Field Survey for *Astragalus sabulosus* var. *sabulosus* (Cisco milkvetch), var. *vehiculus* (stage milkvetch), and *Astragalus iselyi.* (Isely's milkvetch)

Grand County, Utah

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Methods

Beginning at known locations for *Astragalus sabulosus* vars. *sabulosus* and *vehiculus* reported by Franklin (1988, 1999), Atwood (1995) and *Astragalus iselyi* (Franklin 2004, Thompson 1987, 1991) along with herbarium collection data, we recorded GPS locations for both varieties of *A. sabulosus* and *A. isleyi* using Garmin Map 60 receivers. When one of the three kinds of *Astragalus* plants was located, we counted the others of the same species that could be seen from that point, recording the variety, number of plants that had flowered, along with juvenile, or plants not in flowering stage. Plants that seemed dead were also recorded. This was possible, as the stems and pods of *A. sabulosus* and *A. iselyi* are very stiff and fibrous, remaining upright for several years. Some plants appeared to be dead, but were green at the base, without leaves due to the dry weather in 2012. We also recorded common associated species and general notes about the habitat; soil and geology, disturbances, position on the slope, and surrounding habitat. Points where *A. sabulosus* and *A. iselyi* were not found were also of interest, and we recorded plant species and habitat notes at these points also. Previous locations of *A. sabulosus* var. *sabulosus* were associated with steep, semi barren slopes and Mancos Shale formation clay substrates in the Cisco Desert. We looked on these slopes, but also searched other habitats nearby. Known locations for *A. sabulosus* var. *vehiculus* were in the vicinity of Courthouse Rock, north of Moab. The habitat was reddish, sandy clay on gentle slopes, with scattered vegetation. We searched this habitat and also nearby washes and densely vegetated hills, recording locations for *A. sabulosus* var. *vehiculus,* and marking coordinates for other species as negative points. We used the GPS locations to create positive and negative dots on a map using ARCMAP software.

Astragalus iselyi was previously mapped on exposed Morrison Formation in the vicinity of Onion Creek, northeast of Moab, and southeast of Moab at Brumley Ridge, Pack Creek and Kane Springs Creek (Franklin, 2003, Thompson 1987, 1991).

Results and Discussion

The locations of the three *Astragalus* species found in the Utah Natural Heritage Program survey is shown in Figure 1, and plant counts summarized in Table 1.

Astragalus sabulosus var. *sabulosus* was fruiting when we began our survey on 8 May 2012. Due to drought conditions, there was very little flowering in 2012, and most plants were found by observing pods remaining from previous years. Locations of *A. sabulosus* var. *sabulosus* along with negative points are shown in Figure 2 and 3. We counted 4311 plants at 641 points, and recorded 357 negative points. The area is used for grazing, and there are natural gas lines and accompanying service roads in the area. *Astraglus sabulosus* var. *sabulosus* usually grows in small rivulets on steep barren slopes and we did not observe human disturbance in these areas. The colonies of *A. sabulosus* var. *sabulosus* are found near Thompsons Springs, White House and Cisco Mesa. These areas are separated by several kilometers, and more survey should be conducted in between these areas.

Astragalus sabulosus var. *vehiculus* was also fruiting when we surveyed 9 May and 7, 15 June 2012. We observed 1831 plants at 202 points, with 97 negative points. Figure 4 shows the locations the plants we encountered, along with negative points. The habitat is in a popular recreation area, but we observed little off-road vehicle use around the plants. There were cattle

on the site during our surveys. Power poles cross part of the habitat, and we saw *A. sabulosus* var. *vehiculus* plants growing underneath them in soil disturbed soil. We noted that there is more potential habitat to survey in the Courthouse Rock area.

We surveyed for *A. iselyi* 13, 14, 26-30 June and 1, 2 July 2012. We counted 3192 plants at 294 points. We obtained GPS points for the isolated colony at Onion Creek, the north most known location for *A. iselyi* (Figure 5). However, we did not find any new locations in the vicinity of Onion Creek. The *A. iselyi* colony west of Brumley Creek was mapped by Franklin (2003). We updated this map with GPS and found more colonies east of Brumley Creek. We also updated the *A. iselyi* locations in the Kane Springs Canyon drainage, to the south of Brumley Creek (Figure 6). The plants were found on purple, white or green eroding slopes of the Morrison Fomation. Collections at Stanley L. Welsh Herbarium (BRY) reported *A. iselyi* from the Mancos Shale Formation, but the locations on the label are on Morrison Formation when mapped on geologic maps.

Table 1. Counts of *Astragalus sabulosus* varieties *sabulosus* and *vehiculus*, and *Astragalus iselyi.* The numbers represent plants seen at survey points and do not represent the total population.

Species	Positive Points	Negative Points	Plant Count	Adult	Juvenile	Dead	Seedling
Astragalus sabulosus var. *sabulosus*	673	356	4649	2019	72	1969	379
Astragalus sabulosus var. *vehiculus*	202	97	1831	1763	20	47	1
Astragalus iselyi	294	187	3192	2902	16	174	0

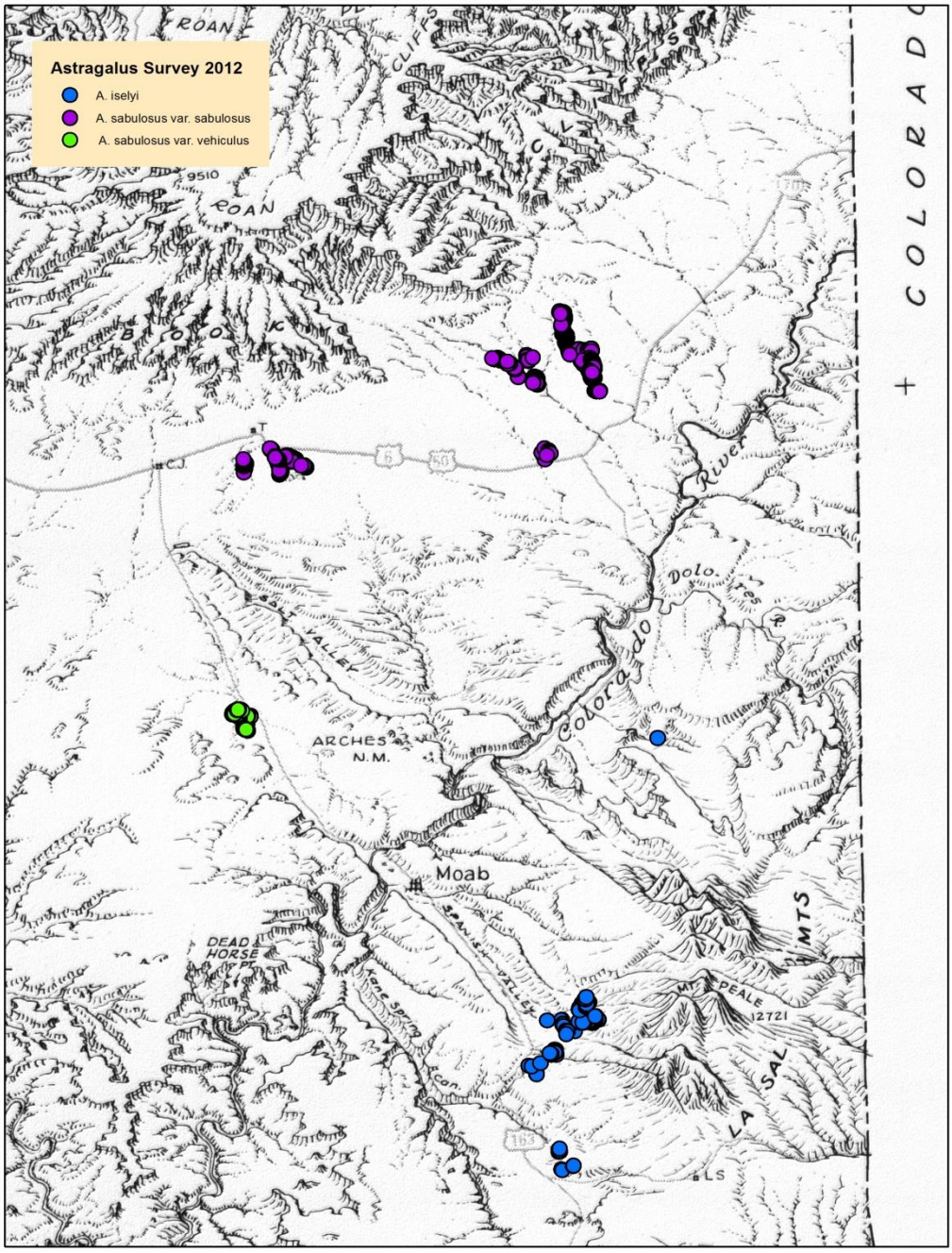

Figure 1. *Astragalus iselyi, A. sabulosus* var. *sabulosus* and *A. sabulosus* var. *vehiculus* locations found in Utah Natural Heritage Program survey 2012.

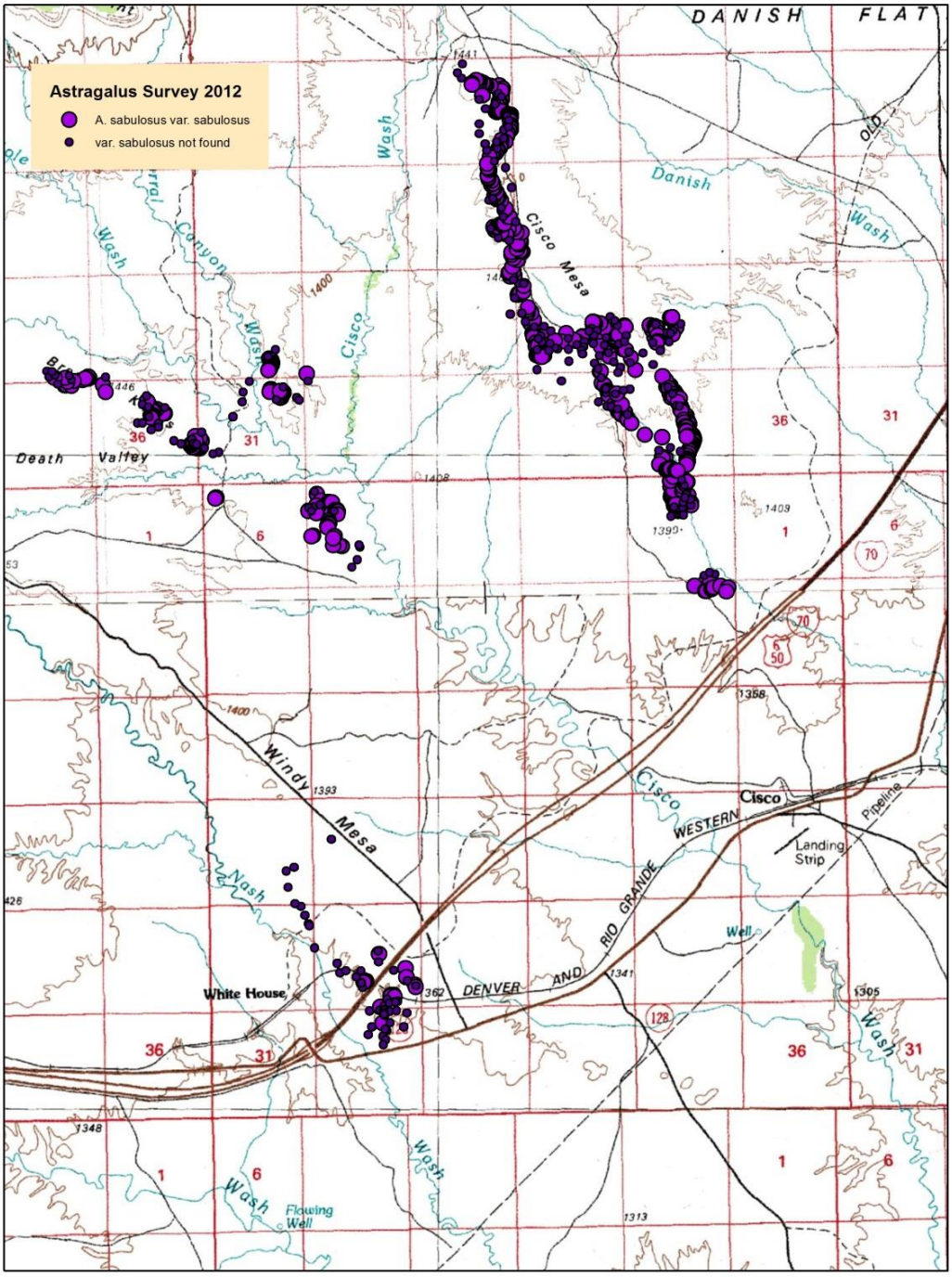

Figure 2. *Astragalus sabulosus* var. *sabulosus* locations in the vicinity of Cisco Mesa, White House and Bread Knolls, found by the Utah Natural Heritage Program 2012.

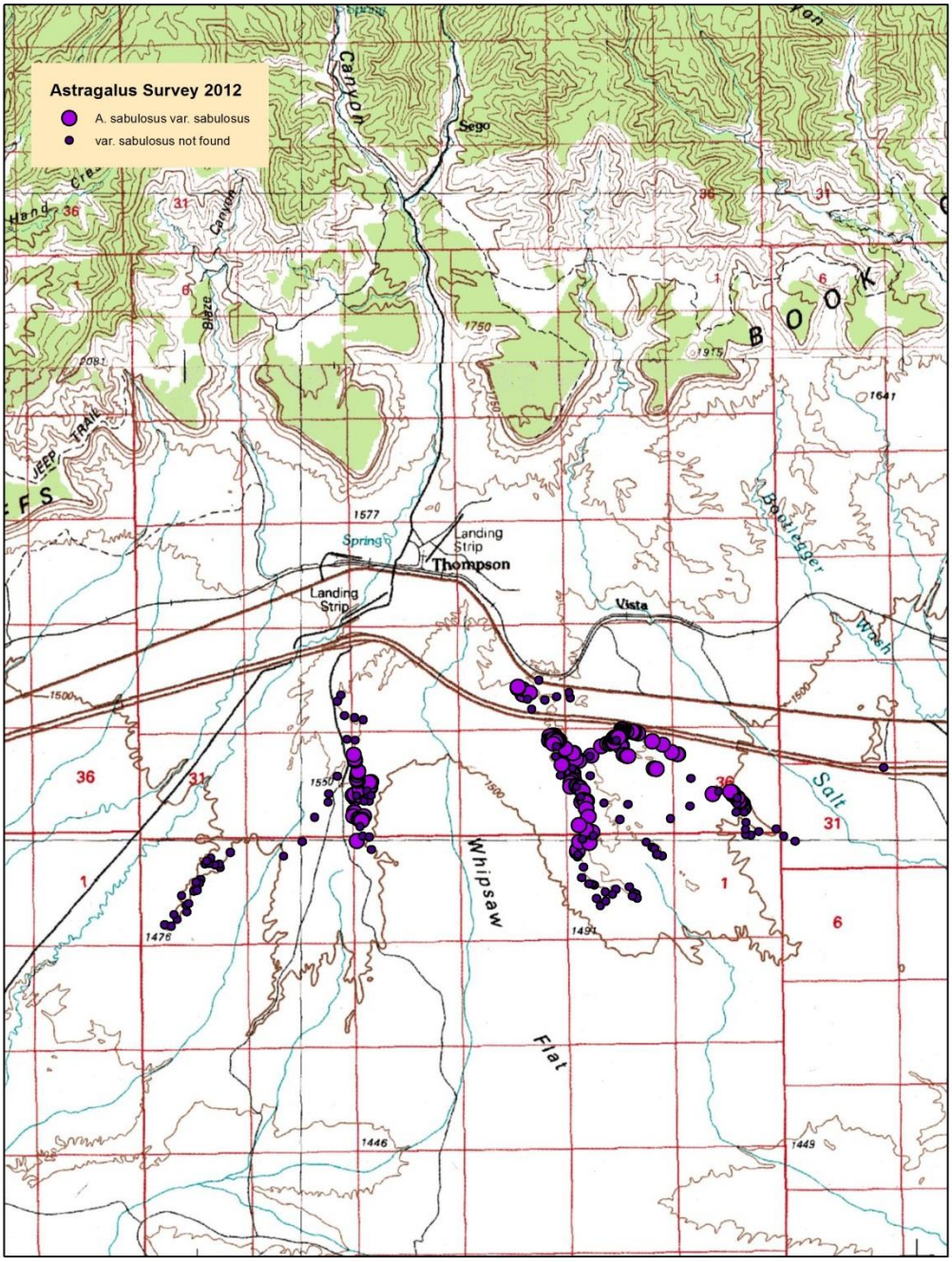

Figure 3. *Astragalus sabulosus* var. *sabulosus* locations in the vicinity of Thompson, Utah. 1:80,000 scale.

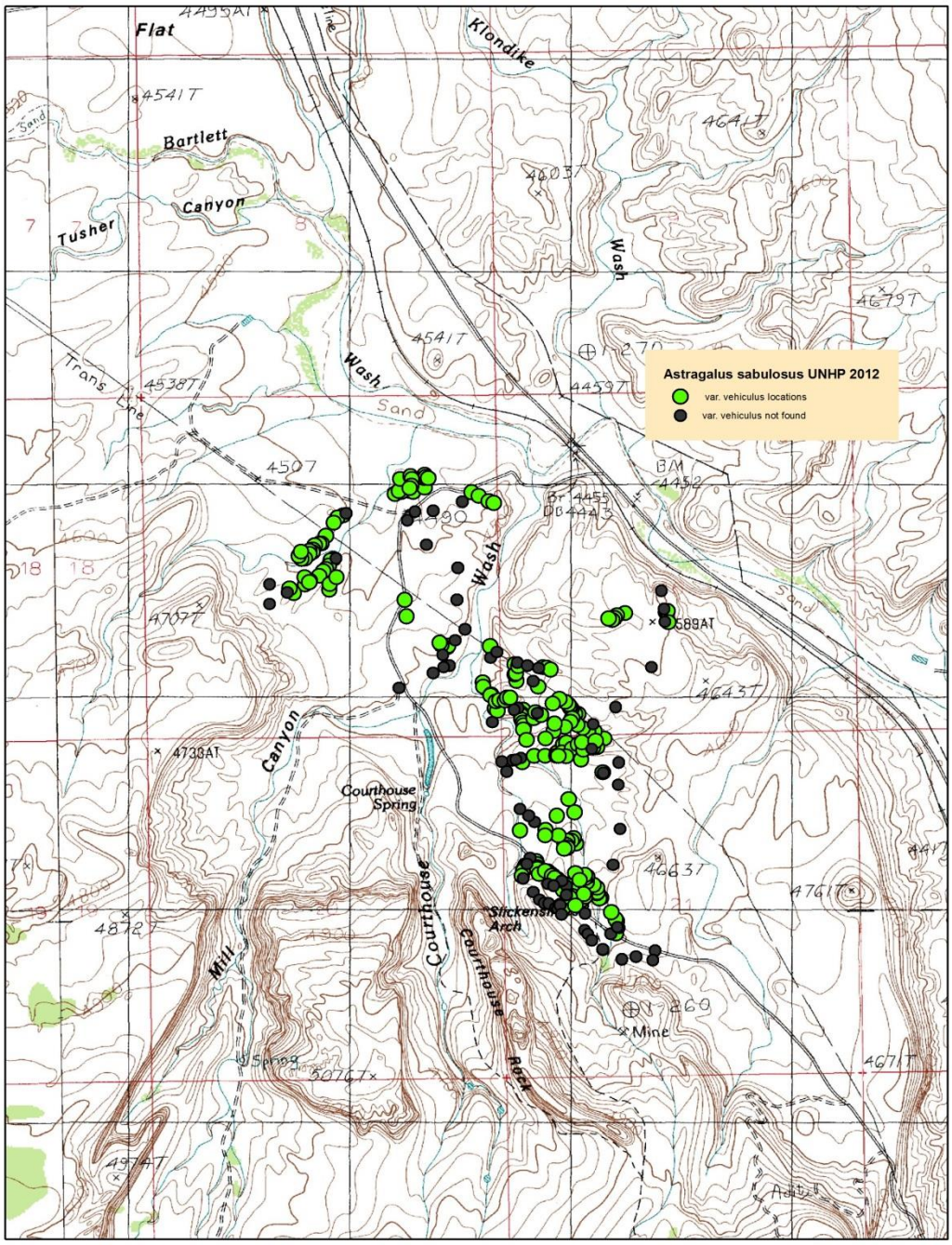

Figure 4. *Astragalus sabulosus* var. *vehiculus* locations and negative points, Utah Natural Heritage Program survey 2012. 1:24,000 map scale.

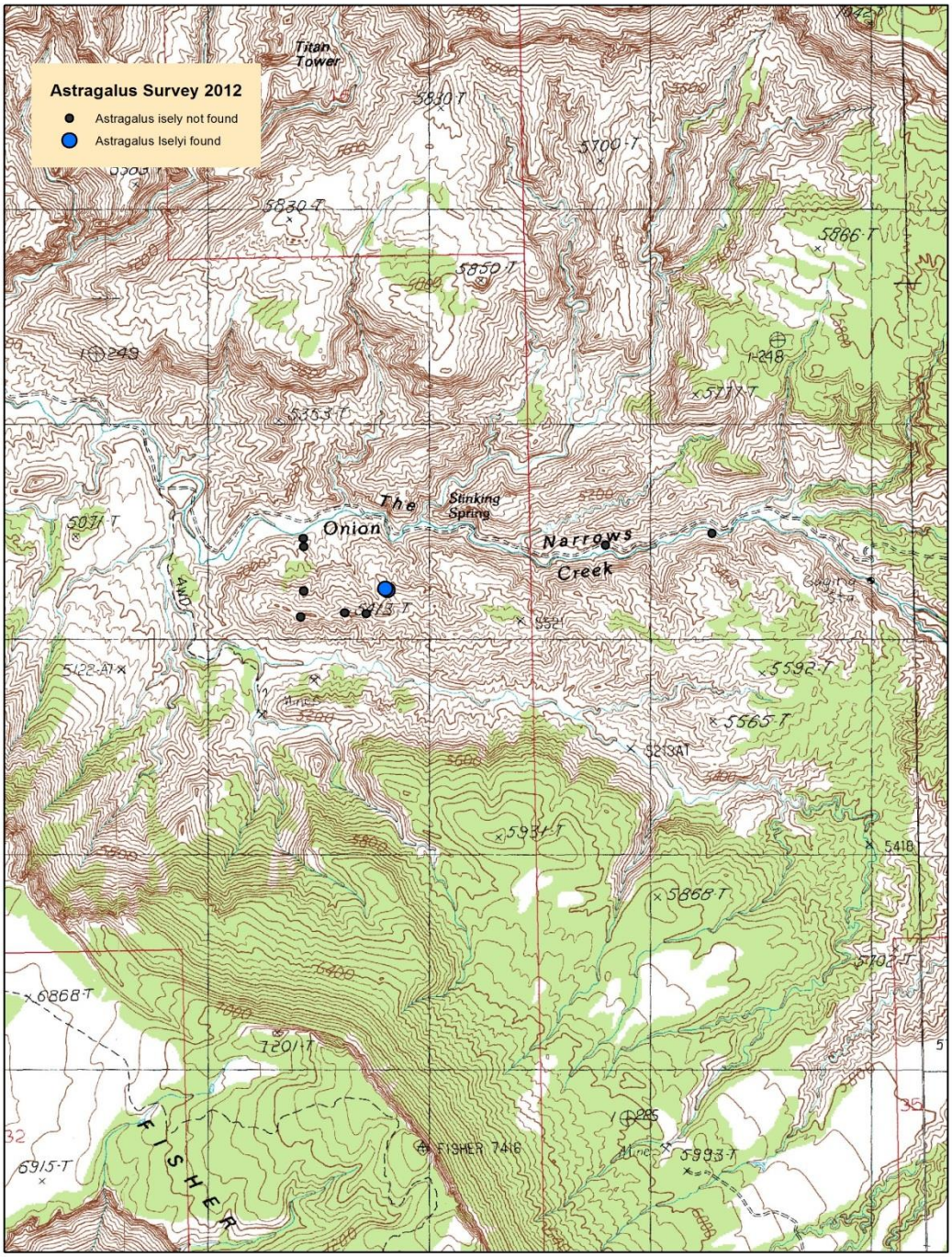

Figure 5. *Astragalus iselyi* in the vicinity of Onion Cr. found by the Utah Natural Heritage Program, spring 2012. 1:24,000 map scale.

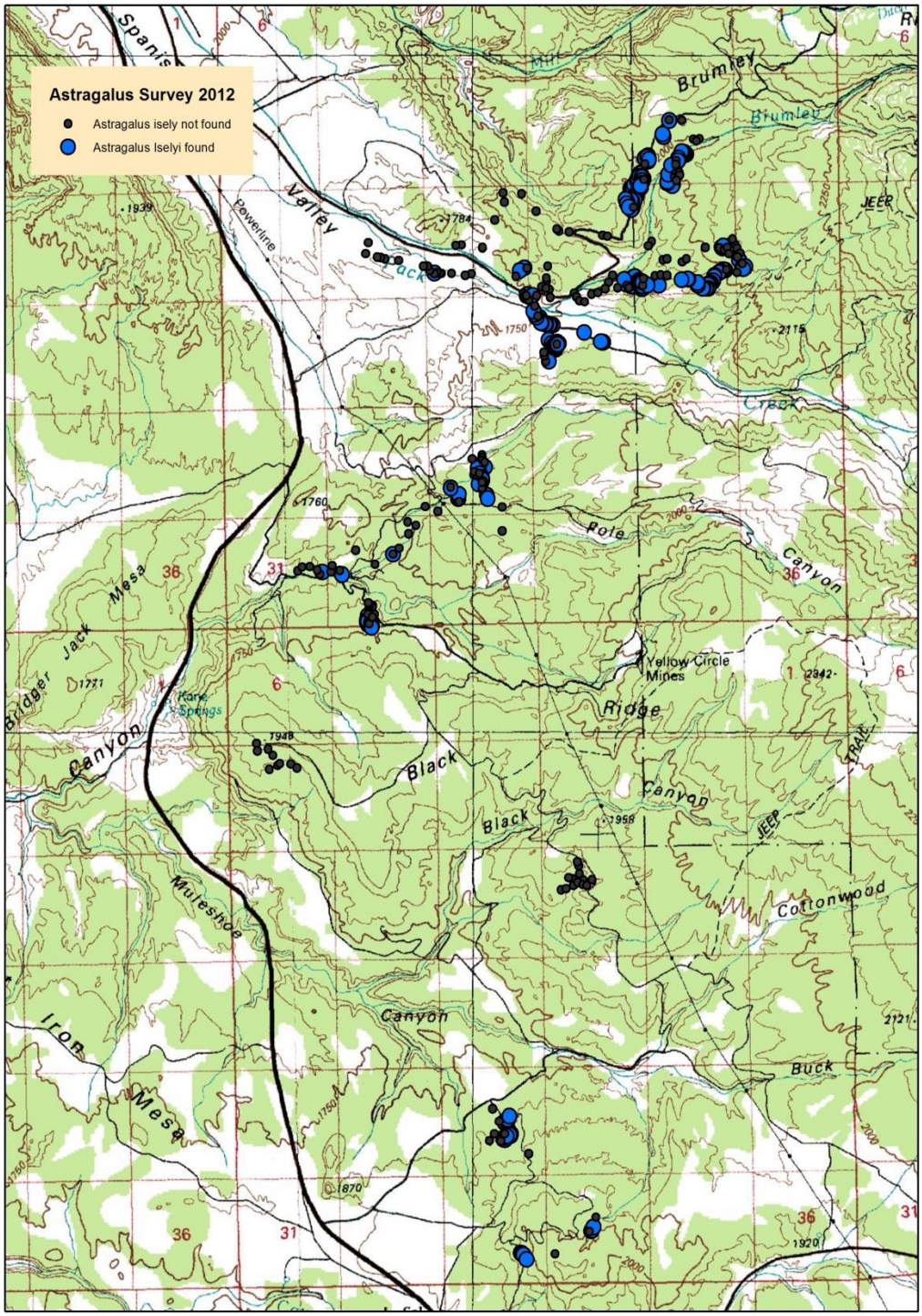

Figure 6. *Astragalus iselyi* locations from Brumley Creek South to La Sal found by the Utah Natural Heritage Program 2012. 1:80,000 scale.

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BRY. No Date. Brigham Young University, Stanley L. Welsh Herbarium, Monte L. Bean Life Science Museum, Provo, Utah.

Vouchers

Collections are housed at UVU herbarium.

Astragalus sabulosus var. *sabulosus:*

Benjamin J. Gibbons, #2

Robert D. Fitts, 2012-36, 39.

Astragalus sabulosus var. *vehiculus:*

Robert D. Fitts, 2012-45.

Astragalus iselyi:

Robert D. Fitts, 2012-52, 54, 54A.