

**Botanical Survey for the Proposed  
Aspens at Gull Lake Housing Development**

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This report communicates the results of botanical survey work performed at the 15 acre site of the proposed “The Aspens at Gull Lake” housing development located near the Town of June Lake, in Mono County, California. The purposes of the 2006 botanical survey were to describe the relatively undisturbed native vegetation present, and to determine the whether rare plant habitats or species are present.

The Aspens at Gull Lake project (“study area”) is located in a montane environment. Development would occur at the base of the southwest-facing slope of a rocky mountainous spur, where the upland slope transitions to shoreline wetlands associated with Gull Lake (Figure 1). The average elevation of the project is 7640 ft (2730 m). The climate at this elevation on the eastern side of the central Sierra Nevada Range is cold montane, with more than 50% (and locally as much as 90%) of annual precipitation falling as snow (Mono County Planning Department, 1988). The average winter temperature is 30° F. The frost-free growing season is about 120 days and is characterized by low humidity and moderate daytime temperatures. The average summer temperature is 70° F (Natural Resource Conservation Service, 1996).

## Methods

### Literature Search

A literature search was conducted in order to identify potentially occurring rare plant species. Five potentially occurring rare plant species, *Astragalus monoensis* var. *monoensis* (Mono milkvetch), *Botrychium crenulatum* (scalloped moonwort), *Botrychium lunaria* (common moonwort), *Lupinus duranii* (Mono Lake lupine), and *Streptanthus oliganthus* (Masonic Mountain jewelflower, Table 1), were identified using regional data (Mono County Planning Dept., 1993, California State Water Resources Control Board, 1993, Halford and Fatooh, 1994, U.S. Forest Service, 1998a, 1998b, California Department of Fish and Game (CDFG), 2007a), published floras (Cronquist, *et al.*, 1984, Hickman, 1993, Honer, 2001), and environmental documents for area projects (U.S. Forest Service, 1986, Bagley, 1988, 1994, Paulus, 1998, 2001a, 2001b). The California Natural Diversity Database (CNDDDB) was searched pre-field in July 2006, and post-field in January 2007, checking the State’s rare plant records for the June Lake, Lee Vining, Mammoth Mountain, Mount Dana, Koip Peak, Mount Ritter, Mono Mills, Crestview, and Old Mammoth quadrangles (CDFG, 2006, 2007b).

Table 1. Sensitive plant species search list for the 1% acre Aspens at Gull Lake study area. Based upon a pre-survey literature review, 5 species have some potential to occur. Flowering period data is from CNPS (2001). A key to the rank or status symbols follows the table (NL = not listed).

Scientific Name Common Name Life Form	Rank or Status <sup>1</sup>					Habitat	Flowering Period
	USFWS	DFG	USFS	CNPS	NDDB		
<i>Astragalus monoensis</i> var. <i>monoensis</i> Mono milkvetch herbaceous perennial	NL	R	NL	1B.2	S2.2	open scrub, sand or pumice	June- August
<i>Botrychium crenulatum</i> scalloped moonwort herbaceous perennial	NL	NL	S	2.2	S2.2	wet forest, meadow, marshy	fertile June-July
<i>Botrychium lunaria</i> common moonwort herbaceous perennial	NL	NL	S	2.3	S2?	wet forest, meadow, marshy	fertile August
<i>Lupinus duranii</i> Mono Lake lupine herbaceous perennial	NL	NL	NL	1B.2	S2.2	open scrub, pumice	May-July
<i>Streptanthus oliganthus</i> Masonic Mt. jewelflower herbaceous perennial	NL	NL	NL	1B.2	S2.2	pinyon- juniper woodland, slopes	June-July

1. Rank or status, by agency:

**USFWS** = U.S. Fish and Wildlife Service status under the Endangered Species Act (CDFG, 2007a)

**DFG** = California Department of Fish and Game listings under the Native Plant Protection Act and the California Endangered Species Act (CDFG, 2007a).  
R = Rare

**USFS** = US Forest Service, Inyo National Forest, Bishop Office (1998a, 1998b)  
S = Sensitive List, June 1998 W = Watch List, December 1998

**CNPS** = California Native Plant Society listings (CNPS, 2001, 2006)  
1B = rare and endangered in Calif. and elsewhere  
2 = rare, threatened or endangered in California, but more common elsewhere  
Threat Code extensions:

- .1 is Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
- .2 is Fairly endangered in California (20-80% of occurrences threatened)
- .3 is Not very endangered in California (< 20% of occurrences threatened or no current threats known).

**NDDB** = California Natural Diversity Data Base rankings by the CDFG (CDFG, 2007a)

S1 is < 6 occurrences or < 1000 individuals or < 1000 acres

S2 is 6-20 occurrences or 1000-3000 individuals or 2000-10000 acres

S3 is 21-100 occurrences or 3000-10000 individuals or 10000-50000 acres

Threat Number extensions: .1 = very threatened, .2 = threatened, .3 = no threat currently known,  
? indicates CNDDDB uncertainty in status.



Plant species that occur on-site or could potentially occur on-site were considered rare if they have current state or federal status as Rare, Threatened or Endangered (CDFG, 2007a), are included in the California Natural Diversity Database List of Special Plants (CDFG, 2007c), or are listed by the California Native Plant Society (CNPS) in their inventory of sensitive California plants (CNPS, 2001, 2006).

Habitats, or at least some of the important elements of the habitats required by potentially occurring rare plants (Table 1), can be found within the bounds of the study area. Mono milkvetch and Mono Lake lupine are recognized as potentially occurring in the general area, and broadly within a plant community type that occupies most of the study area, by the Mono County Master Environmental Assessment (Mono County Planning Department, 1993) and by the Los Angeles Department of Water and Power's Mono Basin Water Rights EIR (California State Water Resources Control Board, 1993). Mono Lake lupine is restricted to pumice gravel soil, and may grow in association with members of the sensitive Mono Pumice Flat community. Both species are known to occur within a pumice gravel flat habitat that is 2.5 miles northeast of the study area. Mono milkvetch is currently state listed as "Rare". Populations of *Botrychium crenulatum* are known from the Convict Lake Basin 16 miles to the south (D. Taylor, pers. comm.) and from near Tioga Pass about 12 miles to the north (CNDDDB, 2007b). A population of *Botrychium lunaria* has been documented in the Lee Vining area about 13 miles north of the study area. Both of these rare *Botrychium* species are restricted to perennially moist soils. Suitable wet habitat is present near seeps and within the lakeside meadow at the study area. Populations of Masonic Mountain jewelflower have been found in rocky, granitic upland habitat at 7400 ft and 8300 ft near the mouth of Lundy Canyon, within 20 miles of the study area (these populations are not yet included in CNDDDB records). Upland soils in the study area have a high pumice content, but granitic alluvium is present west of North Shore Drive (Figure 2).

No occurrences of rare plant species within the study area have been documented in the California Natural Diversity Database. No occurrences of these (or any other) rare plant species, and no occurrences of the Mono Pumice Flat community were documented on-site in previous biotic assessments that included all or part of the study area (U.S. Forest Service, 1986, Mono County Planning Department, 1988, Bagley, 1994).

## Field Surveys

On July 24, 2006, nearby populations of the rare plants *Astragalus monoensis* var. *monoensis* and *Lupinus duranii* were visited. Blooming and fruiting *A. monoensis* var. *monoensis* and *L. duranii* at the known populations were inspected, in order to form clear search patterns for recognizing these perennial species if they should occur in the study area. As described by Bagley (1994), these populations occur together at 7700 ft elevation, 2.5 miles to the northeast of the study area (7640 ft) in Mixed Sagebrush Scrub. This scrub type shares broad similarity to much of the study area's vegetation in terms of canopy species composition. However, as determined on July 24, the habitats available for plants at the known population site and at the study area differ significantly in other characteristics. The known *L. duranii* population occurs in gravelly pumice flats that support a relatively low and open shrub assemblage, while the study area scrub exhibits a much greater shrub stand density and height that is typical of soils with higher productivity. The upland habitats present within the study area represent habitat types that

are commonly found on slopes throughout this region, while the gravelly flat that supports known rare plant populations is a specialized, rarer habitat. Unusual pumice soil habitats that can support specialized, rare plants such as *A. monoensis* var. *monoensis* and *L. duranii* have been recognized as distinct communities (eg., “Mono Pumice Flats”, CDFG, 2003) or as readily recognizable variants of more common regional scrub types (Bagley, 1994). It is unlikely that pumice flat habitats could occur within the bounds of the study area, because the terrain there is continuously sloping.

Field searches for occurrences of rare plants within the study area were performed during the last week of July, 2006 and the first week of August, 2006. Searching was mainly conducted by walking 15 parallel transects across the study area (Figure 2). A wandering course was used to search around and under shrub canopies, and to search patches where tree canopies or boulders have potentially created microhabitat variation. Transects were centered every 50 feet when searching in the scrub vegetation that dominates most of the study area. Searching was intensified when dense mountain mahogany canopies were encountered, and within any areas where a grassy meadow-like sward was dominant. Wet soils associated with seep and spring zones were also thoroughly searched so that all species, even those with very small, environmentally limited distributions would be identified. Finally, all roadside and other recently disturbed soils were walked, in order to assess the current status of invasive non-native plants and their potential for further infestation. A list of all plant species encountered was compiled (Appendix A). Plants that were not immediately recognized were keyed by the consulting botanist (using Hickman, 1993) to taxa sufficient to determine rare species presence or absence. All field surveys, which totaled 18 hours of searching and additional time spent mapping vegetation on-site, were performed by Jim Paulus of Oakhurst, California.

Plant community boundaries were mapped using data collected along rare plant search transects when they were revisited in late August, 2006. Plant community classification was decided using the Holland (1986) system. Plant community boundaries were adjusted slightly to account for a new map provided in early October. Final boundaries (Figure 3) were drawn using data collected on October 16, 2006. At the time of this last visit, it was too late in the growing season to perform further rare plant searches.

## Results

### Plant communities and species

The majority of the study area is covered by scrub vegetation dominated by big sagebrush (*Artemisia tridentata*), and is classified as Big Sagebrush Scrub. Smaller areas at the edges of the property support wetland meadow vegetation classified as Wet Montane Meadow and upland woodland vegetation classified as Curl-leaf Mountain Mahogany Woodland. If wetland meadows at the southern property edge (mapped here as Wet Montane Meadow) and prohibitively steep, woodland slopes that lie north of North Shore Drive (Curl-leaf Mountain Mahogany Woodland) are not directly or indirectly impacted by the project, then project construction may displace up to 12 acres of scrub vegetation (Table 2). These acres (Figure 3) were central to the area that was surveyed for potentially occurring rare plants in 2006.

In much of Mono County, plant communities transition rapidly as the elevation of the steeply rising Sierra Nevada Mountains increases. In the Gull Lake area, the plant assemblage typically shifts from sagebrush-dominated scrub at lower elevations to dense Jeffrey pine or lodgepole pine forest on the cooler and wetter mountain slopes above. Within the limits of the study area, construction of the project would mainly impact a relatively treeless, well-established stand of typical (eg., regionally common) sagebrush scrub. About 20 Jeffrey pine (*Pinus jeffreyi*) and five western juniper (*Juniper occidentalis* var. *australis*), all young trees, are scattered within this stand. Historically, much of the property may have been heavily forested, as can now be found on nearby slopes of similar aspect. The area was burned over by wildfire within the last three or four decades (U.S. Forest Service, 1986). It is likely that some of the pines were planted during the early 1980's in a rather unsuccessful post-fire attempt to reintroduce a forest canopy to the property (Mono County Planning Department, 1988).

Table 2. Plant communities found within the study area. Holland (1986) names are given. In addition, 1.3 ac of paved roadway, bare disturbed soil, or other devegetated area was found in 2006.

Community type	Holland Number	Holland Name	Acreage in Study Area
Woodland	76200	Curl-leaf Mountain Mahogany Woodland <sup>1</sup>	0.5
Scrub	35210	Big Sagebrush Scrub <sup>2</sup>	12.0
Meadow	45110	Wet Montane Meadow <sup>3</sup>	1.2

<sup>1-3</sup>Classification numbers most recently adopted by CDFG (2003):

1. 76.200.00 "Curlleaf Mountain-Mahogany Woodland and Scrub"
2. 35.110.07 "Big Sagebrush - Antelope Bitterbrush Scrub"
3. 45.310.12 "Wet Montane Meadow"

In 2006, overall diversity of plant species (including annuals) was high, with the greatest contribution to the study area's diversity provided by the Wet Montane Meadow assemblage. At much of the southern property edge, the Wet Montane Meadow plant environment transitions from perennially wet (lakeshore marsh and springfed hydric) soils toward a more xeric (upland) condition. Where this habitat is wet enough to support a predominance of wetland hydrophytes (plants dependent on seasonally to perennially available groundwater in addition to precipitation), the plant community was mapped as Wet Montane Meadow. The available range of perennially wet to seasonally wet soils in Wet Montane Meadow translates to relatively great plant species diversity in comparison to other plant communities that occur in the study area. In Mono County, this type of habitat can harbor rare plants, and it is considered "Sensitive" by the State (CDFG, 2003). The lowest contribution to diversity was found in Curl-leaf Mountain Mahogany Woodland, which is the only habitat shaded by a canopy of dominant trees. Curl-leaf Mountain Mahogany Woodland is a regionally common, possibly seral community type that, like Big Sagebrush Scrub, has no current community-specific state or federal protections.

A total of 103 species belonging to 29 plant families were identified within the study area (Appendix A). A total of 35 herbaceous species, mostly native grasses and sedges, were identified in the Meadow community. Dominant herbaceous species form a relatively low-growing (average height is 1 ft) sward that provides 90-100% living cover. Herb diversity (S) is also high in the Scrub community, where 4 wetland ecotone and 40 exclusively upland species were found under and between shrub canopies in 2006. Herb strata diversity is lowest (S = 18) where tree canopies dominate in the Woodland community. The Woodland tree stratum is composed almost entirely of mature curl-leaf mountain mahogany (*Cercocarpus ledifolius* var. *intermontanus*), which provide dense cover (80% canopy closure) averaging 10-12 ft in height. Trees (pines and juniper) also occur in Scrub, but as minor components. Big Sagebrush Scrub has the greatest diversity of shrub species (S = 14), but 80% of this cover is produced by a single species, big sagebrush. The living shrub stratum in the upland Scrub community averages 60-70% total cover and 2.5 ft in height. Shrub frequencies and stature are reduced rapidly across the ecotone-like margin where the study area's Meadow and Scrub communities meet, and all upland Scrub dominants are absent from the Meadow habitat. Many shrub species common in Scrub are also absent from the upland Woodland community, likely due to shading and perhaps increased herbivory.

The clear differences in average vegetation height, density, and dominant canopy species serve to make the study area's plant communities visually distinct on-site. Community transitions are usually abrupt. Locating community edges for the purpose of avoidance should therefore be relatively simple.

An additional habitat type found in 2006 could be described as "disturbed" or "weedy". This habitat encompasses the pavement and roadsides of Leonard Avenue and North Shore Drive, as well as three unpaved road tracks (Figure 2). The unpaved tracks appear to be abandoned. Small, historically devegetated canopy gaps that are present throughout the study area are now recovering to resemble Big Sagebrush Scrub. In 2006, roadsides of Leonard Avenue and North Shore Drive, which were the areas where mechanical disturbance had most recently occurred, were observed to be infested with cheatgrass (*Bromus tectorum*), a non-native annual grass that is an invasive noxious weed as defined by the California Exotic Pest Plant Council (1999, CalEPPC code A-1: "the most invasive pest plants, and are already widespread"). High density cheatgrass stands are thought to increase the risk and frequency of wildfire (CalEPPC, 1999). Cheatgrass has become well-established in the Gull Lake area (*pers. obs.*) It has been previously described as invading relatively undisturbed Scrub at an adjacent property (Paulus, 2001). Within the study area, cheatgrass has invaded into near-road Big Sagebrush Scrub at high abundance. It remains absent from Meadow and Woodland on-site. Non-native Russian thistle (*Salsola tragus*), yellow salsify (*Tragopogon dubius*), Jerusalem oak (*Chenopodium botrys*), and redstem filaree (*Erodium cicutarium*) were also present on roadsides, but only Russian thistle has become firmly established in relatively undisturbed Big Sagebrush Scrub. It is likely that these undesirable annual weeds are already important components of the local seedbank (USFS, 1998c). Soil disturbance associated with the project could contribute to the ongoing local spread of invasive cheatgrass and Russian thistle. Project features that invoke native plant revegetation or contemplate enhancement of avoided plant communities on-site will have an increased likelihood of meeting mitigative goals if management practices that discourage cheatgrass and Russian thistle invasiveness are included.

A few native species seem to be adapted to rapidly recolonize mechanically disturbed soils. Native perennials that are most abundant and healthy within roadside habitats such as the roadcut slope at North Shore Dr. include big sagebrush, antelope bitterbrush (*Purshia tridentata*), prickly poppy (*Argemone minuta*), curl-leaf rabbitbrush (*Chrysothamnus viscidiflorus*), Parry rabbitbrush (*C. parryi*), silvery lupine (*Lupinus argenteus* var. *heterantherus*), and squirreltail grass (*Elymus elymoides*). Native plants that were only found in disturbed habitat in 2006 included prickly poppy, and common annual *Astragalus* and *Eriogonum* species. Native willows (*Salix exigua*) have rapidly colonized a nearby (off-site) upland area that was mechanically devegetated in recent years to construct a runoff collection pond.

### **Big Sagebrush Scrub**

The majority of the study area was classified as a single community, composed mainly of sagebrush (*Artemisia tridentata*), with patchy antelope bush (*Purshia tridentata*), and curl-leaf rabbitbrush (*Chrysothamnus viscidiflorus*) present at relatively low abundances. This composition is typical of Holland's Big Sagebrush Scrub community (Holland, 1986), which is widespread on the eastern Sierra Nevada margin between Modoc and Inyo Counties. Big Sagebrush Scrub is classified as Basin Sagebrush in the Mono County Master Environmental Assessment (Mono County Planning Department, 1993). The existing perennial shrub canopy is generally uniform, 60-70% total cover, and the average height of dominant *A. tridentata* and *P. tridentata* is 2.5 feet.

The area between shrubs was overall sparsely populated by native annuals in 2006, the exception being often abundant cheatgrass. Native perennial grasses provide greater than 10% total cover only in the ecotone where Big Sagebrush Scrub transitions to Wet Montane Meadow. This zonal ecotone averages 10-50 ft wide (mapped as Big Sagebrush Scrub), and is signaled by a shift from upland needlegrasses (*Achnatherum occidentale*, *A. hymenoides*), ricegrass (*Leymus cinereus*), and squirreltail grass (*Elymus elymoides*) to dominance by facultatively hydrophytic grasses, primarily creeping wildrye (*Leymus triticoides*). Herbaceous perennial and annual cover found elsewhere in Big Sagebrush Scrub, including cover contributed by all native grasses, totaled less than 10% in 2006. The predominant herbaceous upland annuals present in 2006 were summer snowflakes (*Gayophytum diffusum* ssp. *parviflorum*) and Great Basin woollystar (*Eriastrum sparsiflorum*).

Although devoid of surface water at the time of the survey, seasonal seeps are indicated at two locations within Big Sagebrush Scrub (Figure 3) by abrupt shifts in species composition. The added species here include thicket-like wild rose (*Rosa woodsii* var. *ultramontana*), snowberry (*Symphoricarpos rotundifolius*) and currant (*Ribes viscosissimum*), and also species recognized (Reed, 1988) as obligate wetland hydrophytes in California, including a few willows (*Salix* spp.) and diffuse stands of rush (*Juncus mexicanus*). Both locations are small (about 50 ft<sup>2</sup>) and are completely embedded within Big Sagebrush Scrub. Their hydrologic connectivity (if any) to the larger downslope wetland area is not indicated in the current pattern of vegetation.

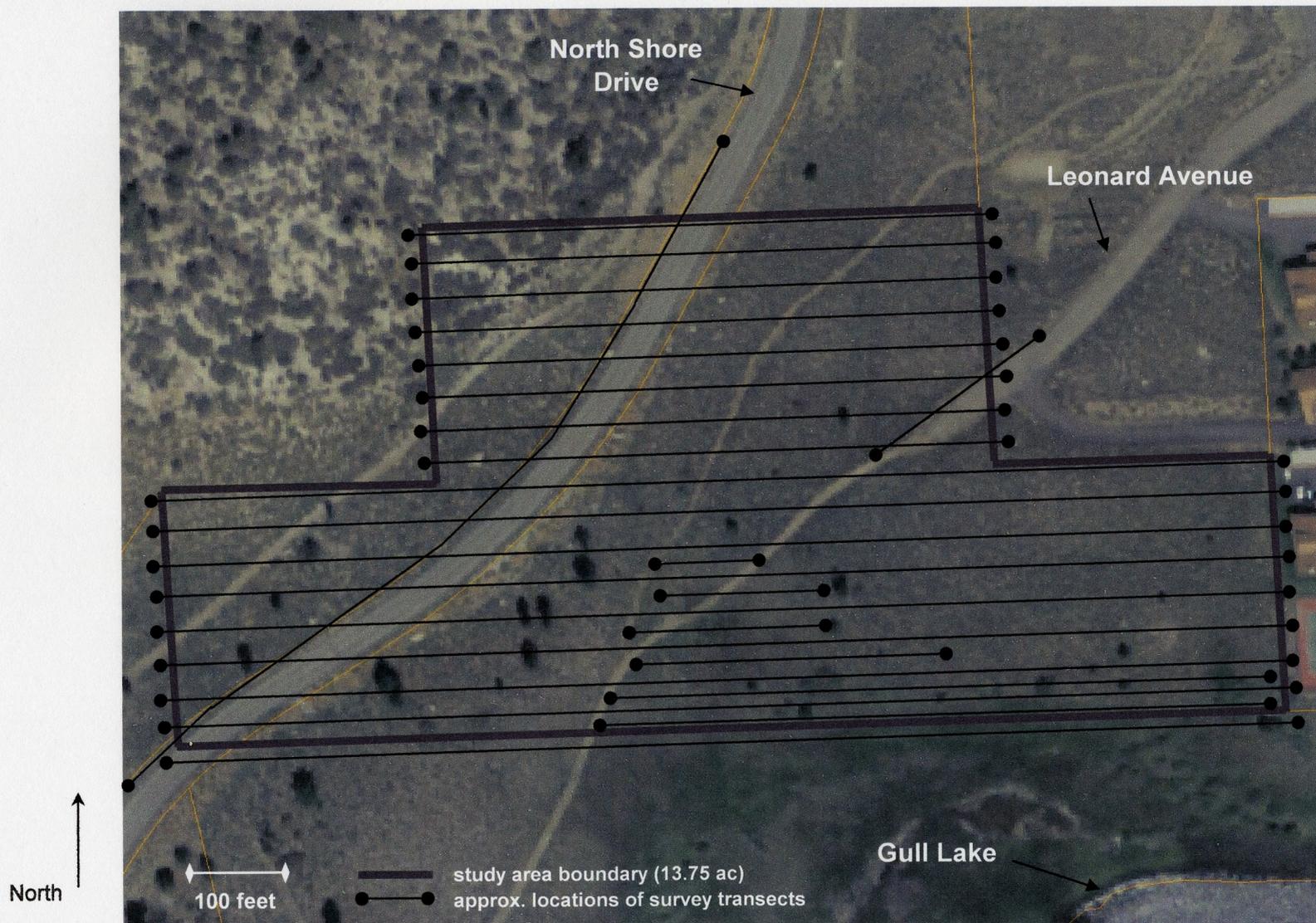


Figure 2. The Aspens at Gull Lake study area, showing survey transects used to search for rare plants and map community boundaries in July-October, 2006. Transect spacing was about 50 feet in uplands and 25 ft in wetlands.

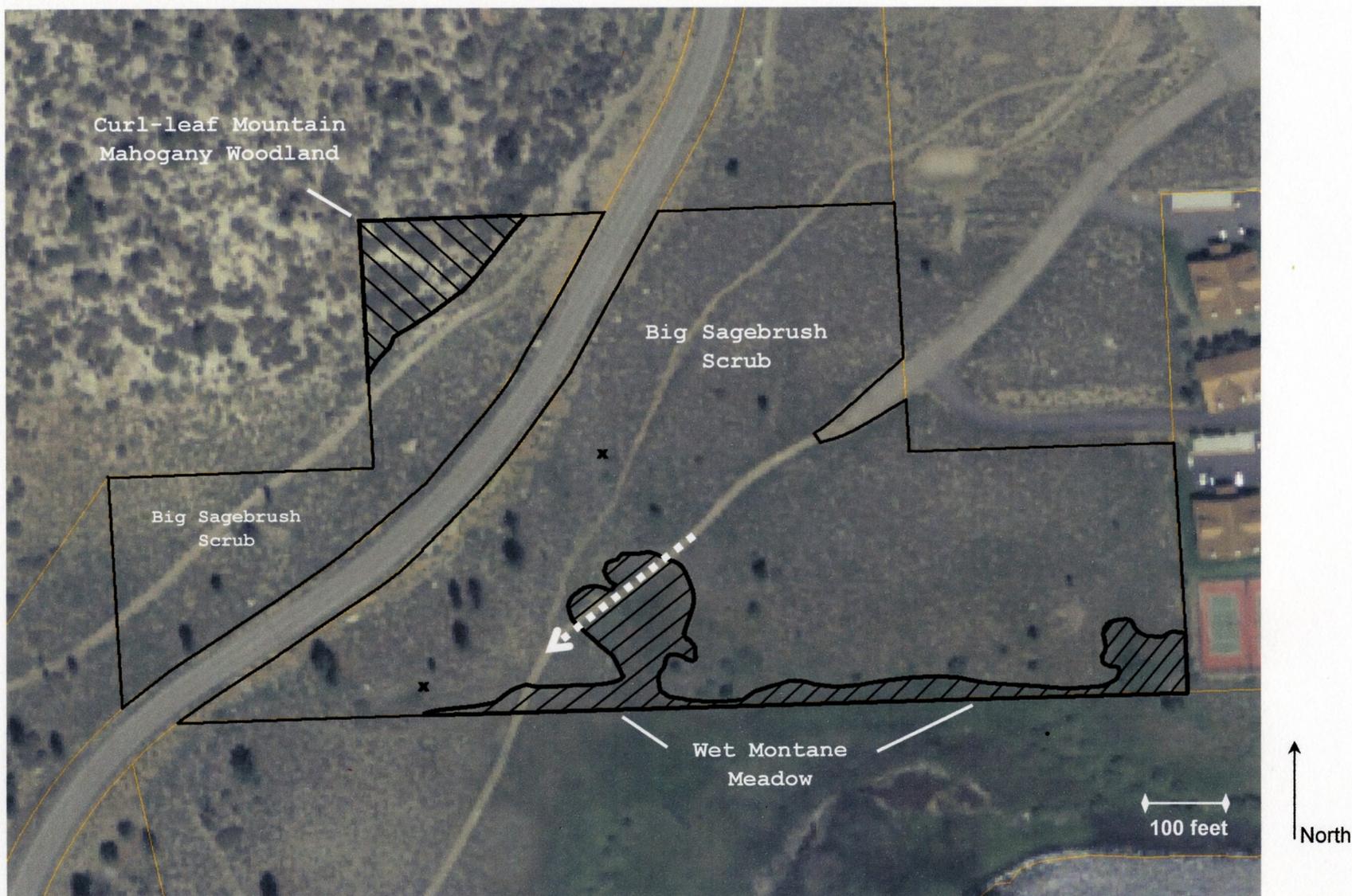


Figure 3. Map showing occurrences of Big Sagebrush Scrub, Wet Montane Meadow, and Curl-leaf Mountain Mahogany Woodland within the study area. Arrow depicts location of the gully formation discussed in the text. Potential snowmelt (seasonal) seep zones indicated by "x".

## Curl-leaf Mountain Mahogany Woodland

Curl-leaf mountain mahogany (*Cercocarpus ledifolius* var. *intermontanus*) attains a tree-like stature of up to 15 ft within the study area. It has become dominant on a steep, south-facing slope that just enters the northwestern corner of the study area (Figure 3). The plant community there is designated as Mountain Mahogany Woodland. This community occurs on relatively steep and unstable terrain, in the shallow rocky soil accumulated at the base of large rock outcrops.

The distribution of curl-leaf mountain mahogany is characteristically clumped, in contrast to the more uniform cover of adjacent Scrub. Woodland cover averages 60% on most of the slope above the study area, but it is increased to 80% within the study area. The cover contributed by shrubs and herbs amounts to less than 10%. Signs of deer use for forage and cover were relatively dense in this portion of the study area. However, some perennial herbs not found elsewhere in the study area, including abundant slender buckwheat (*Eriogonum microthecum*), tolerate the sunny and unstable aspect, as well as increased herbivory in Curl-leaf Mountain Mahogany Woodland.

## Wet Montane Meadow

The Wet Montane Meadow community occurs along the southern edge of the study area. Most members of the Wet Montane Meadow community are restricted to soils that are seasonally to perennially saturated by a combination of 1) the shallow groundwater table contiguous with Gull Lake, and 2) recharge provided by a group of on-site perennial springs and seasonal seep zones. These hydrologic flows are intermingled on site, yet are separate to the extent that the springs and seeps are likely supplied from upslope (non-lacustrine) groundwater sources. Direct or indirect impacts that alter the annual pattern or degree of root zone wetting and drying in any areas mapped here as Wet Montane Meadow will lead to relatively rapid changes in the extent of wetland habitat, degree of vegetation cover, and species composition.

Herbaceous cover is far more important in Wet Montane Meadow than elsewhere. Total cover in and near surface water is 100%, averages 1 ft high, and is usually underlain by a thick thatch layer. Springflow channels embedded within Wet Montane Meadow are often hidden under the dense vegetation. These channels are narrow and are not noticeably excised, yet they support aquatic plants such as water cress (*Rorippa nasturtium-aquaticum*) and American brooklime (*Veronica americana*), suggesting that surface waters are perennial. Meadow herbaceous cover is dominated by several species of sedge (*Carex* spp.), or by patches of pale bentgrass (*Agrostis pallens*), Kentucky bluegrass (*Poa pratensis* ssp. *pratensis*) and fowl bluegrass (*P. palustris*). About 30% of the living herbaceous layer cover in the meadow is made up of introduced perennial grasses (*P. pratensis* and *P. palustris*). Throughout the Sierra Nevada, introduced bluegrasses have often become naturalized as dominants in disturbed wetland areas (Sawyer and Keeler-Wolf, 1995), and may have been present locally since the days of sheep herding.

The Meadow margin is characterized by somewhat drier rooting zone soil. Total cover thins, revealing scattered small patches of open soil where the slope increases and the vegetation

begins to transition to upland Scrub. Plant diversity increases, as common yarrow (*Achillea millefolium*), wild iris (*Iris missouriensis*), elk thistle (*Cirsium scariosum*), rushes (especially *Juncus mexicanus*), and the wetland-adapted shrub silver sagebrush (*Artemisia cana* ssp. *bolanderi*) join the dominant bluegrass and sedge species. As elevation continues to increase, grass dominance shifts to a single species, creeping wildrye (*Leymus triticoides*), and the soil becomes dry enough to support small, “invasive” big sagebrush. The ecotone where big sagebrush and creeping wildrye co-occur as dominants was included here in the area that was mapped as Big Sagebrush Scrub. Significant downslope advancement of ecotonal dominant big sagebrush and creeping wildrye that is not attributable to climate may be interpreted as signaling that some impact has caused soil drying in Wet Montane Meadow.

For now, ongoing Wet Montane Meadow disturbance due to erosion is clearly evident at one old track that extends steeply downslope from the paved terminus of Leonard Avenue. A newly created gully (Figure 3) has undercut the local shallow groundwater table. The gully is draining a portion of the on-site wetland habitat and is encouraging non-native weeds to invade Wet Montane Meadow. Weedy tansy mustard (*Descurainia sophia*), clasping pepperweed (*Lepidium perfoliatum*), and common knotweed (*Polygonum arenastrum*) had densely colonized Wet Montane Meadow areas upslope from the gully in 2006. Furthermore, the eroded channel now redirects potential Wet Montane Meadow recharge normally provided by a perennial spring flow that emerges upslope of the gully. Conversion of slopes residing above the study area from scrublands to impervious surfaces has significantly increased the magnitude of runoff during the past decade. Until upslope runoff is redirected, this gully will increasingly serve as a drain for the upslope habitat, impacting the groundwater supply and likely attenuating seasonal drying within the phreatophytic rooting zone.

### Rare plant species

No occurrences of *Lupinus duranii*, or the Mono Pumice Flats community where it may be sometimes found, were observed within the study area in 2006. Well developed fruits, leaves, and lower plant internodes were commonly available during the time of the survey. Much larger leaf size and fruit size allowed for positive differentiation of the study area’s silvery lupine (*Lupinus argenteus*) from the rare species *L. duranii*. No *Astragalus monoensis* var. *monoensis* were identified within the study area in 2006. The only plants observed having the 1-pinnate leaf structure that is typical of *Astragalus*, including *A. monoensis*, were identified as *Astragalus purshii*, a common species having distinctive silver-hairy leaves and fruits in contrast to the short-hairy to relatively glabrous condition expected for *A. monoensis*. Similarly, *Streptanthus oliganthus* were not found within the study area. Calyx and petal shapes were checked on all populations of cruciferous herbs having basal rosettes of (entire) leaves and tall inflorescence peduncles. No plants having the expected combination of basal rosette leaf clusters, tall inflorescence peduncles, and urn-shaped calyces typical of *S. oliganthus* were found.

Members of the distinctive genus *Botrychium* are typically small and their aboveground appearances can be relatively ephemeral. Scalloped moonwort (*B. crenulatum*) and its close relative common moonwort (*B. lunaria*) produce one to several rather ephemeral, frond-like or vaguely fern-like leaves of less than 10 cm height that bear distinctive sporangia. *B. crenulatum*

is known to occur at broadly similar montane elevations both to the north and south of the study area, and *B. lunaria* has been found at similar elevation near Lee Vining. *B. crenulatum* requires shade and moist soil through spring and early summer (USFS, 2001), and *B. lunaria* requires meadow or moist forest habitats (CDFG, 2007b), so potential habitat available for these species at the study area would be restricted to where vegetation was classified as Wet Montane Meadow. No plants with frond-like leaves were found in this habitat in 2006.

Utah monkeyflower (*Mimulus glabratus* ssp. *utahensis*) is recognized by the state as Rank S1.1 (see Table 1, CDFG, 2007a), while it is considered an indistinct variant of common monkey flower (*M. guttatus*) by other authorities (Hickman, 1993). Utah monkeyflower's distribution is associated with riparian forest and scrub or springfed lakeshore habitats in the Mono Lake area. The nearest population that has been documented in recent decades is 13 miles to the north of the study area (CDFG, 2007b). If this rare species were to occur within the study area, it would be restricted to the perennially moist to saturated soils found near seep zones within Wet Montane Meadow. The only *Mimulus* found in this habitat in 2006 were many-flowered monkeyflower (*M. floribundus*) and primrose monkeyflower (*M. primuloides* ssp. *primuloides*), relatively small plants distinguishable from *M. glabratus*/*M. guttatus* by their open-throated corollas and radially symmetrical calices.

Occurrence of the perennial herb subalpine fireweed *Epilobium howellii* has been reported in the Mammoth Mountain area, about 16 miles to the south of the study area. This diminutive perennial herb would generally occur in moist areas, such Wet Montane Meadow habitat, and would appear relatively prostrate and fragile plant that usually does not grow to more than 20 cm in height. No *E. howellii* were found, and *Epilobium* species that were found in Wet Montane Meadow in 2006 were clearly annuals (*E. cf. minutum*), or were much larger in all respects (*E. saximontanum*).

Pondweeds (*Potamogeton* spp.), including the rare species slender-leaved pondweed (*P. filiformis*), are thought to require relatively stable lakeshore habitats for rooting. Populations of this species are scattered at montane lakes throughout the region. The nearest known population of *P. filiformis* is located at a similar elevation and within 1 mile of the study area, at the southern shoreline of June Lake. Similar aquatic habitat does not occur within the study area. The steeply falling spring flows crossing within Wet Montane Meadow vegetation at the study area were checked along their entire lengths for quiet water. No suitable habitat was detected, and no species of pondweed were found.

Additional upland-adapted rare plants that occur within 15 miles of the study area (eg. *Arabis pinzlae*, *Agrostis humilis*, *Draba breweri* var. *cana*, *Silene oregana*) are known only from alpine habitats at significantly higher elevations than found in the study area, so their likelihood of on-site occurrence is considered very low. Nevertheless, care was taken during the survey to verify that any closely related species found on-site could be distinguished as common. For example, the herbaceous rare perennial *Arabis tiehmii* was identified by Bagley (1988) as having potential to occur near the study area. This species is known from substantially higher elevation locations along the Sierra Crest. All *Arabis* found exhibited the recurved to appressed fruits of common *A. holboellii*, rather than the ascending fruit that would be expected of *A. tiehmii* (and *A. pinzlae*).

Based upon the absence of any rare plants documented in previous botanical searches of the study area (U.S. Forest Service, 1986, Mono County Planning Department, 1988), in recent surveys conducted with similar search methods on two adjacent parcels to the east (Paulus, 1998, 2001a) and a large adjacent parcel to the west (Paulus, 2001b), and in the 2006 survey reported here, it is concluded that it is very unlikely that any rare plant populations occur within the 15 ac study area for The Aspens at Gull Lake project.

During the transect surveys, sign of widespread use by deer was observed. Browsing on perennial shrubs was evident, but overall light, with the exception of heavy browse and cover use evident within the small area classified as Curl-leaf Mountain Mahogany Woodland. There was no evidence that this area had been used for livestock grazing during any recent growing season, and grazing activity likely did not significantly influence the ability to detect sensitive plants during this survey.

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Appendix A. List of plant species occurring in The Aspens at Gull Lake study area. Habit summarizes the growth form of each species. Codes are defined below. Plants occurrence in each of six habitats is denoted by an "x".

Plant Families and Species	Habit	Occurrence In Study Area			
		Curl-leaf Mtn. Mahogany Woodland	Big Sagebrush Scrub	Wet Montane Meadow	disturbed
<b>GYMNOSPERMS</b>					
Equisetaceae					
<i>Equisetum</i> sp.	smooth scouring rush	NAH		X	
Pteridaceae					
<i>Cheilanthes gracillima</i>	lace fern	NPH	X		
Selaginellaceae					
<i>Selaginella</i> sp.	spike moss	NH	X		
Cupressaceae					
<i>Juniperus occidentalis</i> var. <i>australis</i>	mountain juniper	NT	X	X	
Pinaceae					
<i>Pinus jeffreyi</i>	Jeffrey pine	NT		X	
<b>ANGIOSPERMS</b>					
<b>Dicots</b>					
Asteraceae					
<i>Achillea millefolium</i>	common yarrow	NPH		X	
<i>Anaphalis margaritacea</i>	anaphalis	NPH		X	
<i>Antennaria rosea</i> ssp. <i>confinis</i>	rosy pussytoes	NPH		X	
<i>Arnica chamissonis</i> ssp. <i>foliosa</i>	leafy arnica	NPH		X	
<i>Artemisia cana</i> ssp. <i>bolanderi</i>	silver sagebrush	NS		X	X
<i>Artemisia tridentata</i>	big sagebrush	NS	X	X	X
<i>Aster ascendens</i>	aster	NPH		X	
<i>Aster occidentalis</i> var. <i>occidentalis</i>	western aster	NPH		X	
<i>Chrysothamnus nauseosus</i> ssp. <i>albicaulis</i>	rubber rabbitbrush	NS		X	X
<i>Chrysothamnus parryi</i> ssp. <i>nevadensis</i>	Parry rabbitbrush	NS		X	X
<i>Chrysothamnus viscidiflorus</i>	curl leaf rabbitbrush	NS	X	X	X

Plant Families and Species	Habit	Occurrence in Study Area			
		Woodland	Scrub	Meadow	disturbed
<b>Asteraceae (cont.)</b>					
<i>Cirsium scariosum</i>	elk thistle			X	
<i>Machaeranthera canescens</i> var. <i>canescens</i>	hoary aster		X		
<i>Stephanomeria tenuifolia</i>	wire lettuce		X		
<i>Tetradymia canescens</i>	cotton thorn		X		
<i>Tragopogon dubius</i>	yellow salsify				X
<i>Wyethia mollis</i>	mules ears		X		
<b>Boraginaceae</b>					
<i>Cryptantha circumscissa</i>	cushion cryptantha		X		X
<i>Cryptantha echinella</i>	prickly cryptantha			X	X
<i>Cryptantha micrantha</i>	purple-rooted forget-me-not	X	X		
<i>Cryptantha simulans</i>	cryptantha		X	X	
<b>Brassicaceae</b>					
<i>Arabis holboellii</i>	Holboell rock cress	X	X		
<i>Descurainia sophia</i>	tansy mustard			X	X
<i>Lepidium perfoliatum</i>	clasping pepperweed			X	X
<i>Rorippa nasturtium-aquaticum</i>	water cress			X	
<b>Caprifoliaceae</b>					
<i>Symphoricarpos rotundifolius</i>	snowberry	X	X		
<b>Chenopodiaceae</b>					
<i>Chenopodium botrys</i>	Jerusalem oak				X
<i>Chenopodium denticatum</i>	goosefoot		X		
<i>Salsola tragus</i>	russian thistle		X		X
<b>Fabaceae</b>					
<i>Astragalus purshii</i>	woolypod milkvetch				X
<i>Lupinus argenteus</i> var. <i>heteranthus</i>	silvery lupine	X	X		X
<i>Trifolium longipes</i> var. <i>nevadense</i>	longstalk clover			X	

Plant Families and Species	Habit	Occurrence In Study Area			
		Woodland	Scrub	Meadow	disturbed
Geraneaceae <i>Erodium cicutarium</i>	redstem filaree			X	X
Grossulariaceae <i>Ribes viscosissimum</i>	sticky currant			X	
Hydrophyllaceae <i>Phacelia crenulata</i> var. <i>crenulata</i>	cleftleaf phacelia	X		X	
<i>Phacelia cryptantha</i>	cryptantha-like phacelia			X	
<i>Phacelia hastata</i> ssp. <i>hastata</i>	silverleaf phacelia	X		X	
<i>Phacelia</i> sp.				X	
Loasaceae <i>Mentzelia albicaulis</i>	blazing star	X		X	
Onagraceae <i>Gayophytum diffusum</i> ssp. <i>parviflorum</i>	summer snowflakes	X		X	X
<i>Epilobium</i> cf. <i>minutum</i>	small willowherb				X
<i>Epilobium saximontanum</i>	mountain willowherb				X
Papaveraceae <i>Argemone minuta</i>	prickly poppy				X
Polemoniaceae <i>Eriastrum sparsiflorum</i>	Great Basin woollystar	X		X	X
<i>Leptodactylon pungens</i>	granite prickly phlox			X	
<i>Phlox diffusa</i>	diffuse phlox			X	
<i>Phlox stansburyi</i>	Stansbury phlox	X		X	
Polygonaceae <i>Eriogonum elatum</i> var. <i>elatum</i>	woolly buckwheat			X	
<i>Eriogonum fasciculatum</i> var. <i>foliosum</i>	leafy buckwheat	X		X	
<i>Eriogonum microthecum</i>	slender buckwheat	X			
<i>Eriogonum nidularium</i>	buckwheat			X	

Plant Families and Species	Habit	Occurrence In Study Area			
		Woodland	Scrub	Meadow	disturbed
<b>Polygonaceae (cont.)</b>					
<i>Eriogonum nudum</i> var. <i>deductum</i>	naked buckwheat		X		
<i>Eriogonum spergulinum</i>	spurry buckwheat		X		X
<i>Eriogonum umbellatum</i> var. <i>nevadense</i>	sulphur flower	X	X		
<i>Eriogonum</i> sp.					X
<i>Polygonum arenastrum</i>	knotweed			X	X
<i>Rumex paucifolius</i>	few-leaved dock			X	
<b>Rubiaceae</b>					
<i>Galium multiflorum</i>	shrubby bedstraw	X	X		
<b>Rosaceae</b>					
<i>Cercocarpus ledifolius</i> var. <i>intermontanus</i>	curl-leaf mountain mahogany	X	X		
<i>Potentilla biennis</i>	white cinquefoil			X	
<i>Potentilla glandulosa</i> ssp. <i>nevadensis</i>	Nevada cinquefoil			X	
<i>Purshia tridentata</i> var. <i>tridentata</i>	antelope bush	X	X		
<i>Rosa woodsii</i> var. <i>ultramontana</i>	interior rose		X	X	
<b>Salicaceae</b>					
<i>Salix exigua</i>	narrowleaf willow		X	X	
<i>Salix</i> sp.	willow		X		
<b>Scrophulariaceae</b>					
<i>Castilleja angustifolia</i>	desert paintbrush		X		
<i>Mimulus floribundus</i>	many-flowered monkeyflower			X	
<i>Mimulus primuloides</i> ssp. <i>primuloides</i>	monkeyflower			X	
<i>Penstemon rydbergii</i> var. <i>oreocharis</i>	penstemon			X	
<i>Penstemon speciosus</i>	royal penstemon	X	X		
<i>Verbascum thapsus</i>	woolly mullein				X
<i>Veronica americana</i>	American brooklime			X	
<b>Violaceae</b>					
<i>Viola purpurea</i>	goosefoot violet		X		

Plant Families and Species	Habit	Occurrence In Study Area			
		Woodland	Scrub	Meadow	disturbed
<b>Monocots</b>					
<b>Cyperaceae</b>					
<i>Carex athrostachya</i>	slenderbeak sedge	NPGL		X	
<i>Carex douglasii</i>	Douglas sedge	NPGL		X	X
<i>Carex lanuginosa</i>	woollyfruit sedge	NPGL		X	
<i>Carex nebrascensis</i>	Nebraska sedge	NPGL		X	
<i>Carex</i> sp.	sedge	NPGL		X	
<b>Iridaceae</b>					
<i>Iris missouriensis</i>	wild iris	NPGL		X	
<b>Juncaceae</b>					
<i>Juncus bufonius</i> var. <i>occidentalis</i>	toad rush	NAGL		X	
<i>Juncus mexicanus</i>	Mexican rush	NPGL		X	
<b>Liliaceae</b>					
<i>Calochortus</i> cf. <i>leichtlinii</i>	mariposa lily	NPGL		X	
<i>Smilacina stellata</i>	false Solomon's seal	NPH		X	
<b>Poaceae</b>					
<i>Achnatherum hymenoides</i>	indian ricegrass	NPG	X	X	
<i>Achnatherum occidentale</i>	western needlegrass	NPG		X	
<i>Achnatherum thurberianum</i>	Thurber needlegrass	NPG		X	
<i>Agrostis pallens</i>	pale bentgrass	NPG			X
<i>Agrostis thurberiana</i>	Thurber bentgrass	NPG			X
<i>Bromus tectorum</i>	cheat grass	IAG		X	X
<i>Elymus elymoides</i>	squirreltail grass	NPG	X	X	X
<i>Hesperostipa comata</i> ssp. <i>comata</i>	needle and thread grass	NPG	X	X	
<i>Leymus cinereus</i>	ashy wildrye	NPG	X	X	X
<i>Leymus triticoides</i>	beardless wildrye	NPG		X	X
<i>Melica stricta</i>	rock melic	NPG	X	X	
<i>Muhlenbergia richardsonis</i>	mat muhly	NPG		X	X

Plant Families and Species	Habit	Occurrence In Study Area			
		Woodland	Scrub	Meadow	disturbed
Poaceae (cont.)					
<i>Poa fendleriana</i> ssp. <i>longiligula</i>	muttongrass	X			
<i>Poa pratensis</i> ssp. <i>pratensis</i>	Kentucky bluegrass			X	
<i>Poa palustris</i>	fowl bluegrass			X	

key to growth habit codes:

- A annual
- B biennial
- G grass
- H herb
- GL grass-like
- HS half-shrub
- I introduced
- N native
- P perennial
- S shrub
- T tree