b>	Rock debris from road construction is present, as well as litter and invasive plants.
<b>Condition</b>	Very low condition. This spring does not have much evidence of water or wetland vegetation. It may have been partially buried by rock debris from highway construction above the site. One large cottonwood tree is present, but many non-native plants.

## Appendices

Appendices 1 and 2 list all plants observed at the spring sites that could be identified. At the time of visit, in March, some plants had not yet leafed out or flowered. All plant names (except those in parentheses) are from the USDA PLANTS database (<https://plants.usda.gov>).

### Appendix 1. Plant list sorted by scientific name, within life form groups

Species	Common name
<b>Forb/Herbaceous</b>	
<i>Acroptilon repens</i>	hardheads (or Russian knapweed)
<i>Adiantum capillus-veneris</i>	common maidenhair
<i>Aquilegia micrantha</i>	Mancos columbine
<i>Artemisia ludoviciana</i>	white sagebrush
<i>Astragalus</i> sp.	milkvetch
<i>Cirsium rydbergii</i>	Rydberg's thistle
<i>Cirsium</i> sp.	thistle
<i>Gutierrezia sarothrae</i>	broom snakeweed
<i>Malcolmia africana</i>	African mustard
<i>Medicago sativa</i>	alfalfa
<i>Mimulus eastwoodiae</i>	Eastwood's monkeyflower
<i>Oxytenia acerosa</i>	copperweed
<i>Primula specuicola</i>	cavedwelling primrose
<i>Salsola tragus</i>	prickly Russian thistle
<i>Xanthium strumarium</i>	rough cocklebur
<b>Graminoid (grass-like)</b>	
<i>Achnatherum hymenoides</i>	Indian ricegrass
<i>Agropyron cristatum</i>	crested wheatgrass
<i>Bromus tectorum</i>	cheatgrass
<i>Carex</i> sp.	sedge
<i>Carex aurea</i>	golden sedge
<i>Distichlis spicata</i>	saltgrass
<i>Juncus arcticus</i>	arctic rush (or Baltic rush)
<i>Juncus ensifolius</i>	swordleaf rush
<i>Phragmites australis</i>	common reed
<i>Poa</i> sp.	bluegrass
<i>Schoenoplectus acutus</i>	hardstem bulrush
<i>Sporobolus airoides</i>	alkali sacaton
<i>Typha latifolia</i>	broadleaf cattail

<b>Shrub</b>	
<i>Artemisia tridentata</i>	big sagebrush
<i>Atriplex canescens</i>	fourwing saltbush
<i>Atriplex confertifolia</i>	shadscale saltbush
<i>Ephedra viridis</i>	mormon tea
<i>Ericameria nauseosa</i>	rubber rabbitbrush
<i>Forestiera pubescens</i>	stretchberry (or desert olive)
<i>Rhus aromatica</i>	fragrant sumac
<i>Rosa</i> sp.	rose
<i>Rosa woodsii</i>	Woods' rose
<i>Salix exigua</i>	narrowleaf willow (or coyote willow or sandbar willow)
<i>Salix lasiolepis</i>	arroyo willow
<i>Sarcobatus vermiculatus</i>	greasewood
<i>Tamarix chinensis</i>	five-stamen tamarisk
<i>Yucca</i> sp.	yucca
<b>Tree</b>	
<i>Amelanchier utahensis</i>	Utah serviceberry
<i>Elaeagnus angustifolia</i>	Russian olive
<i>Fraxinus anomala</i>	singleleaf ash
<i>Juniperus osteosperma</i>	Utah juniper
<i>Pinus edulis</i>	twoneedle pinyon
<i>Populus fremontii</i>	Fremont cottonwood
<i>Salix gooddingii</i>	Goodding's willow

## Appendix 2. Plant list sorted by common name, within life form groups

Species	Common name
<b>Forb/Herbaceous</b>	
African mustard	<i>Malcolmia africana</i>
alfalfa	<i>Medicago sativa</i>
broom snakeweed	<i>Gutierrezia sarothrae</i>
cavedwelling primrose	<i>Primula specuicola</i>
common maidenhair	<i>Adiantum capillus-veneris</i>
copperweed	<i>Oxytenia acerosa</i>
Eastwood's monkeyflower	<i>Mimulus eastwoodiae</i>
hardheads (or Russian knapweed)	<i>Acroptilon repens</i>
Mancos columbine	<i>Aquilegia micrantha</i>
milkvetch	<i>Astragalus</i> sp.
prickly Russian thistle	<i>Salsola tragus</i>
rough cocklebur	<i>Xanthium strumarium</i>
Rydberg's thistle	<i>Cirsium rydbergii</i>
thistle	<i>Cirsium</i> sp.
white sagebrush	<i>Artemisia ludoviciana</i>
<b>Graminoid (grass-like)</b>	
alkali sacaton	<i>Sporobolus airoides</i>
arctic rush (or Baltic rush)	<i>Juncus arcticus</i>
bluegrass	<i>Poa</i> sp.
broadleaf cattail	<i>Typha latifolia</i>
cheatgrass	<i>Bromus tectorum</i>
common reed	<i>Phragmites australis</i>
crested wheatgrass	<i>Agropyron cristatum</i>
golden sedge	<i>Carex aurea</i>
hardstem bulrush	<i>Schoenoplectus acutus</i>
Indian ricegrass	<i>Achnatherum hymenoides</i>
saltgrass	<i>Distichlis spicata</i>
sedge	<i>Carex</i> sp.
swordleaf rush	<i>Juncus ensifolius</i>



<b>Shrub</b>	
arroyo willow	<i>Salix lasiolepis</i>
big sagebrush	<i>Artemisia tridentata</i>
five-stamen tamarisk	<i>Tamarix chinensis</i>
fourwing saltbush	<i>Atriplex canescens</i>
fragrant sumac	<i>Rhus aromatica</i>
greasewood	<i>Sarcobatus vermiculatus</i>
mormon tea	<i>Ephedra viridis</i>
narrowleaf willow (or coyote willow or sandbar willow)	<i>Salix exigua</i>
rose	<i>Rosa</i> sp.
rubber rabbitbrush	<i>Ericameria nauseosa</i>
shadscale saltbush	<i>Atriplex confertifolia</i>
stretchberry (or desert olive)	<i>Forestiera pubescens</i>
Woods' rose	<i>Rosa woodsii</i>
yucca	<i>Yucca</i> sp.
<b>Tree</b>	
Fremont cottonwood	<i>Populus fremontii</i>
Goodding's willow	<i>Salix gooddingii</i>
Russian olive	<i>Elaeagnus angustifolia</i>
singleleaf ash	<i>Fraxinus anomala</i>
twoneedle pinyon	<i>Pinus edulis</i>
Utah juniper	<i>Juniperus osteosperma</i>
Utah serviceberry	<i>Amelanchier utahensis</i>

### Appendix 3. List of plants observed at each spring.

The following tables list the plants that were observed at each spring. The springs are listed in alphabetical order. This survey was done in March, which is early in the growing season, before many plants have leaves or flowers. Therefore it was not possible to see or identify all plants that would be present and identifiable later in the season. In addition, the objective was to do a quick survey, recording the dominant plant species. Thus this is not a complete species list.

The information under "nativity" and "duration" is from the USDA PLANTS database (<https://plants.usda.gov>). Nativity refers to whether a plant is native to the United States. Under nativity we also indicate if the species is a noxious weed based on the Utah Noxious Weed list (<http://ag.utah.gov/divs-progs/50-plants-and-pests/hay-grain-seed/599-noxious-weed-list.html>). Duration refers to whether a species is annual or perennial.

#### Dripping Springs

Species	Common Name	Nativity	Duration
<i>Achnatherum hymenoides</i>	Indian ricegrass	Native	Perennial
<i>Artemisia ludoviciana</i>	white sagebrush	Native	Perennial
<i>Bromus tectorum</i>	cheatgrass	Introduced	Annual
<i>Distichlis spicata</i>	saltgrass	Native	Perennial
<i>Oxytenia acerosa</i>	copperweed	Native	Perennial
<i>Rhus aromatica</i>	fragrant sumac	Native	Perennial
<i>Salix exigua</i>	narrowleaf willow	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

#### Dripping Springs Wetland

Species	Common Name	Nativity	Duration
<i>Phragmites australis</i>	common reed	Native	Perennial
<i>Rhus aromatica</i>	fragrant sumac	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

#### Maverick Spring (Spring 136)

Species	Common Name	Nativity	Duration
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Juncus arcticus</i>	arctic rush	Native	Perennial
<i>Juniperus osteosperma</i>	Utah juniper	Native	Perennial
<i>Pinus edulis</i>	twoneedle pinyon	Native	Perennial
<i>Rosa woodsii</i>	Woods' rose	Native	Perennial

**Navajo Spring**

<b>Species</b>	<b>Common Name</b>	<b>Nativity</b>	<b>Duration</b>
<i>Acroptilon repens</i>	hardheads	Introduced, Noxious	Perennial
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Populus fremontii</i>	Fremont cottonwood	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

**Side Canyon of Dripping Springs Stream**

<b>Species</b>	<b>Common Name</b>	<b>Nativity</b>	<b>Duration</b>
<i>Distichlis spicata</i>	saltgrass	Native	Perennial
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Rhus aromatica</i>	fragrant sumac	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial
<i>Typha latifolia</i>	broadleaf cattail	Native	Perennial

**Spring 1**

<b>Species</b>	<b>Common Name</b>	<b>Nativity</b>	<b>Duration</b>
<i>Carex</i> sp.	sedge	unknown	Perennial
<i>Distichlis spicata</i>	saltgrass	Native	Perennial
<i>Oxytenia acerosa</i>	copperweed	Native	Perennial
<i>Salsola tragus</i>	prickly Russian thistle	Introduced	Annual
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial
<i>Schoenoplectus acutus</i>	hardstem bulrush	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial
<i>Typha latifolia</i>	broadleaf cattail	Native	Perennial
<i>Xanthium strumarium</i>	rough cocklebur	Native	Annual

**Spring 4**

<b>Species</b>	<b>Common Name</b>	<b>Nativity</b>	<b>Duration</b>
<i>Artemisia tridentata</i>	big sagebrush	Native	Perennial
<i>Distichlis spicata</i>	saltgrass	Native	Perennial
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Juncus arcticus</i>	arctic rush	Native	Perennial
<i>Phragmites australis</i>	common reed	Native	Perennial
<i>Populus fremontii</i>	Fremont cottonwood	Native	Perennial
<i>Salix exigua</i>	narrowleaf willow	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

## Spring 7

Species	Common Name	Nativity	Duration
<i>Adiantum capillus-veneris</i>	common maidenhair	Native	Perennial
<i>Aquilegia micrantha</i>	Mancos columbine	Native	Perennial
<i>Artemisia ludoviciana</i>	white sagebrush	Native	Perennial
<i>Artemisia tridentata</i>	big sagebrush	Native	Perennial
<i>Astragalus sp.</i>	milkvetch	unknown	unknown
<i>Atriplex canescens</i>	fourwing saltbush	Native	Perennial
<i>Carex aurea</i>	golden sedge	Native	Perennial
<i>Cirsium rydbergii</i>	Rydberg's thistle	Native	Perennial
<i>Elaeagnus angustifolia</i>	Russian olive	Introduced, Noxious	Perennial
<i>Ephedra viridis</i>	mormon tea	Native	Perennial
<i>Forestiera pubescens</i>	stretchberry	Native	Perennial
<i>Fraxinus anomala</i>	singleleaf ash	Native	Perennial
<i>Medicago sativa</i>	alfalfa	Introduced	Perennial
<i>Mimulus eastwoodiae</i>	Eastwood's monkeyflower	Native	Perennial
<i>Phragmites australis</i>	common reed	Native	Perennial
<i>Primula specuicola</i>	cavedwelling primrose	Native	Perennial
<i>Rhus aromatica</i>	fragrant sumac	Native	Perennial
<i>Rosa sp.</i>	rose	unknown	Perennial
<i>Salix exigua</i>	narrowleaf willow	Native	Perennial
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial
<i>Yucca sp.</i>	yucca	Native	Perennial

## Spring 11

Species	Common Name	Nativity	Duration
<i>Distichlis spicata</i>	saltgrass	Native	Perennial
<i>Fraxinus anomala</i>	singleleaf ash	Native	Perennial
<i>Juncus arcticus</i>	arctic rush	Native	Perennial
<i>Juncus ensifolius</i>	swordleaf rush	Native	Perennial
unknown	grass	unknown	unknown
<i>Oxytenia acerosa</i>	copperweed	Native	Perennial
<i>Rhus aromatica</i>	fragrant sumac	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial



## Spring 12

Species	Common Name	Nativity	Duration
<i>Distichlis spicata</i>	saltgrass	Native	Perennial
<i>Fraxinus anomala</i>	singleleaf ash	Native	Perennial
<i>Oxytenia acerosa</i>	copperweed	Native	Perennial
<i>Salix exigua</i>	narrowleaf willow	Native	Perennial
<i>Schoenoplectus acutus</i>	hardstem bulrush	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial
<i>Typha latifolia</i>	broadleaf cattail	Native	Perennial

## Spring 13

Species	Common Name	Nativity	Duration
<i>Agropyron cristatum</i>	crested wheatgrass	Introduced	Perennial
<i>Cirsium sp.</i>	thistle	unknown	unknown
<i>Juncus arcticus</i>	arctic rush	Native	Perennial
<i>Poa sp.</i>	bluegrass	unknown	unknown
<i>Salix exigua</i>	narrowleaf willow	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

## Spring 14

Species	Common Name	Nativity	Duration
<i>Juncus arcticus</i>	arctic rush	Native	Perennial
<i>Salsola tragus</i>	prickly Russian thistle	Introduced	Annual
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

## Spring 44 East

Species	Common Name	Nativity	Duration
<i>Bromus tectorum</i>	cheatgrass	Introduced	Annual
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Juncus arcticus</i>	arctic rush	Native	Perennial
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

## Spring 44 North

Species	Common Name	Nativity	Duration
<i>Amelanchier utahensis</i>	Utah serviceberry	Native	Perennial
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Populus fremontii</i>	Fremont cottonwood	Native	Perennial
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

## Spring 46

Species	Common Name	Nativity	Duration
<i>Atriplex confertifolia</i>	shadscale saltbush	Native	Perennial
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Populus fremontii</i>	Fremont cottonwood	Native	Perennial
<i>Rhus aromatica</i>	fragrant sumac	Native	Perennial
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial

## Spring 46 East

Species	Common Name	Nativity	Duration
<i>Ericameria nauseosa</i>	rubber rabbitbrush	Native	Perennial
<i>Populus fremontii</i>	Fremont cottonwood	Native	Perennial
<i>Sporobolus airoides</i>	alkali sacaton	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

## Spring 46 South

Species	Common Name	Nativity	Duration
<i>Populus fremontii</i>	Fremont cottonwood	Native	Perennial
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial
<i>Sporobolus airoides</i>	alkali sacaton	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

## Spring 54

Species	Common Name	Nativity	Duration
<i>plants on wet wall that are hard to see</i>	unknown	unknown	unknown
<i>Populus fremontii</i>	Fremont cottonwood	Native	Perennial
<i>Salix gooddingii</i>	Goodding's willow	Native	Perennial

**Spring 55 North**

<b>Species</b>	<b>Common Name</b>	<b>Nativity</b>	<b>Duration</b>
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial

**Spring 55 Upper**

<b>Species</b>	<b>Common Name</b>	<b>Nativity</b>	<b>Duration</b>
<i>Sarcobatus vermiculatus</i>	greasewood	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

**Todie Spring**

<b>Species</b>	<b>Common Name</b>	<b>Nativity</b>	<b>Duration</b>
<i>Salix exigua</i>	narrowleaf willow	Native	Perennial
<i>Salix lasiolepis</i>	arroyo willow	Native	Perennial
<i>Tamarix chinensis</i>	five-stamen tamarisk	Introduced, Noxious	Perennial

#### Appendix 4. Coordinates of Springs.

Site Name	General Location	UTM North	UTM East
Dripping Springs	SW of Moab, just east of Colorado River	4255325	618535
Dripping Springs Wetland	SW of Moab, just east of Colorado River	4255694	618176
Maverick Spring	East of Natural Bridges NM	4163242	598931
Navajo Spring	West of Bluff, where Comb Ridge intersects Hwy 163	4124601	617493
Side Canyon Dripping Springs	SW of Moab, just east of Colorado River	4255626	618167
Spring 1	SW of Moab, just east of Colorado River	4254264	614587
Spring 4	West of Bluff, near Comb Ridge	4127952	620940
Spring 7	East of Bluff	4127942	631746
Spring 11	Near Valley of the Gods	4127337	605929
Spring 12	Valley of the Gods	4123559	600810
Spring 13	Cedar Mesa, off Cigarette Springs Road	4140624	592547
Spring 14	Cedar Mesa, along highway 261	4143073	594318
Spring 44 East	North of Bluff and west of Hwy 191	4140156	628212
Spring 44 North	North of Bluff and west of Hwy 191	4140095	627987
Spring 46	North of Bluff and west of Hwy 191	4136290	630731
Spring 46 East	North of Bluff and west of Hwy 191	4136321	630876
Spring 46 South	North of Bluff and west of Hwy 191	4136172	630658
Spring 54	Just north of Bluff, off powerline road	4130834	628514
Spring 55 North	North of Bluff and west of Hwy 191	4140093	627893
Spring 55 Upper	North of Bluff and west of Hwy 191	4140088	627933
Todie Spring	Cedar Mesa, off Hwy 261, near Todie Spring Trailhead	4149013	594722

#### Acknowledgments

Thanks to Sarah Dunn for mapping Bears Ears springs from public databases and spending her Spring Break from Whitman College assessing 21 springs. Matt Redd provided advice on roads and experiences with springs. Stephanie Smith created the map of the 21 springs visited. Mary O'Brien reviewed and edited drafts of this report.