

***DESCURAINIA BROWNIAE* (CRUCIFERAE),
A NEW SPECIES FROM BRIAN HEAD PEAK, IRON COUNTY, UTAH**

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ABSTRACT

Descurainia browniae R.P. McNeill, a new species described from Brian Head Peak, Iron County, Utah. It is most similar to *D. incana* (Bernh. ex. Fisch. & C.A. Mey.) Dorn, *D. torulosa* Rollins, and *D. kenheilii* Al-Shehbaz but can be distinguished from these species based on fruit and flower morphology and geography. Due to the known patterns and processes of island biogeography, it is likely a neoendemic to Brian Head Peak, Utah.

Descurainia Webb & Berthelot, although not one of the larger North American genera in Cruciferae/Brassicaceae, is still complex due to extensive interspecific hybridization and ruderal habit (Detling 1939; Goodson 2007; Goodson & Al-Shehbaz 2010). On 1 July 2014, I found two individuals of an unfamiliar member of the Cruciferae on a volcanic substrate on Brian Head Peak in southern Utah. I attempted to identify the taxon with the available floras, including the Flora of North America, the Intermountain Flora, and A Utah Flora (Cronquist et al. 1994; Goodson & Al-Shehbaz 2010; Welsh et al 1993). I identified it as the genus *Descurainia*, but species level identification was not satisfactory. I contacted Dr. Ihsan Al-Shehbaz at the Missouri Botanical Garden and he stated that it was possibly an undescribed taxon. I returned to the site on 2 August 2014 and made a more thorough survey of the peak. I found 46 plants and made a collection of three mature specimens. On 6 September 2014, I returned for a third visit, which resulted in finding a total of 42 plants. I collected a further seven individuals at that time. On 12 September 2015, I returned and collected a further 10 plants. None of the plants from 2014 appeared to be in existence in 2015, indicating an annual life cycle.

DESCURAINIA BROWNIAE R.P. McNeill, **sp. nov.** **TYPE:** Utah. Iron Co.: Brian Head Peak, Dixie National Forest, ca. 100 m S of the parking area at the end of FR 047/Brian Head Peak Rd, on S ridge below peak, on outcrop of the distinct reddish scoria band below rock band that forms the peak, rock heavily covered with yellow and orange lichens, growing in the cracks where mineral soil has accumulated, extensive signs of rodent activity (poop), 37.67965, -112.83089, main slope: 65%, (rocky outcrop where soil collects: 100%), W aspect on a south ridge, 3391 m, 12 Sept 2015, *Rick McNeill s.n.* (holotype: UTC). Figures 1–4.

Descurainia browniae superficially is most similar to *D. incana* (Bernh. ex. Fisch. & C.A. Mey.) Dorn, *D. torulosa* Rollins and *D. kenheilii* Al-Shehbaz. It can easily be differentiated from these species based on flower/fruit morphology, and disjunct geographic range.

Descurainia browniae has glabrous fruits, median filaments 0.56–0.87 mm long and is an annual, while *D. torulosa* has pubescent fruits, median filaments 1.6–2 mm long and is perennial. *Descurainia browniae* is found in southwestern Utah while *D. torulosa* is endemic to Wyoming.

Descurainia incana has 14–22 ovules per fruit, median filaments 1.4–2 mm long, distal leaf segments that are acute, and is biennial; *D. browniae* has 1–11 ovules per fruit, median filaments 0.56–0.87 mm long, distal leaf segments that are obtuse or rotund, and is an annual.

Descurainia kenheilii looks most similar to smaller specimen of *D. browniae*. Both are small *Descurainia* that occur in high elevation habitats, but these two species can easily be separated based on numerous characteristics. *Descurainia kenheilii* has fruits 1–1.3 mm wide, is not canescent, has styles 0.1–0.2 mm long, has a prominent vein on the septum of the fruit, is a perennial and only occurs in southwestern Colorado; *D. browniae* has fruit 0.53–1.00(–1.06) mm wide, is canescent, styles 0.24–0.40 mm long, no vein on the septum, is an annual and has only been found in southwestern Utah. The known range of *Descurainia browniae* is approximately 480 km from the range of *D. kenheilii* and 560 km from the range of *D. torulosa*.

Herbs, annual, eglandular, canescent, with dendritic trichomes. **Stems** 2.0–11.5 cm tall, erect, single from base, simple or multiple branched above, highly branched individuals are apparently a response to herbivory. **Leaves** basal and cauline, pinnate, obovate to ovate; basal petioles 3.5–19.3 mm long, cauline petioles 0.4–9.2 mm, blade 1.2–18.7 x 0.4–13.5 mm, lateral segments 1–4 pairs, obtuse to rounded, occasionally mucronulate, distal segments obtuse to rounded, rarely acute on smaller segments, entire; reduced upwards. **Racemes** not elongated in fruit, 11.0–81.9 mm; **fruiting pedicels** appressed may become erect or ascending at maturity, 1.07–4.46 mm, slender, straight to curved. **Flowers: sepals** obovate, ascending; at anthesis, adaxially yellow; abaxially green, dendritic trichomes 0.42–1.16 x 0.42–0.66 mm; **petals** yellow, clawed, obovate, 0.50–0.99 (1.14) x 0.30–0.67 mm; median filaments 0.56–0.87 mm long; anthers rotund, 0.18–0.32 mm long. **Fruit** linear, appressed to ascending, glabrous, 1.40–9.99 x 0.53–1.00(–1.06) mm wide, straight to slightly curved, terete; valves glabrous, torulose, with a distinct mid-vein; septum without a prominent mid-vein; style nearly obsolete 0.24–0.40 mm long; ovules and seeds 1–11 per fruit. **Seeds** reddish brown, uniseriate, asymmetrically oval or ovate, 0.90–1.34 x 0.42–0.62 mm.

Descurainia browniae flowers and fruits June–September and will fruit while only 21 mm tall. Associated species at the type locality are *Erigeron compositus* var. *glabratus*, *Poa glauca* subsp. *rupicola*, *Potentilla pensylvanica* var. *pensylvanica*, and *Ribes velutinum* var. *velutinum*. The new species is named in honor of Dr. Sara H. Brown ecologist, educator, and friend. High resolution images of the new species are available at McNeill (2017).

Descurainia browniae occurs on Brian Head Peak in southwestern Utah (Fig. 1). It is found at approximately 3391 meters elevation, 36 meters below the top of the peak in the alpine zone. It occurs on the Isom formation (26–27 mya), which is a densely welded, trachydacitic, ash-flow tuff that has been exposed by weathering of the overlying Leach Canyon formation (23.8 mya), a poorly welded, rhyolite tuff that forms the top of Brian Head Peak (Rowey et al. 2013). At present the plants are known to occur in a single location on the west side of the south ridge. The area where this population is found is a high use location for small mammals. The site has a large amount of mammal scat and many individuals show signs of herbivory. The plants apparently respond to herbivory by transferring apical dominance and producing multiple stems. In the absence of herbivory plants appear to be single-stemmed. *Descurainia browniae* grows in microsites where mineral soil and mammal scat has accumulated in rock cracks and on flat spots on the rocky outcrop. The site is largely inaccessible except to climbing or flying animals.

Descurainia browniae is likely a neoendemic to Brian Head Peak. The small size and short growing season of *D. browniae* suggest both an annual life cycle and self-fertilizing reproduction (Snell & Aarssen 2005), but the plants also appear to reproduce continually throughout the growing season, as old fruit and new flower buds were present on the same small plants and seedlings were present when plants had mature fruit in early fall.

High elevation peaks in the desert form what are essentially island biogeographical patterns for those species restricted to the alpine environments. These patterns can easily result in the reproductive isolation of a population (Billings 1974; Kruckeberg 2002; Warshall 1995), and exert

strong selection pressures, especially for selfing (Billings 1974; Snell & Aarssen 2005). These pressures can produce marked changes, especially on short-lived, annual species that may produce multiple generations in one season and thereby accumulate changes very rapidly. When these processes of island biogeography occur in conjunction with the selection pressures of the alpine environment, endemic species, while not common, are not unexpected (Schoville et al. 2011).

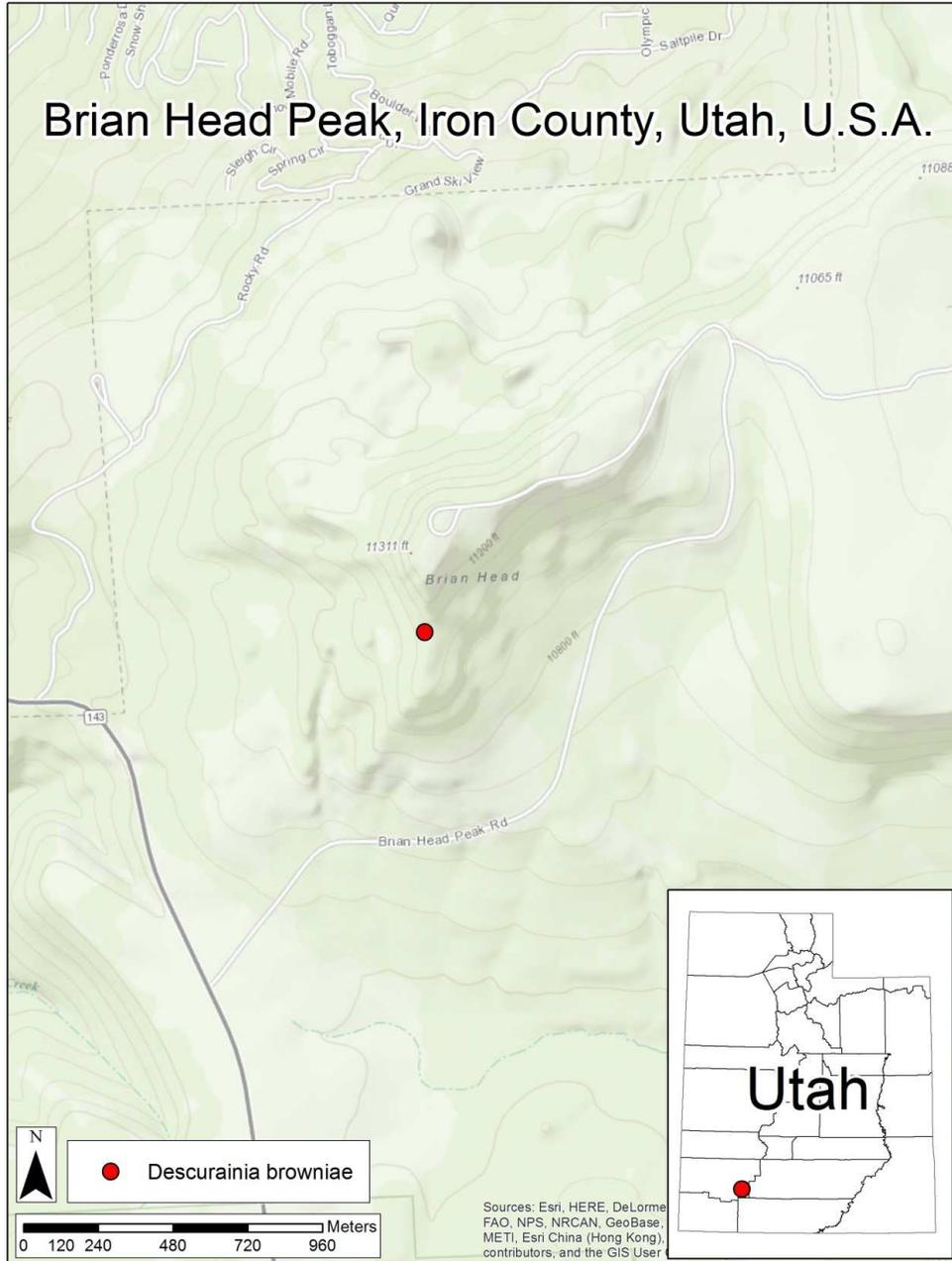


Figure 1. Location of *Descurainia browniae* in Iron Co., Utah.

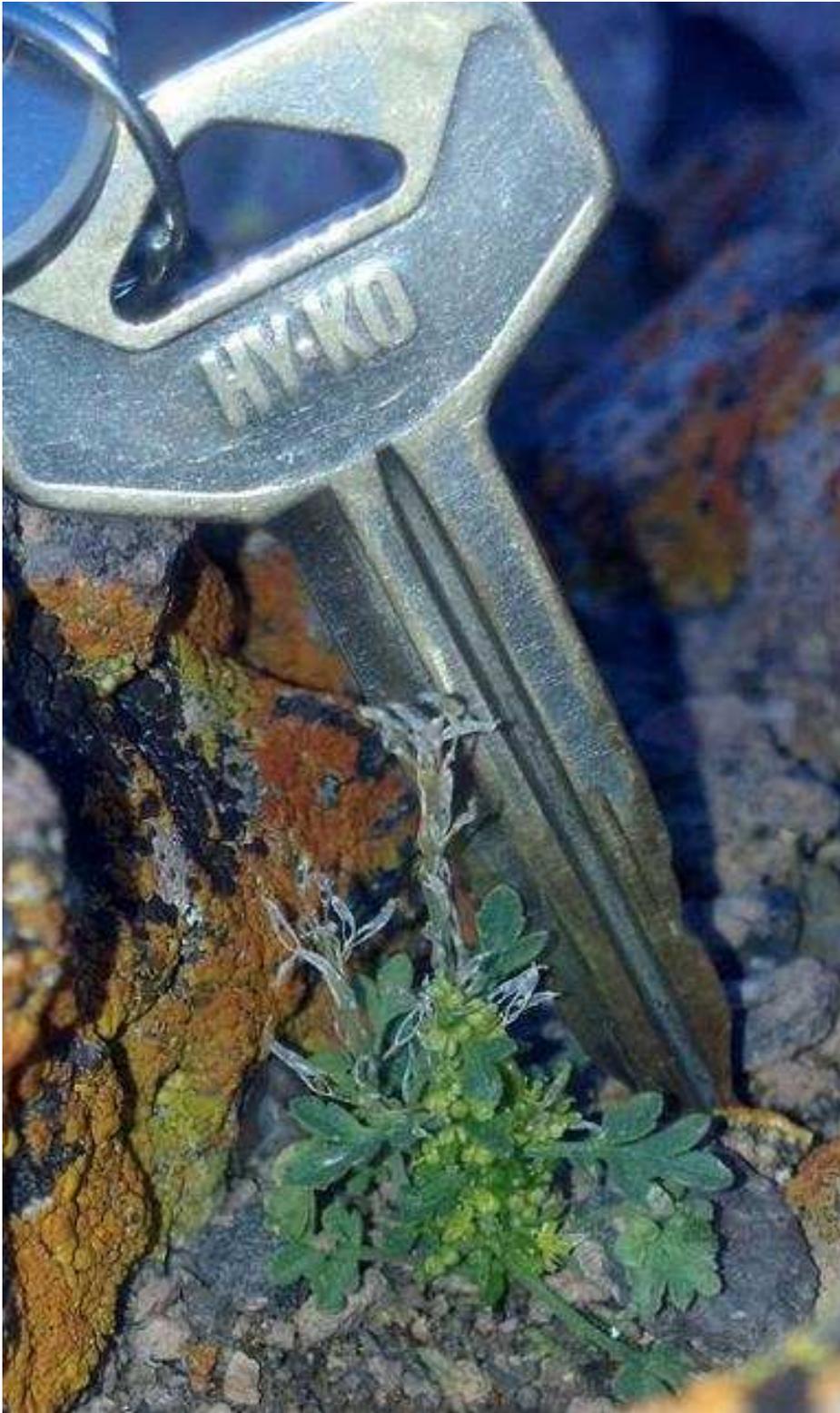


Figure 2. Mature plant of *Descurainia browniae* next to a automobile key. This plant has new flowers and buds lower on the stem and older septae of fruits on the upper stem.

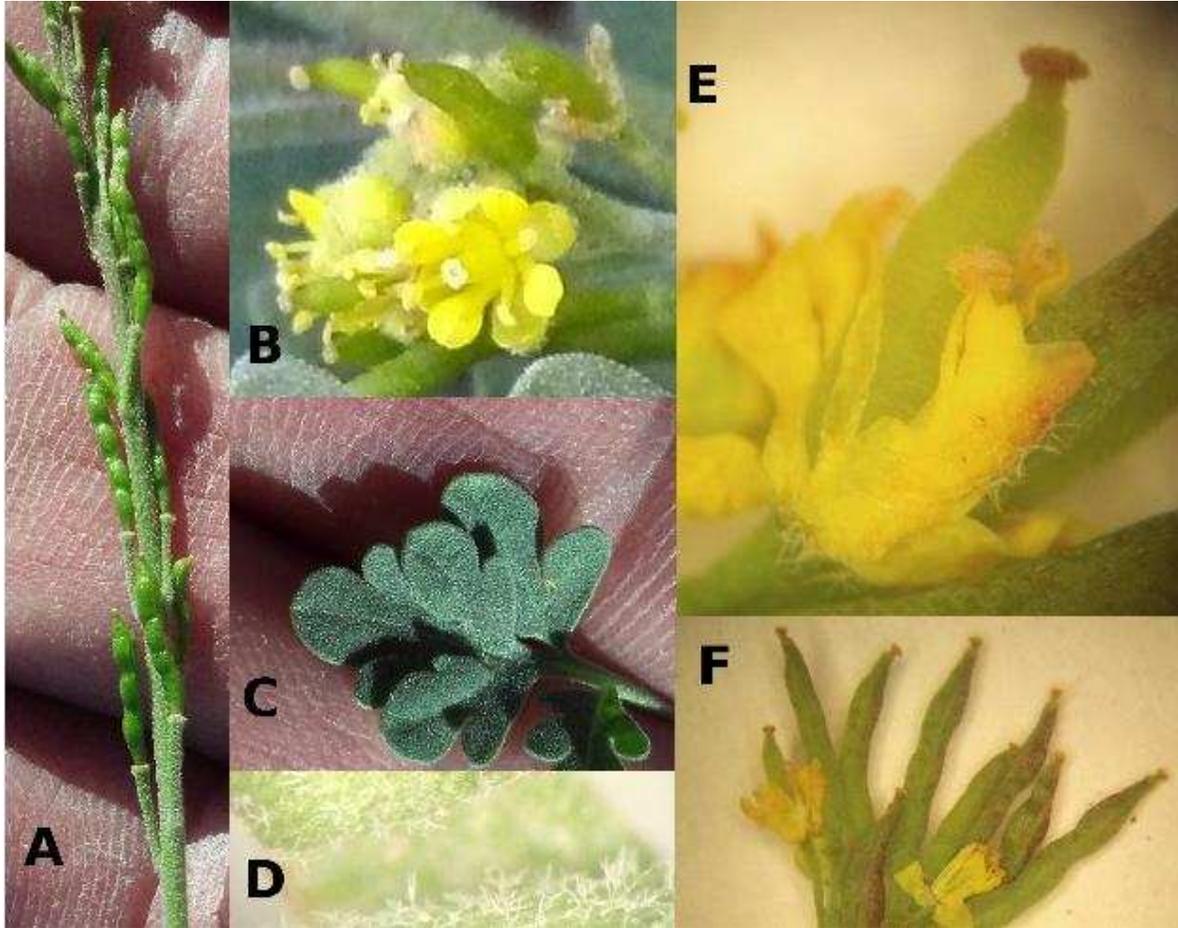


Figure 3. *Descurainia browniae*. (A) stem and fruits, (B) flowers and immature fruits, (C) canescent leaf, (D) trichomes, (E) flower and immature fruit, and (F) immature fruits

Key to selected species in *Descurainia* (mature fruit required)

1. Fruit pubescent, Wyoming endemic ***Descurainia torulosa***
1. Fruit glabrous, not restricted to Wyoming.
 2. Fruit fusiform, not torulose ***Descurainia californica***
 2. Fruit linear and torulose, at least slightly.
 3. Ovules ≥ 14 per fruit, \pm slightly torulose, median filaments ≥ 1.4 mm long.
 4. Fruit width 0.3–0.6 mm, biennial, septum often veined ***Descurainia incana***
 4. Fruit width 0.9–1.3 mm, annual, septum not veined ***Descurainia incisa***
 3. Ovules ≤ 11 per fruit, torulose, median filaments ≤ 1 mm long.
 5. Torulose indentations $< \frac{1}{4}$ width of fruit when mature, fruit 1–1.3 mm wide, perennial, septum veined, plant not canescent, style 0.1–0.2 mm long, Colorado endemic ***Descurainia kenheillii***
 5. Torulose indentations $> \frac{1}{4}$ width of fruit when mature, fruit 0.53–1.00(–1.06) mm wide, annual, septum not veined, plant canescent, style 0.24–0.40 mm long, Utah endemic ***Descurainia browniae***



Figure 4. *Descurainia browniae* size, habit, and habitat. (A) large plant, (B) small plant, (C) large plant, (D) small plant and mammal feces, (E) habitat, and (F) small plant.

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