



MEMORANDUM

TO: John Wondolleck (CDM Smith) and Stephe Jennings (DOE)
FROM: Tara Schoenwetter and Tom Mulroy Leidos
RE: Braunton's Milk-Vetch Plants at Santa Susana Field Laboratory Area IV
DATE: 4 March 2016

The purpose of this memorandum is to provide a preliminary draft version of the background and status of Braunton's milk-vetch (*Astragalus brauntonii*) to be included in the Biological Assessment. This memorandum was requested by Jenny Marek of the United States Fish and Wildlife Fish Service during a meeting on 9 December 2015.

Braunton's Milk-vetch (*Astragalus brauntonii*), FE, CRPR 1B.1

Description. Braunton's milk-vetch was listed as endangered on 29 January 1997; (62 FR 4172). This short-lived, robust perennial is in the pea family (Fabaceae) and is one of the tallest members of the *Astragalus* genus, reaching a height of 5 feet (1.5 meters). Braunton's milk-vetch has a thick taproot from which numerous woolly stems and leaves arise. Inflorescence is spike like with lilac flowers clustered in rows of 35 to 60 flowers.

Habitat. Braunton's milk-vetch is often found growing in disturbed areas associated with fire-dependent chaparral communities, but is also found in valley grassland, sage scrub, and closed-cone pine forest. Common associated chaparral species on SSFL Area IV include chamise (*Adenostoma fasciculatum*), sugar bush (*Rhus ovata*), manzanita (*Arctostaphylos* spp.), Malibu baccharis (*Baccharis malibuensis*), and chaparral yucca (*Hesperoyucca whipplei*). The species was once thought to be restricted to carbonate and calcareous soils though has also been found on gravelly clay soils overlaying granite sandstone (Landis 2007; EPA 2009a; USFWS 2010).

Critical Habitat. Critical habitat was designated on 14 November 2006 (71 FR 66374) and comprised 3,300 acres (ac) (1,337 hectares [ha]) in Ventura, Los Angeles, and Orange Counties (USFWS 2006). In designating Braunton's milk-vetch critical habitat, the following features were identified as being essential to the conservation of the species: (1) calcium carbonate soils derived from marine sediment; (2) a low proportion (less than 10 percent) of shrub cover directly around the plant; and (3) chaparral and coastal sage scrub communities characterized by periodic disturbances that stimulate seed germination (e.g., fire, flooding, erosion) and reduce vegetative cover (USFWS 2010). Critical habitat has been designated for Braunton's milk-vetch on portions of the SSFL (USFWS 2006; Figure 1). Unit 1d is situated primarily along the western side of SSFL Area IV along a ridge system located southwest of Burro Flats; Unit 2F is on a ridge system between Dayton and Bell Canyons, and includes the southeastern corner of the SSFL Southern Buffer Zone.

Distribution and range. Braunton's milk-vetch is known from 20 locations in five disjunct geographic areas in southern California (70 FR 68984). These locations include the Simi Hills in eastern Ventura and western Los Angeles counties; eastern Santa Monica Mountains near Pacific Palisades in Los Angeles County; San Gabriel Mountains in Monrovia, Los Angeles County; and Santa Ana Mountains in Orange County. Plants occur from 800 to 2,100 feet (244 to 640 meters) in elevation (Landis 2007; EPA 2009a; USFWS 2010).

Primary Constituent Elements. The PCEs are (1) carbonate limestone soils derived from marine sediment; (2) low proportion (<10%) of shrub cover directly around the plant; and (3) periodic disturbances that stimulate seed germination (e.g. fire, flooding) and reduced vegetation cover (USFWS 2009).

Life Cycle. Braunton's milk-vetch typically blooms from March to July, though it has been observed blooming in February on SSFL. It produces two-chambered seed pods. Seeds produced in the front chamber of the pod germinate readily. Seeds produced in the rear chamber of the pod are innately dormant with a thickened seed coat, typical of many chaparral plants; these dormant seeds can persist in the soil for many years until conditions are suitable for germination (e.g., after fire or other disturbance promoting the scarification of the seed coat) (Fotheringham and Keeley 1998). The seeds do not have an apparent dispersal agent and probably rely on water and gravity as primary methods of dispersal. Numbers of individuals in any given year vary depending on the stage of the fire cycle and site disturbance (Landis 2007; EPA 2009a). Pollinators are primarily native megachilid bees and a native bumble bee species (Fotheringham and Keeley 1998).

Threats. Threats to Braunton's milk-vetch include urban development, fragmentation of habitat, reduction of necessary pollinators, fire suppression activities, and random, naturally occurring extinction due to disturbances in small population sizes.

Recovery Plan. The existing recovery plan for Braunton's milk-vetch (USFWS 1999) does not include the population of the species at SSFL because it was not discovered on site until after the 2005 Topanga fire. In the recovery plan, 16 known extant occurrences of Braunton's milk-vetch were identified. Seed has been collected from 6 of the 20 known populations and stored at Rancho Santa Ana Botanic Garden, Claremont, California (USFWS 2009). Braunton's milk-vetch seeds have been collected from the wild and successfully propagated on several occasions.

Period of greatest sensitivity within the SSFL. The period of greatest sensitivity for this species is expected to be during growth, flowering, and seed production, estimated as March–August in the first year following a fall season fire or disturbance event, and continuing for 3 to 5 years, usually the number of individuals declining with each successive year. If another disturbance event occurs there is a chance that this period could be extended, and new individuals could come up after each event. During 2009 and subsequent surveys at SSFL, there was evidence that the plants had been browsed by mule deer, potentially reducing the amount of seed produced there (EPA 2009a, observations by the preparers).

Occurrence at SSFL. Braunton's milk-vetch was first documented on SSFL during surveys conducted in June and July 2006, which evaluated specific areas for the potential impacts of a critical habitat designation within SSFL Units 1d and 2f, see Figure 1 (MWH Global Inc. 2009). These two focus areas, located on the western and southeastern corner of SSFL, burned during the October 2005 Topanga Fire. Surveys documented Braunton's milk-vetch over an area of approximately 16.55 acres (6.7 hectares) within the SSFL property boundary and on adjacent private lands (Unit 1d). There were also two isolated occurrences including one individual in the southern portion of Unit 1d and another individual just west of Unit 2f (MWH Global Inc. 2009). In 2006, a total of 2,000 Braunton's milk-vetch plants were counted within Unit 1D somewhat restricted to stands of chamise-chaparral yucca (or chamise-hoaryleaf ceanothus). At this time the total population size within the SSFL boundary was estimated at 33,500 individuals.

Additional Braunton's milk-vetch surveys were conducted October – November 2009 in critical habitat Unit 1d within Area IV (SAIC 2009). The areas occupied by individual plants were similar to 2006 surveys, though the plants slightly expanded to the north in 2009. The extent of occupied Braunton's milk-vetch habitat was approximately 17.5 acres (7.1 hectares) and was roughly estimated to be about 18,500 individuals (SAIC 2009). Two isolated plants in formerly developed areas of Area IV were also documented during these surveys. These plants were likely transported when soil from an established borrow area within Braunton's milk-vetch critical habitat was borrowed to backfill remediated sites.

By 2009, Braunton's milk-vetch plants appeared to be nearing the end of their life span (SAIC 2009), based on the size and condition of plants. In 2006, most (49.4 percent) of the plants were small (<10 cm) and by 2009 the majority of the plants were large (>70cm) (MWH 2009) and thought to be fully mature (MWH 2009). During 2009, no seedling recruitment of the stand from the previous spring season was noted and a majority of the plants (> 50 percent) appeared to be dead based on their dried out brittle condition and lack of live tissue; especially those on south-facing slopes in the occupied area.

From 2010 to 2012, Environmental Protection Agency (EPA) conducted a radiological study (involving vegetation cutting, gamma scanning, geophysical survey, surface and subsurface soil sampling, groundwater monitoring well sampling, and surface water and sediment sampling), within the critical Habitat Unit 1d. The number of living Braunton's milk-vetch individuals potentially adversely affected by the radiological study was estimated at 5 percent of the estimated 2009 standing live individuals, or approximately 462 individuals (HydroGeologic, Inc. and Envicom 2012). The USFWS issued a Biological Opinion (BO) for the radiological study on 25 May 2010 (USFWS 2010). The BO specified that it was likely that a maximum of up to two-thirds of the Braunton's milk-vetch plants on the SSFL project site could be directly adversely affected by the proposed project. This would equate to up to approximately 12,000 to 22,000 Braunton's milk-vetch plants. Furthermore, if one-third or more of the Braunton's milk-vetch plants within the action area needed to be cut to implement the proposed activities; USFWS directed the EPA to collect, store, and preserve the seed from all of the plants targeted to be cut prior to their removal or trimming. The EPA would store the seeds until the radiological study project and all additional ground disturbing activities were completed. The collected seeds were to be sown back to the areas from which they were collected.

During the two years of the radiological project activities, 129 live Braunton's milk-vetch were directly impacted (HydroGeologic, Inc and Envicom 2012). Of these impacts, four plants were destroyed by vegetation clearance activities or by mule-mounted gamma scanning. Damage was described as uprooted plants, trimmed, destroyed, stem cuts, damaged root base or soil disturbed by mule hoof prints. There was no record of any impacts made to plants that were senescent to dead. Evaluating the impacts of project activities on the Braunton's milk-vetch population based on the conclusions of the BO, project activities impacted 0.4 to 0.7 percent of the estimated 18,500 to 33,500 Braunton's milk-vetch individuals on the project site in 2009 and 2006 respectively. Therefore, project impacts to this species were below the amount expected to be affected as reported in the BO and there was no record of any seed collection.

During spring 2011, and subsequently in 2012 and 2013, a previously undocumented seed bank of Braunton's milk-vetch germinated, resulting in hundreds of new emergent plants on a hill along the property boundary north of critical habitat Unit Id (Figure 1). The emergence of plants was noticed after the chaparral vegetation had been cleared in late 2010 to facilitate radiological surveys. The hill, unburned by the 2005 Topanga fire, had been covered with dense chaparral, scrub, and woodland vegetation prior to its clearing. The Braunton's milk-vetch plants that emerged presumably had been in the seedbank and were stimulated to germinate by removal of the thick vegetation and ground disturbance associated with the vegetation clearing and subsequent radiological survey. The number of plants that established on the hill subsequent to clearing in 2011 was estimated to be a few hundred individuals (HydroGeologic, Inc. and Envicom 2012). The remaining Braunton's milk-vetch individuals were visited by Leidos biologists during SSFL biological surveys conducted for soil characterization studies as well as during a site visit with USFWS on 18 June 2013.

In March 2014, about 100 plants were observed by Leidos biologists, and approximately 10 percent were still alive. At least 40 plants (of the 100 observed) had multiple flowering stalks that had not been browsed and appeared to have set seed due to the presence of open bracts (where seed pods were no longer present). Some plants appeared to have been browsed by mule deer (EPA 2009a, observations by the preparers). To minimize further damage to the plants, DOE and Leidos biologists put protective fencing around a total of 13 surviving individuals in 2014 and 2015 (Leidos 2016). An additional two individuals were recorded but not fenced due to the difficulty of isolating the plant without destroying

native vegetation. As of November 2015, results suggest the protective fencing has been effective in minimizing browsing damage to Braunton's milk-vetch plants. All plants protected did not show any new evidence of browsing, appeared healthy (determined by evidence of new growth) and many showed signs of flowering, suggesting that they set seed; though this was only a visual observation and cannot be confirmed (no collections of seed or soil were made). To date, a total of 9 plants remain fenced within Area IV on SSFL, three which are located within critical habitat Unit 1d and the remaining 6 are on the adjacent hill to the north, outside of critical habitat.

Over the years, Braunton's milk-vetch on SSFL has been noted amongst several vegetation communities, including: chamise-chaparral yucca series, coast live oak woodland, non-native grassland, Mexican elderberry series, and purple needlegrass grassland. Plants within Area IV are associated with alkaline soils that range in pH from 7.39 -9.2 and occur on four different soil types: Gaviota rocky sandy loam, Calleguas-Arnold Complex, Zamora loam, and Los Osos clay loam, though most plants occur on Gaviota rocky sandy loam. These areas are mainly associated with the Santa Susana Formation, which is divided into several different geologic units that consist of gray, micaceous claystone and siltstone, with a few minor thin sandstone beds (Dibblee 1992). Variations in soil types across the Santa Susana Formation are partly reflective of variation in slope gradients. In Area IV, Braunton's milk vetch primarily occurs on relatively steep (15 to 50 percent slopes) north-facing slopes, with lesser amounts present on southeast-facing slopes. The distribution of plants on SSFL agree with historical observations of Braunton's milk-vetch, which indicate that plants can occur on gravelly clay soils overlaying granite and sandstone and they are not restricted to soils derived from limestone (Skinner 1991).

Observations suggest that the cycle of growth, flowering and production of seed to replenish the seed bank at SSFL is approximately four to five years. Plants have been noted on site in all stages of growth. Nine plants in Area IV remain in protective fencing and it is estimated that a handful of additional individuals are still alive on the site, though new individuals could emerge after disturbance. There have been no site wide surveys to determine if Braunton's milk-vetch occurs outside the two known areas. Select areas of SSFL have been the subject of focused Braunton's milk-vetch surveys but no new locations have been found (Padre 2014; NASA 2014). If soil and underlining bedrock conditions are suitable, it is possible that Braunton's milk-vetch could occur elsewhere on SSFL, particularly within the Southern buffer zone, the northeastern portion of Area II and the southern portion of Area I (NASA 2014). However, given that more than 10 years have elapsed since the Topanga fire it is likely that these exist only as buried seed.

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