

TOWNSENDIA RAPTORA (ASTERACEAE: ASTEREAE):
A NEW NARROW ENDEMIC SPECIES FROM UTAH AND COLORADO (U.S.A.)

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ABSTRACT

A new species of *Townsendia* (Asteraceae: Astereae) is described from Grand County, Utah. ***Townsendia raptora*** L.M. Shultz, T.K. Lowrey, & Z.R. Coury, sp. nov. was first found in the vicinity of the Mill Canyon dinosaur tracksite and is named in honor of fossil tracks made by raptor-like dinosaurs at this location. *Townsendia raptora* was previously recognized as the variety *T. strigosa* var. *prolixa*. *Townsendia raptora* is distinct from *T. strigosa* Nutt. based on its long-lived perennial (not biennial) habit and differs from the co-occurring *T. incana* Nutt. in its larger heads, cuspidate leaf tips, and acaulescent habit. The species also occurs in adjacent Montrose County, Colorado.

RESUMEN

Se describe una nueva especie de *Townsendia* (Asteraceae: Astereae) del condado de Grand, Utah. ***Townsendia raptora*** L.M. Shultz, T.K. Lowrey, & Z.R. Coury, sp. nov. se encuentra en las proximidades del yacimiento de huellas de dinosaurios de Mill Canyon y recibe su nombre en honor de las huellas de dinosaurios similares a rapaces encontradas cerca de las poblaciones. *Townsendia raptora* se ha confundido anteriormente como una variedad de *T. strigosa* var. *prolixa*. *Townsendia raptora* se distingue de *T. strigosa* por su hábito perenne de larga vida, no bienal, y se diferencia de la *T. incana* por el tamaño de su cabeza y la forma de sus hojas. La especie también se conoce en los condados adyacentes de Colorado.

KEY WORDS: *Townsendia*, Courthouse Rock, Sinbad Valley, edaphic endemic, Cedar Mountain Formation

INTRODUCTION

First described by Hooker in 1834, *Townsendia* is a western North American genus with approximately twenty-eight species (Beaman 1957; Reveal 1970; Shultz & Holmgren 1980; Lowrey & Knight 1994; Strother 2007; Lee et al. 2022). Seventeen of these occur in Utah, with four extremely rare narrow endemics that are on Utah's rare plant watch list (UNPS 2024). The species we describe has been found in the Courthouse Rock area northwest of Arches National Park in Utah, a well-studied area already known to harbor unusual and narrowly endemic species of vascular plants, such as *Astragalus vehiculus* (S.L. Welsh) S.L. Welsh (Welsh 2015). The few prior collections of this plant have been treated in herbaria as *T. strigosa* var. *prolixa* (M.E. Jones) S.L. Welsh (S.L. Welsh 2003), a biennial with elongated internodes that was first described as *T. incana* var. *prolixa* from the Uinta Basin of Utah by Marcus E. Jones (1910). *Townsendia raptora* differs from both species in ways described below.

Specimens of this *Townsendia* were brought to the Intermountain Herbarium by Meghan McCormick then Zach Coury, botanists working for the Utah Rare Plant Program with Utah State University, both of whom thought the plants were distinct from *T. incana* and *T. strigosa*. Joel Tuhy, a botanist retired from The Nature Conservancy in Utah, had also noted unusual aspects of these collections. Edaphic endemism and apomixis have been recognized as drivers of speciation in *Townsendia*, and many of the rare plants with restricted ranges in the genus have strong substrate associations (Lowrey & Knight 1994). *Townsendia raptora* follows this trend and is apparently a narrow edaphic endemic of calcareous substrates, primarily of the Cedar Mountain Formation. It also seems to be restricted to similar substrates of the Hermosa Formation at the single Colorado population.

Townsendia raptora L.M. Shultz, T.K. Lowrey, & Z.R. Coury, **sp. nov.** (Figs. 1–3). TYPE: U.S.A. UTAH. Grand Co.: E flank of Courthouse Rock, Colorado Plateau desert blackbrush community, powdery soils of the Cedar Mountain Formation, with *Coleogyne ramosissima*, *Artemisia bigelovii*, *Xylorhiza venusta*, *Astragalus vehiculus*, *Androstephium breviflorum*, 38.711°N, 109.725°W, 5 May 2023, Zach Coury 133 & Joel Tuhy (HOLOTYPE: UTC!, ISOTYPE: BRY!).

Description.—Pulvinate, taprooted, acaulescent perennial herb from a woody caudex that branches at maturity, arising 2–3 (5) cm above ground level, plants 5–12 cm broad, mostly with (1) 2–5 (12) broadly campanulate heads, 10–35 mm broad, sessile or on short (1–2 cm) peduncles that are short-strigose and leafless or with a single leaf, emerging from clusters of leaves on branches of the caudex; phyllaries herbaceous, in (1)2–3 series, narrowly lanceolate, (4)8–11 × 1–2 mm, abaxially strigose, margins membranous and ciliate, midrib green, slightly enlarged at the base; leaves mostly basal, (20)24–40 × 3–6 mm, narrowly spatulate-lanceolate, well developed leaves cuspidate, both surfaces densely strigose with appressed hairs and scattered glands, more densely pubescent at narrowed petiolate base, margins slightly revolute when dry; disc flowers bisexual and fertile, (20)30–50(100+), pale yellow with red-tipped lobes, 5–6 mm, shorter than or just surpassing the pappus; ray flowers pistillate and fertile, 10–15, the laminae adaxially white or occasionally pink, abaxially pale pink with reddish striations, glabrous, 10–15 × 2–3 mm, tips somewhat blunt and lacerate; pappi of flattened capillary bristles (setae) that are minutely barbellate, persistent, and of two lengths: disc pappi 5–6 mm; ray pappi 2–4 mm; anthers producing prolific amounts of white and yellow pollen; style with stigmatic branches 2.5–3 mm; cypselae flattened, stramineous to bright orange at maturity, obovate, 3.5–4.0 × 1–1.5 mm, sparsely glochidiform. Pollen viable.

PARATYPES: **U.S.A. UTAH. Grand Co.:** ca. 1 km SSE of historic stage station and 20 km NW of Moab, 40.15231°N, 109.57922°W, elev. 1469 m, 30 Apr 1984, S.L. Welsh 22722 (BRY!) [T24S, not T21S as shown on specimen label]; NE of Courthouse Rock, ca. 13 mi NW of Moab, 19 Apr 1994 [not Sep 1993 as shown on specimen label], J.S. Tuhy 3741 (BRY!).

Additional collections.—**U.S.A. COLORADO. Montrose Co.:** NE1/4 SW1/4 of S27, T49N R19W, Sinbad Valley; rocky pinyon-juniper association with *Arabis*, *Physaria*, elev. 5900 ft, 20 May 1988, R. Dorn 4895 (RM); [not Mesa Co., as shown on specimen label, based on listed coordinates]: 38.482917°N, 108.972111°W, Sinbad Valley via Salt Creek Rd. on N facing ridge slopes, soil gray rocky-sandy limestone, 30 May 1995, T.K. Lowrey 1603, R. Sivinski, & R. Hartman (RM!, UNM!); San Miguel and lower Dolores River drainages, S end of Sinbad Valley, pinyon-juniper with sandy clay slopes on gypsum, elev. 4700–4800 ft, S22 & S27 T49N R19W 30 May 1995, R.L. Hartman 50915, T.K. Lowrey & R. Sivinski (RM!). **UTAH. Grand Co.:** SE1/2 of S17 T24S R20E, ca. 12 mi NW of Moab where power lines cross the road, on clay hills with shadscale, galleta grass and snakeweed, 5 May 1989, R. Fleming 739 (BRY!, SJNM!); Tusher Canyon NW of Courthouse Wash and due west of courthouse rock, elev. 1540 m, 21 May 1995, N.D. Atwood 20249 (BRY!); S of Tusher Canyon Road and 1.2 air mi N of courthouse rock, 38.72319°N, 109.73677°W, elev. 1372 m, 16 Jun 1995, N.D. Atwood 20279 (BRY!); Courthouse Rock, NE of BLM road 215, south Mill Canyon, desert scrub, 38.70986938°N, 109.72464752°W, 15 Apr 2021, M. McCormick 49, J. Tuhy, B. Wellard, G. Billings, & B. Gibbons (UTC!); near road below the E side of Courthouse Rock, 38.7093421°N, 109.724236°W, elev. 4590 ft, 25 Apr 2025, L.M. Shultz 23154 & S.F. Sears (UTC!).

Etymology.—*Townsendia raptora* is named in reference to the Mill Canyon Dinosaur Tracksite, where the type population is located near Courthouse Rock. The site has been the source of many significant paleontological discoveries, including the first dromaeosaur tracks from North America (Bureau of Land Management, n.d.). Raptors made tracks roughly 112 million years ago in mudflats surrounding a shallow lake, and these tracks have been preserved in substrates of the Cedar Mountain Formation. The shallow lacustrine conditions favorable for preserving footprints also created the calcareous substrates to which *Townsendia raptora* is evidently restricted. A suggested common name is Courthouse Rock ground-daisy—or “Dino daisy.”

METHODS

This study was conducted using herbarium specimens of perennial *Townsendia* borrowed from BRY, RM, SJNM, UNM, UT, UTC (Thiers 2009–present), as well as field observations by Coury in 2022–2024 and Lowrey in 1995. Measurements were made using an Olympus SZ dissecting microscope at 10–30X magnification. We compared our material with other pulvinate species in the region, especially *T. exscapa* (Richardson) Porter, *T. leptotes* (A. Gray) Osterh., *T. hookeri* Beaman, *T. mensana* M.E. Jones, *T. glabella* A. Gray, and *T. rothrockii* A. Gray. The software ArcGIS Pro was used to prepare a distribution map based on coordinates from herbarium specimens, in addition to data contributed by the Utah Rare Plant Program. The distribution map

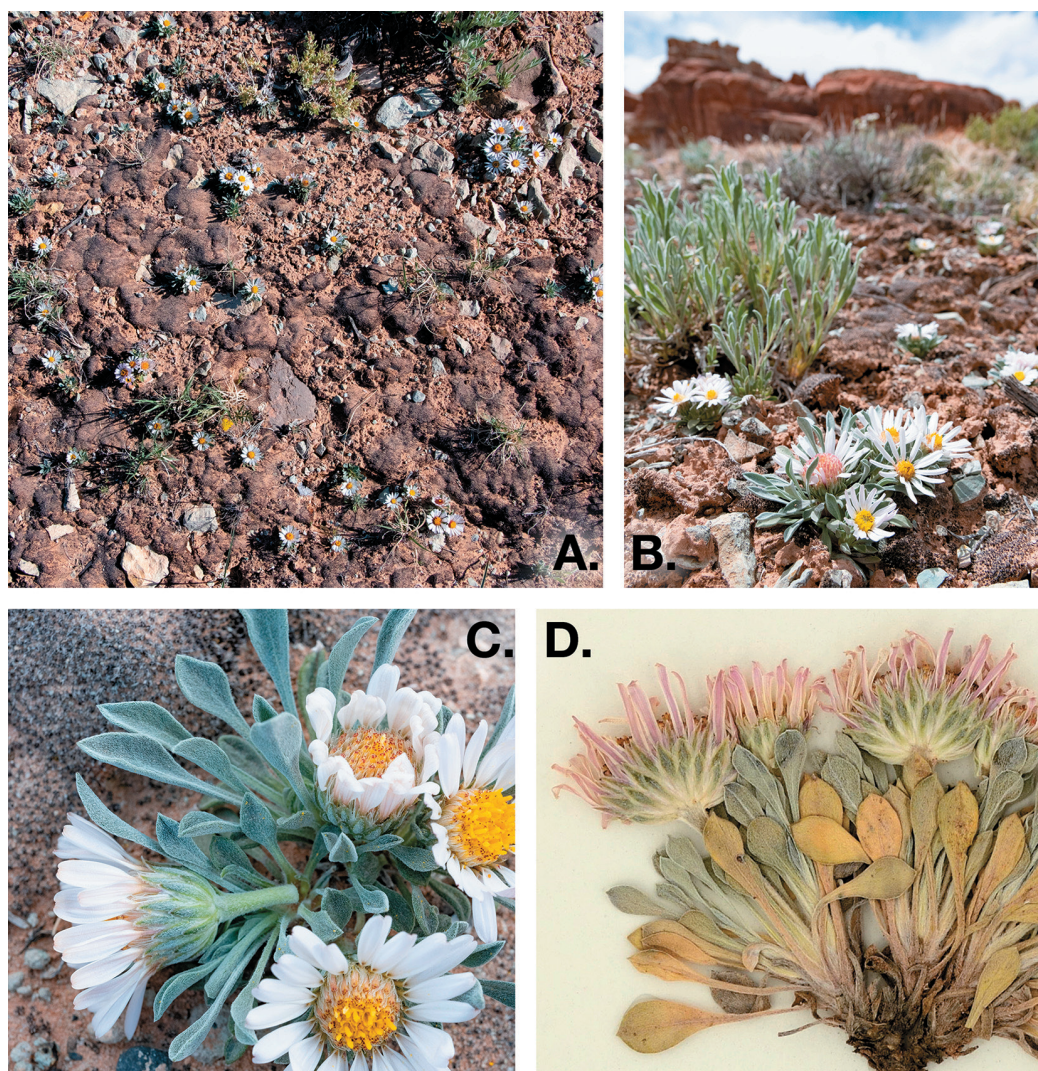


FIG. 1. *Townsendia raptora*. A. Dense cluster of plants at the type locality. B. *Townsendia raptora* in habitat in front of Courthouse Rock. C. Closeup of *T. raptora* in flower, with a bent stem showing the characteristic leafless peduncle and reduced number of phyllaries. Photos by Zach Gouy. D. Herbarium scan of J. S. Tuhy 3741, showing distinctive spatulate leaves with cuspidate apices.

also shows absence data at surveyed locations. Pollen viability was determined by visibility of nuclei using Acetocarmine stain on pollen from a specimen collected in 2025, Shultz 23154

Distribution and habit.—*Townsendia raptora* is known from two areas separated by approximately 30 air miles. In Utah, it occurs as small contiguous populations in Grand County near Courthouse Rock, roughly 15 miles NW of Moab, Utah (Fig. 4). In this area, the plants are known exclusively from the Ruby Ranch Member of the Cedar Mountain Formation, an early Cretaceous sedimentary stratum of fluvial and lacustrine deposits. From searches of herbarium collections, a disjunct population was identified as occurring in Sinbad Valley, Colorado, a valley in Mesa and Montrose Counties, where it occurs on similar locally isolated substrates. The Courthouse Rock population extends approximately two miles along the Cotter Mine and Mill Canyon roads,

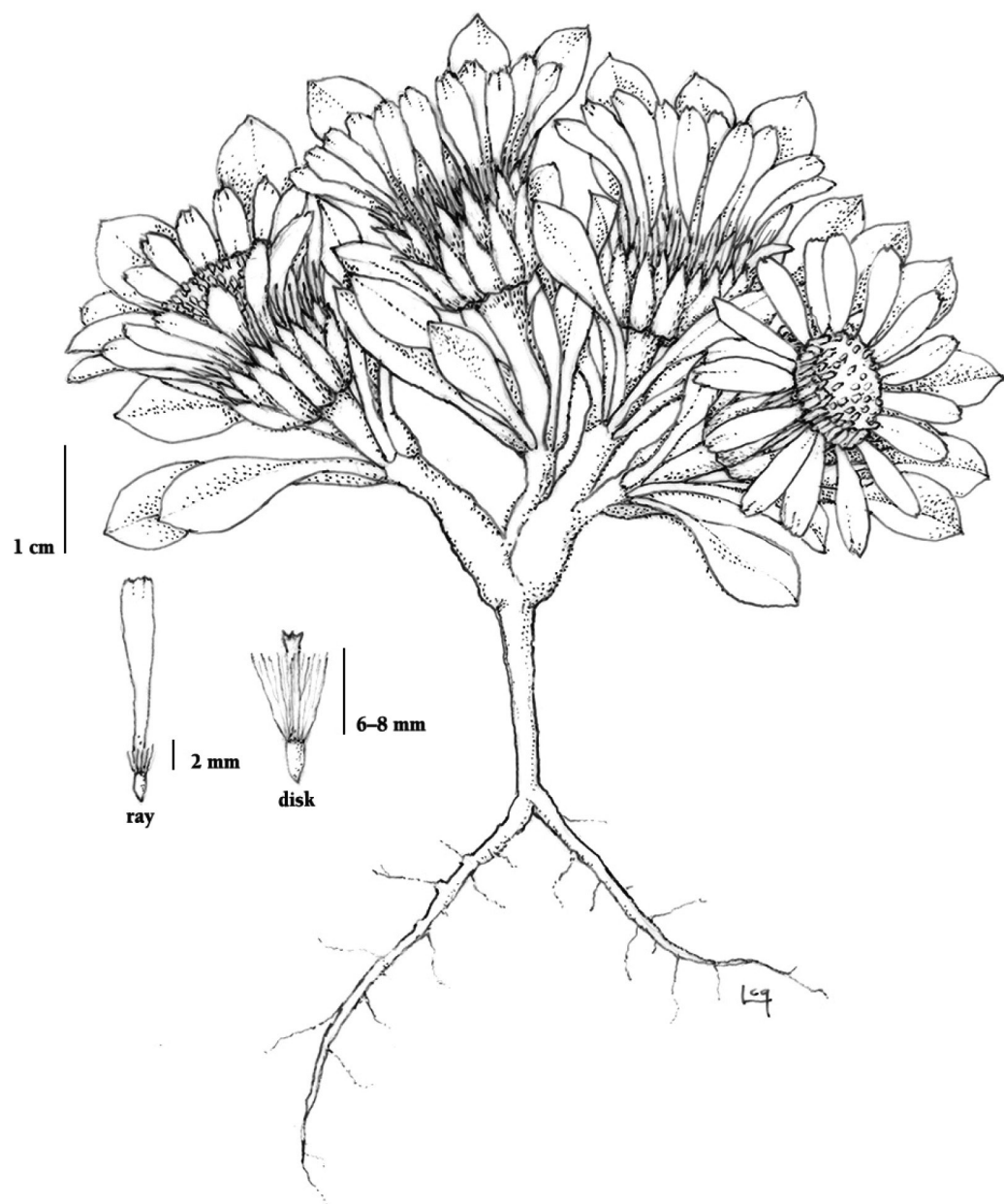


FIG. 2. Illustration of *Townsendia raptora* by Lara Call Gastinger, based on Z.R. Coury 133. Detail compares the ray floret (left) to the disk floret (right). Note differences in pappus and cypsela lengths.

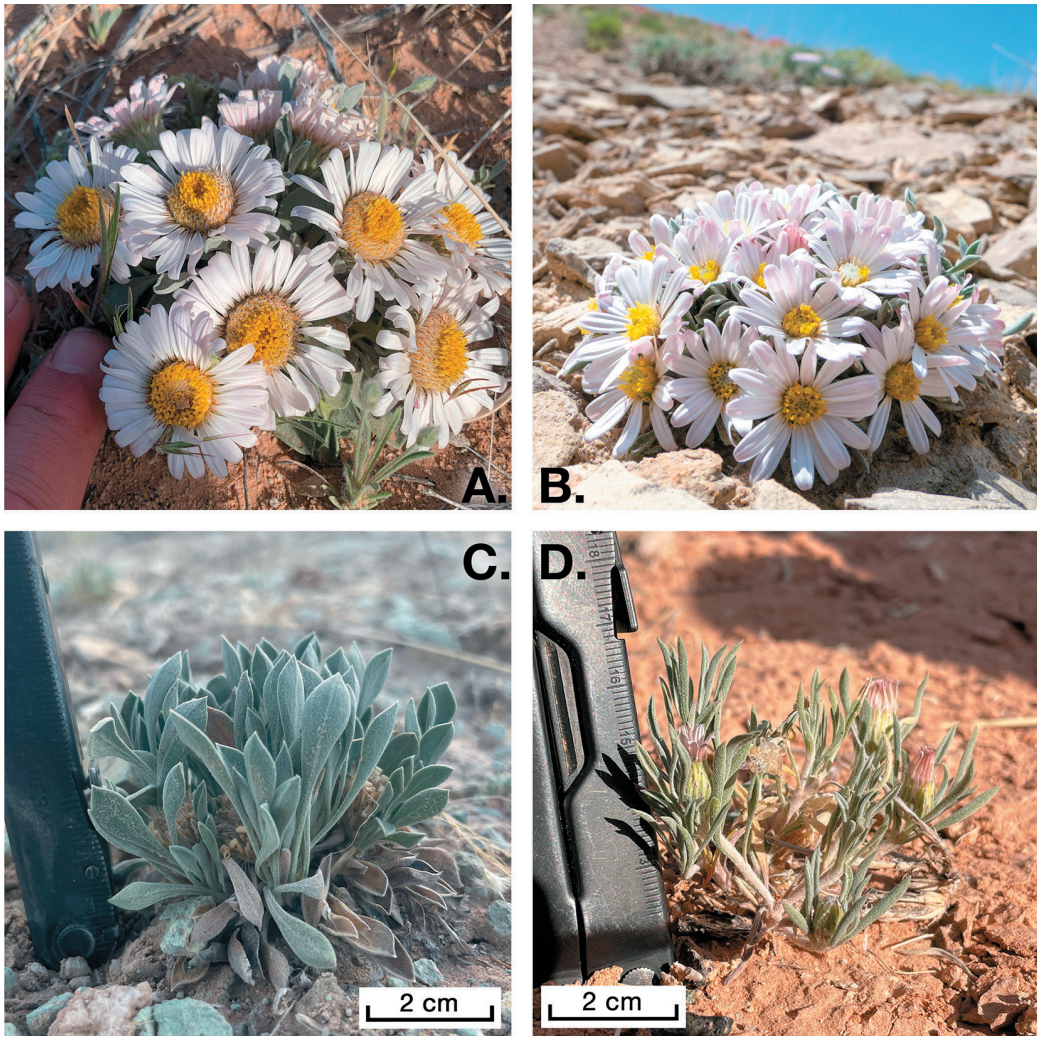


FIG. 3. Comparison between *Townsendia raptora* and *Townsendia incana*. **A.** *Townsendia raptora* at Courthouse Rock, with broad heads (involucres up to 35 mm across) and a large number of disc florets. **B.** *Townsendia incana* photographed in the San Rafael Swell (Emery Co., UT), with much smaller heads (less than 20 mm across) and fewer disc florets. **C. & D.** Comparison between *Townsendia raptora* (C) and *Townsendia incana* (D), photographed on 12 Jun 2024 in close proximity at the type locality, reproduced at the same scale. Morphological differences between the species are especially obvious in the summer months. Photos by Zach Coury.

and the Sinbad Valley population is known from an area roughly one mile in length. In 2025, two additional sites of *T. raptora* several miles from Courthouse Rock were confirmed by the authors, after having been originally encountered by retired botanist Sarah Topp in 2016. Future searches may extend the range of *T. raptora* significantly, and large expanses of possibly suitable habitat exist in both Utah and Colorado.

Townsendia raptora is a probable edaphic endemic known from loose calcareous soils of lacustrine substrates, primarily of The Cedar Mountain Formation. These strata were deposited in the early Cretaceous, roughly between 100 and 113 million years ago, when much of eastern Utah was covered by a shallow sea. The ancient conditions creating these strata fluctuated between shallow lakes, floodplains, fluvial areas, and sand dunes (Stokes 1986). The resulting substrates from this depositional period contain a variety of different sedi-

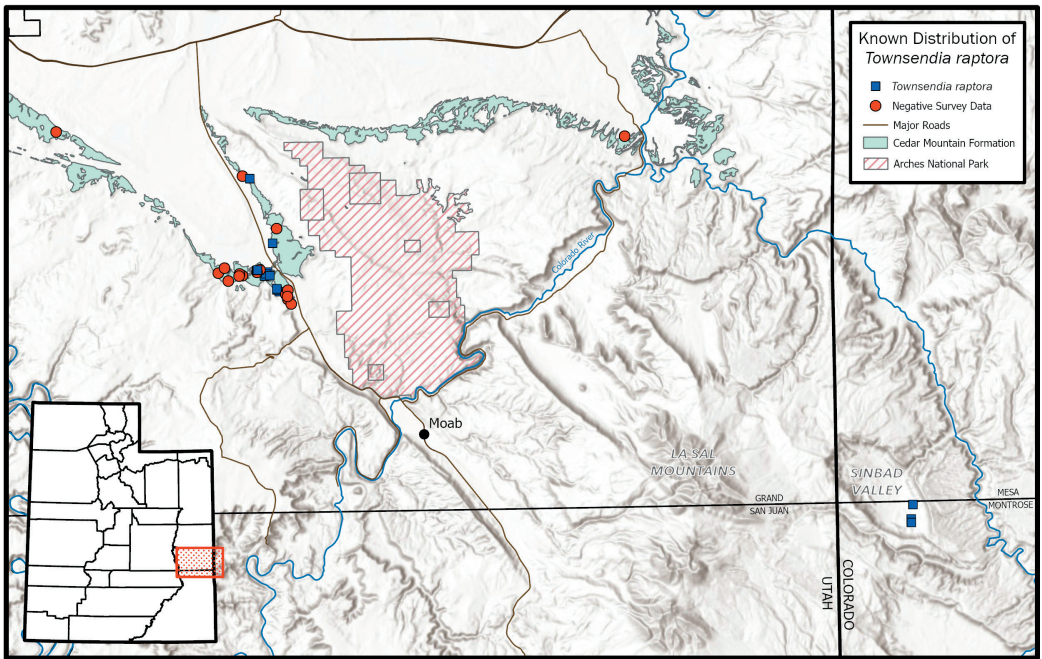


FIG. 4. Map showing distribution of *Townsendia raptora* in Utah and Colorado. Absence data at surveyed locations on the Cedar Mountain Formation are included.

mentary types in a small area, such as river cobble and conglomerates, mudstones, sandstones, and calcareous deposits. This variation in substrate appears to have impacted the distribution of *T. raptora*. The species is almost exclusively observed at the interface between white calcareous deposits and reddish sandy soils, or where the substrates have become mixed to a pale pink. These substrates are typically loose and fine grained, often interspersed with sandstone gravels (Fig. 1). Through analysis of geologic maps and aerial imagery it appears as though the individuals identified as *T. raptora* from Sinbad Valley were collected from very similar calcareous substrates, although from geologically older depositions of the Pennsylvanian Hermosa Formation (Macrostrat, n.d.).

The associated vegetation of the Utah population is largely typical for a Colorado Plateau desert shrubland, however a co-occurring overstory of *Coleogyne ramosissima* Torr. and *Atriplex confertifolia* (Torr. & Frem.) S. Watson is noteworthy. In addition to these dominant species, the site has other shrubs such as *Artemisia bigelovii* A. Gray, *Hilaria jamesii* (Torr.) Benth., *Xylorhiza venusta* (M.E. Jones) A. Heller, *Eriogonum bicolor* M.E. Jones, *Opuntia polyacantha* Haw. var. *nicholii* (L.D. Benson) B.D. Parfitt, *Sclerocactus parviflorus* Clover & Jotter, *Platyschukhria integrifolia* (A. Gray) Rydb., *Oenothera caespitosa* Nutt., *Encelia nutans* Eastw., and *Gaillardia pinnatifida* Torr. Smaller forbs include *Townsendia incana*, *Androstephium breviflorum* S. Watson, *Astragalus amphioxys* A. Gray, *Ipomopsis polycladon* (Torr.) V.E. Grant, *Gilia clokeyi* H. Mason, and *Vesper bulbosus* (A. Nelson) R.L. Hartm. & G.L. Nesom.

Conservation.—Due to its extremely small range, as well as specificity in substrate associations, *Townsendia raptora* is a species of conservation concern that should be managed accordingly. It will likely have a state ranking of S1 in both Utah and Colorado because of the extremely small known populations in both states. A thorough census has not been conducted, but there are likely fewer than 3000 individuals known in Utah. The Utah population exists within the population extent of *Astragalus vehiculus*, and is subject to the same threats, which are numerous and identified by the Three Milkvetch Conservation Team ([TMC], 2023).

Townsendia raptora is especially threatened by off-road recreation due to increased traffic and popularity of the Courthouse Rock Campground, as well as any development of roads or facilities in the immediate area. Significant presence of livestock has also been noted in close vicinity to this population, leading to degraded habitat and trampling of *T. raptora*. Further surveys are recommended to better understand the range of this unusual plant.

DISCUSSION

Although collections designated herein as *Townsendia raptora* have been acknowledged by botanists since the 1980s as interesting and possibly unique, it has not been described as a distinct species until now. A history of collections of this species is offered as an indication of the complexity of the genus. On May 23, 1908, Marcus E. Jones made two collections of *Townsendia* in Utah's Uinta Basin and later used these as type specimens for a new variety, as *Townsendia incana* var. *prolixa* (Jones 1910). This is noteworthy, as his collections were more reminiscent of *T. strigosa*, a common *Townsendia* of the Uinta Basin. *Townsendia strigosa* is similar to the Great Basin's *Townsendia florifera* (Hook.) A. Gray in its annual or biennial habit and distinctly red stems. It has sprawling and branched stems, typically arising from a basal rosette. *Townsendia incana* is an extremely variable species, which often makes its identification challenging. In some habitats, typically at higher elevations, such as in the foothills of the La Sal Mountains, it can be a long-lived perennial, becoming large and somewhat mat-forming. In other habitats it can have a very different appearance, taking a lax, leafy habit with large internodes. In any case, it maintains a consistent feature: densely white pubescent stems with obscuring hairs. Jones' collections have the typical red stems of *T. strigosa*, as well as elongated stems from a basal rosette, features that are not present in *T. incana*. It is likely that Jones was simply unaware of the publication of *T. strigosa*, which was described by Thomas Nuttall in 1841. One note from his description of *T. incana* var. *prolixa* makes this seem even more likely: he describes it as being "common throughout the Duchesne Valley," which is true of *T. strigosa*. Additionally, the varietal name "*prolixa*" is from a Latin root meaning "lengthy, extended, stretched out," which would be a logical description if Jones believed he was looking at a novel variety of *T. incana* and not the previously described *T. strigosa*. The next collection of anything called "var. *prolixa*" was made in 1979 by Stanley Welsh (S.L. Welsh 18338), also from the Uinta Basin. His collection consists of three individuals on a sheet initially labeled simply as *Townsendia*. In 1983 he annotated the sheet as "*T. strigosa*," and later applied the variety "var. *prolixa*" (Welsh 2003). In our opinion, this sheet contains two individuals of what appear to be typical *T. strigosa*, and one individual that is typical *T. incana*.

Stanley Welsh made the first known collection of *Townsendia raptora* on April 30, 1984 (S.L. Welsh 22722). On this trip, Welsh made type collections and named two other rare plants in the area, *Astragalus vehiculus* and *Oreoxis trotteri* S.L. Welsh & Goodrich. Welsh labelled his collection of *T. raptora* as *T. incana* at the time of collection. In 1992 he made a note on the sheet that, "this is a very large-headed plant," and in 2002 he reidentified the material as *T. strigosa* var. *prolixa*. In 2003, for the 3rd Edition of *A Utah Flora*, he published the species as a comb. nov. (Welsh et al. 2003), referring to the 1908 Jones collections as the type material. Interestingly, Welsh accompanies his varietal description with the following notes: "the Grand County plants are similar to, if not identical with, specimens taken by Jones at Chepeta Wells in the Uinta Basin." It is surprising that he made this claim, as the two sheets differ in several ways. Most striking is that the Courthouse Rock material is clearly a long-lived perennial, with a pulvinate growth form and a robust branching underground woody caudex, whereas the Uinta Basin material is a biennial or winter annual, as Jones originally noted. Welsh took the opportunity to reassign "var. *prolixa*" to *T. strigosa* instead of maintaining it as a variety of *T. incana*, however a variety of *T. incana* would be a more reasonable interpretation of the Courthouse Rock material. We believe this can be explained by his apparent understanding that the Uinta Basin plants were the same. *Townsendia raptora* is a result of errors from two of the most important botanists in Utah's history: Jones collected a fairly typical sheet of *T. strigosa*, and gave it a new name, likely because he was unaware of *T. strigosa* as a valid species. Welsh conflated material from Uinta Basin and Courthouse Rock and established a new combination, *Townsendia strigosa* var. *prolixa*.

In summary, our species differs from both *Townsendia strigosa* and *T. incana* by several distinctive morphological characteristics. *Townsendia raptora* is a long-lived perennial from a branching caudex with leafless and non-branching peduncles, whereas *T. strigosa* is a biennial species from a basal rosette, with branching stems that are distinctly red. When compared to *T. incana*, as well as other pulvinate perennials with a woody caudex, *T. raptora* has larger flowering heads (up to 35 mm in diameter, whereas *T. incana* only reaches 20 mm) and lacks elongated internodes (Fig. 3) (Welsh 2015). The two species occur in close proximity and are easily distinguished. Field observations in 2025 found significantly smaller heads for *T. raptora* at the Courthouse Rock type locality than seen in previous years, suggesting that the plant can reduce head size in response to environmental conditions. Mature individuals of *T. raptora* have large spatulate leaves that are often cuspidate, as well as longer pappus bristles (disc pappi 5–6 mm; ray pappi 2–4 mm). *Townsendia raptora* differs from other pulvinate species in the region by often having phyllaries in only two series. The leaf width of 3–6 mm is equaled only by *T. rothrockii* and *T. glabella*, however these species occur in high-elevation habitats above 2000 meters, while *T. raptora* occurs in desert shrub habitats between 1300–1500 meters. Furthermore, *T. glabella* and *T. rothrockii* have mostly glabrous leaves while *T. raptora* has leaves that are densely strigose with scattered glands. Mature, healthy individuals are unique for the genus, and unlike any previously described species in several aspects.

KEY TO TOWNSENDIA OF SE UTAH & SW COLORADO

1. Plants pulvinate, internode length 0.1–1 mm; heads mostly sessile, nested among leafy rosettes or on scapiform peduncles.
 2. Stems densely pilose-hirsute, stem surfaces obscured by white hairs _____ **T. incana**
 2. Stems strigose, glabrate, or pilose, stem surfaces not obscured by hairs.
 3. Ray lamina usually densely glandular-puberulent abaxially, rarely glabrous, plants of high elevations _____ **T. montana**
 3. Ray lamina glabrous abaxially.
 4. Cypselae glabrous or sparsely hairy at bases.
 5. Phyllaries obovate to oblanceolate, apex obtuse; involucre 12–28 mm in diameter, plants of Colorado _____ **T. rothrockii**
 5. Phyllaries lanceolate, apex acute; involucre 8–12 (24) mm in diameter, plants of Utah or Colorado.
 6. Heads usually on scapiform peduncles (rarely sessile), 10–70 mm long; phyllaries 20–30 _____ **T. glabella**
 6. Heads usually sessile, rarely on scapiform peduncles 5–5 mm long; phyllaries 40–50 _____ **T. leptotes**
 4. Cypselae uniformly hairy.
 7. Phyllaries with a tuft of white, tangled ciliate hairs at apex forming an acuminate appendage _____ **T. hookeri**
 7. Phyllaries lacking a ciliate appendage apically, apex obtuse or acute.
 8. Ray lamina 4–8 mm long, glandular-pubescent abaxially, plants of the Uinta Basin _____ **T. mensana**
 8. Ray lamina 10–18+ mm long, glabrous abaxially.
 9. Phyllary length 12–14 mm; phyllaries in 4–6+ series _____ **T. exscapa**
 9. Phyllary length 6–11 mm; phyllaries in 1–2 series _____ **T. raptora**
 1. Plants not pulvinate, internode length 2–25 mm; heads not sessile, borne on leafy stems.
 10. Plants perennial, stems obscured by white hairs _____ **T. incana**
 10. Plants annual or biennial, stems not obscured by white hairs.
 11. Plants annual; pappus not surpassing the corolla, plants of SE Utah, SW Colorado, Arizona or New Mexico _____ **T. annua**
 11. Plants biennial; pappus surpassing the corolla, plants of the Uinta and Green River Basins of east central Utah _____ **T. strigosa**

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