

Pyrrhopappus carolinianus

Carolina Desert-chicory

Asteraceae



Pyrrhopappus carolinianus by Bob Cunningham, 2019

***Pyrrhopappus carolinianus* Rare Plant Profile**

New Jersey Department of Environmental Protection
State Parks, Forests & Historic Sites
State Forest Fire Service & Forestry
Office of Natural Lands Management
New Jersey Natural Heritage Program

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Life History

Carolina Desert-chicory (*Pyrrhopappus carolinianus*), a member of the Aster plant family (Asteraceae), is an annual forb that may occasionally persist into a second growing season (Gleason and Cronquist; Strother 2020; Weakley et al. 2022). Stems are few to single, erect, branching from the base and/or distally, and (5–) 20–50 (–100) cm tall. Plants have a milky sap, and the stems may be finely ridged. Lower and middle stems are mostly glabrous, though short hairs may be present just beneath the flower heads (Gleason and Cronquist 1991; MDC 2023; Miller and Miller 2005; Strother 2020; Turner and Kim 1990).

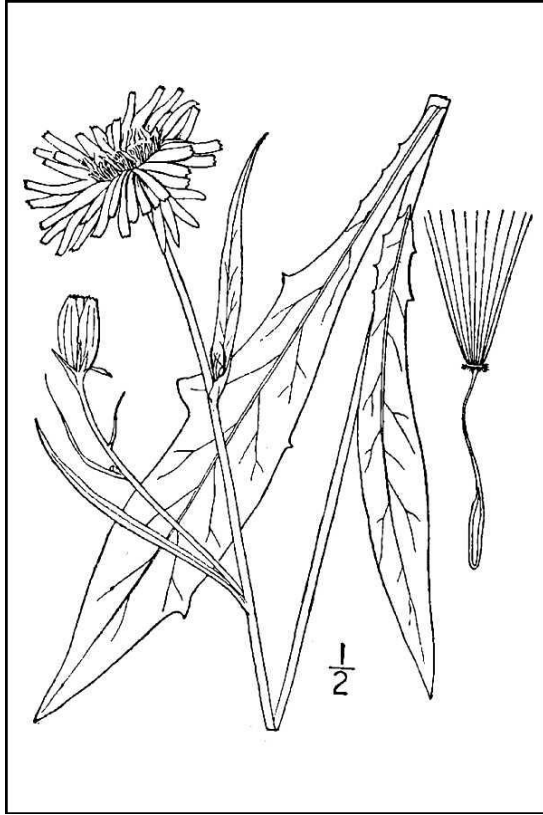
The leaves of the basal rosette are typically oblong or oblong-lanceolate, pinnatifid (like the leaves of the Common Dandelion [*Taraxacum officinale*]), lobed, and coarsely dentate; however, some may be entire, acute, acuminate or obtusish. Up to 25 cm long and 1–6 cm wide, they narrow into margined petioles. Basal leaves often disappear by flowering time (Britton and Brown 1913; MDC 2023; Miller and Miller 2005). If present, stem leaves are alternate, sessile or partly clasping, the upper usually smaller, lanceolate, entire and acuminate or with 1–2 lobes near the base (Britton and Brown 1913; Strother 2020).

Flower heads are solitary or rarely paired, with 3–5 heads arranged in loose, corymbiform rays. Each head is 2–5 cm wide with 50–150 bright yellow to greenish-yellow rays, although the inner florets may appear to have dark flecking due to the brownish fused anther bases (Diamond 2023; MDC 2023; Strother 2020). Involucre bracts are of two types, the upper ones longer with a series of shorter bracts below. The bracts reflex when seeds are released (Miller and Miller 2005).

Depending on location and soil moisture, Carolina Desert-chicory can bloom as early as February and as late as September (Strother 2020). In New Jersey plants were observed in bloom at one site in early to mid-August, and in bloom and fruit at another site in mid-to-late September (NJNHP 2022). The dry single seeded fruits (cypselsae) are reddish brown, 4–6 mm long with a fragile filiform beak 8–10 mm in length. The attached pappi are 7–10+ mm (Strother 2020; Weakley et al. 2022). Like the Common Dandelion, the seeds of Carolina Desert-chicory are wind-dispersed, usually in mid-summer or fall, depending on location.

While *Pyrrhopappus* species do resemble Common Dandelions they can be differentiated by the fact that Desert-chicories usually have taller, leafy stems and larger flat-topped bright yellow flowers that typically close at midday (Northington 1974; LeGrand et al. 2023). Additionally, *Pyrrhopappus* are heliotropic, their flower heads open facing east at sunrise and follow the sun throughout the day (Diamond 2023; Northington 1974).

Pyrrhopappus species can be morphologically variable, depending on environment. Northington (1974) noted that the plants of the Texas population of *P. carolinianus* he studied were normally tall, glabrous, and unbranched but those growing in dry, hard, rocky soil were shorter, with more lobed leaves, and some pubescence, and became more branched (multicaulescent) with age.



Left: Britton and Brown 1913, courtesy USDA NRCS 2023a.

Right: Larry Allain, USGS.



Photos by Larry Allain, USGS.

Pollinator Dynamics

Animal-pollinated, the flowers open in the early morning (becoming pollen receptive) and close by noon. Carolina Desert-chicory has evolved a close relationship with the Halictid bee, *Lasioglossom (Hemihalictus) lustrans* (Carolina Desert Chicory Sweat bee), which times its foraging activity precisely to the same early morning hours (Fowler 2016). Each flower head opens from two to four days in a row, presenting a new group of florets daily for pollination. The female bee gathers pollen from this plant, “tearing open the anthers to remove pollen before it

become available to other bees” (Northington 1974). The bees continue foraging on nearby *P. carolinianus* flowers also in bloom, an efficient way to ensure cross-pollination. However, there is a limit to the extent of area that can be pollinated by an individual *L. lustrans* bee; the bees have a restricted flight range due to their small size. While *Lasioglossom lustrans* is oligolectic, mainly visiting *P. carolinianus* for pollen, this Halictid bee has been known to visit other plants, primarily for nectar (e.g., *Curcubita* and likely Common Chicory [*Cichorium intybus*]) (Discover Life 2023).

The related *Pyrrhopappus geiseri* (Smallflower Desert-chicory, now *P. pauciflorus*) in Texas is similarly pollinated by specialist bees in the *Andrena verecunda* complex, with those flowers opening in late morning. Shinnars (1958) (as cited in Northington 1974) described *Andrena verecunda* in this way: "...in defiance of all the laws of busy bees, [it] does nothing from high noon until after sunrise the next day." The same could be said about *Lasioglossom lustrans*.

Other bee pollinators have been observed visiting *Pyrrhopappus carolinianus* including long-tongued bees (*Apis mellifera*, *Bombus griseocallis*, *Bombus impatiens*, *Bombus pensylvanica*, *Triepeolus concolor*, and *Melissodes* sp.); and short-tongued bees (*Agapostemon splendens*, *Agapostemon texanus texanus*, *Agapostemon virescens*, *Augochlorella striata*, *Augochloropsis metallica metallica*, *Halictus ligatus*, *Lasioglossum apertus*, *Lasioglossum illinoensis*, *Lasioglossum imitatus*, *Lasioglossum pilosus pilosus*, *Lasioglossum versatus*, *Sphexcodes* sp., *Andrena crawfordi*, and *Megachile mendica*) (Hilty 2020; Michener 1947). In the absence of pollinators or with insufficient pollination *P. carolinianus* does have the ability to self-pollinate (autogamy) whereby the styles in one floret twist to ensure that they encounter the stigmas of other florets, thereby transferring pollen to different florets on the same plant (Estes and Thorpe 1975).

Seed Dispersal

The seeds of *P. carolinianus* are wind dispersed, produced in a dandelion-like puffball. Seeds are cylindrical and tapered at both ends, reddish brown, 4–6 mm long, 5 grooved, with a fragile filiform beak 8–10 mm in length. The attached whitish-tan bristles (pappi) are 7–10+ mm (Miller and Miller 2005; Strother 2020; Weakley et al. 2022).

According to Conrad (2023), under the right conditions, it might be possible for *P. carolinianus* seeds to be carried by the wind for hundreds of miles. The seeds of the Common Dandelion have been shown to be dispersed up to 1 km (.62 mi) under warm, dry, windy conditions, though typically land within 2 m (6.5 ft) of the parent plant (Chen et al. 2023; Choi 2018). Recent research has found that dandelion pappi respond to humidity, expanding under drier conditions to effectively capture the wind, and landing closer to the parent plant when conditions are less suitable to dispersal (Seale et al. 2022). A similar mechanism may be at work in *P. carolinianus*.

No information was found regarding seed viability of *P. carolinianus*. While it can germinate in a variety of soil types (see Habitat section below), seeds may require a period of scarification (warm or cold) before germination is possible (Northington 1974). An annual, or rarely biennial species, *P. carolinianus* reproduces only by seeds; it is not known to reproduce vegetatively.

Habitat

Range wide, Carolina Desert-chicory can be found in full sun in dry and moist areas, including uplands, woodland edges, prairies, fields or meadows, glade swamps, banks of streams or margins of ponds and lakes. It is also readily found in disturbed sites such as lawns and pastures, railroad corridors and powerlines, or along roadsides and ditch banks (Clemants and Gracie 2006; MDC 2023; Strother 2020). Miller and Miller (2005) noted that it can be an early invader of new forest plantations. According to LeGrand et al. (2023) the “true natural habitat(s) is not known” as it is usually found in human modified habitats.

In New Jersey, one population was found in a clearing within a deciduous forest that had been partially planted with *Sorghum*. The *P. carolinianus* plants were found growing among *Sorghum* plants as well as in the weedier sections of the clearing. The clearing was adjacent to a brackish marsh system, with scattered Pitch Pine (*Pinus rigida*) and Water Oak (*Quercus nigra*) along the woodland edge. Another population was found in a dry open area at the edge of the woods, with associated species including *Agrostis* sp., *Andropogon virginicus* (Broom-Sedge), *Panicum virgatum* (Wand Panic Grass), *Solanum carolinense* (Carolina Horse-Nettle) as well as *Liquidambar styraciflua* (Sweet-gum) and *Quercus falcata* (Southern Red Oak). A third small population was found along the side of a road (NJNHP 2022).

In Indiana, Deam (1940) found the species growing in a “low, flat fallow field” in hard, white clay soil along a creek in Posey County; another verified herbarium specimen was collected from a berm between two emergent marshes in a fish and wildlife management area in Greene County (Dolan and Moore 2023). In Nebraska, it is considered a “noteworthy” species that is part of the Upland Tall-grass Prairie plant community (Central Tall-grass Big Bluestem Loess Prairie), described as a prairie with dissected hills and plains and moderately well-drained very fertile loams formed in loess and/or glacial till (Rolfsmeier and Steinauer 2010). In Texas, it seems to prefer sandy soil (Barber and Estes 1978) and Turner and Kim (1990) described it as being found in “mostly sandy soils of the eastern United States.” It is also reported to grow on serpentine soils (Kartesz 2015).

While Carolina Desert-chicory is primarily a Mid-Atlantic and Southern Coastal Plain species it is also found in parts of the Midwest and Interior Low Plateau of Kentucky and Tennessee. In some states it is reported as exotic or weedy (Kartesz 2015; Weakley et al. 2022). Range wide, *P. carolinianus* has been found growing between 60 and 100 m (197 to 328 ft) in elevation (Strother 2020).

Most flowering plant species have evolved a symbiosis with mycorrhizal fungi to aid in nutrient and water uptake. While no information specifically about mycorrhizal associations with *Pyrrhopappus* species were found in the literature, of the 233 Asteraceae species reviewed by Wang and Qiu (2006), 97 percent were mycorrhizal, most with endomycorrhizae. It is likely that *Pyrrhopappus carolinianus* is mycorrhizal as well.

Wetland Indicator Status

Pyrrhopappus carolinianus is not included on the National Wetlands Plant List (NWPL). Any species not on the NWPL is considered to be Upland (UPL) in all regions where it occurs. The UPL designation means that it almost never occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2023b)

PYCA2

Coefficient of Conservancy (Walz et al. 2020)

CoC = 1. Criteria for a value of 1 to 2: Native invasive or widespread native that is not typical of (or only marginally typical of) a particular plant community; tolerant of anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The global range of *Pyrrhopappus carolinianus* is restricted to North America. It includes parts of the central and eastern United States and northern Mexico (POWO 2023). The map in Figure 1 shows the extent of *P. carolinianus* in the United States and Canada.

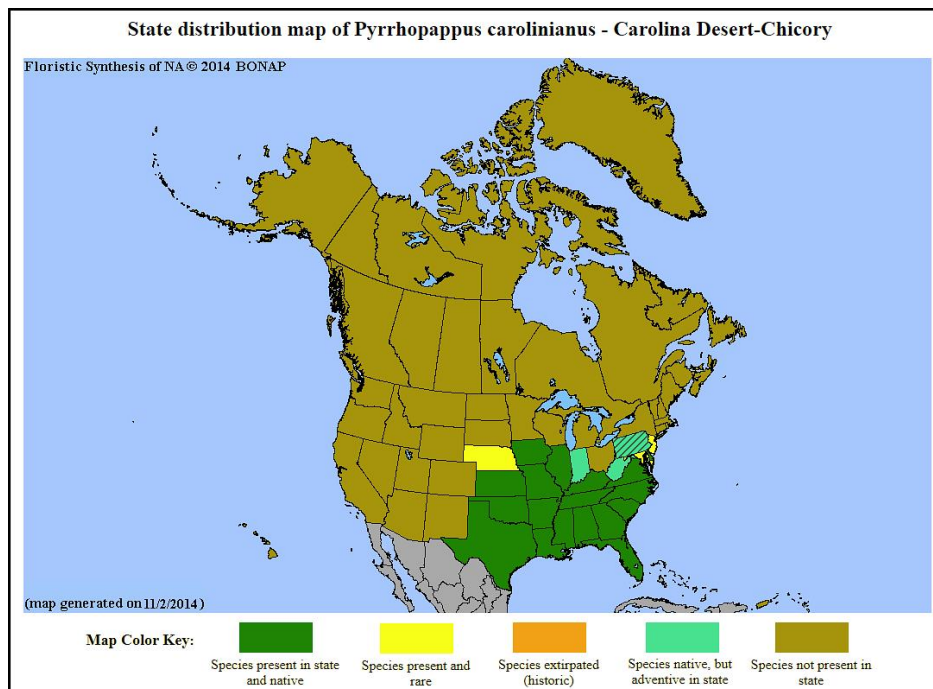


Figure 1. Distribution of *P. carolinianus* in the United States and Canada, adapted from BONAP (Kartesz 2015). Cross hatching /// indicates a questionable presence.

The map provided by the USDA PLANTS Database (2023) did not show a record for *Pyrrhopappus carolinianus* in New Jersey. Figure 2 depicts the county distribution of Carolina Desert-chicory according to records in the state's biotics database (NHNHP 2022). The species has been recorded in three New Jersey counties: Burlington, Cumberland, and Ocean.

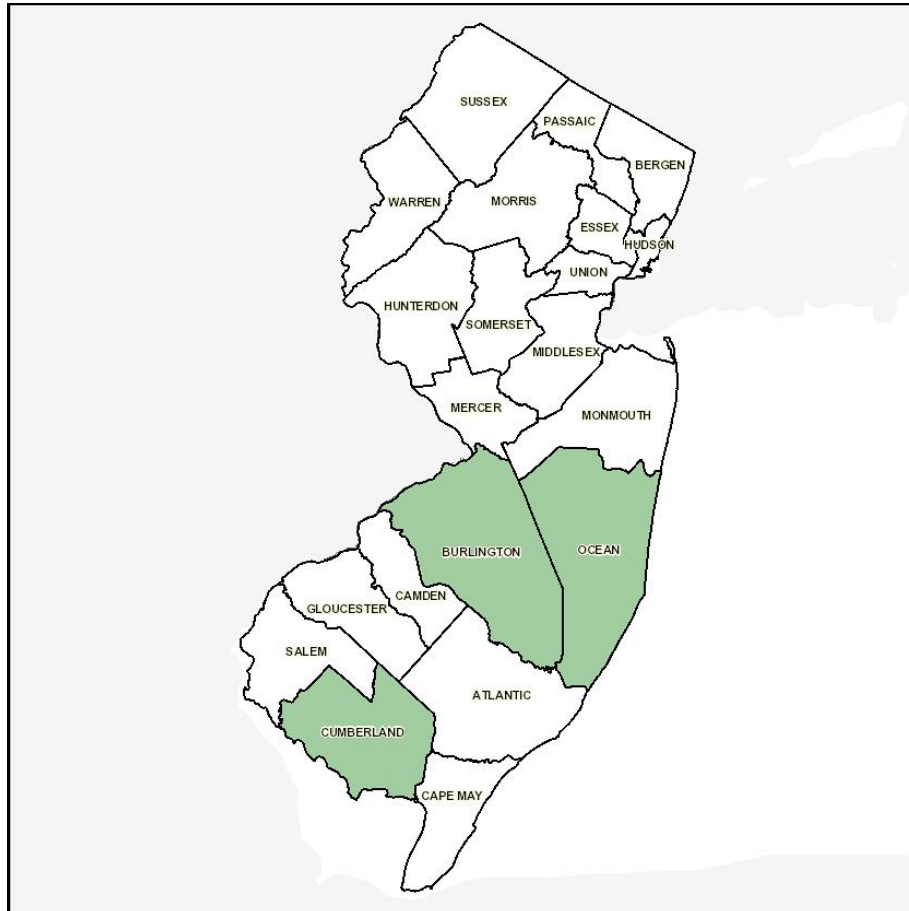


Figure 2. County records of *P. carolinianus* in New Jersey.

Conservation Status

Pyrrhopappus carolinianus is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2023). The map below (Figure 3) illustrates the conservation status of *P. carolinianus* in the United States and Canada. In most states where it occurs, Carolina Desert-chicory is secure, apparently secure, or unranked. Primarily a southeastern and midwestern species, it is most at risk along its northern edge of range. The species is vulnerable (moderate risk of extinction) in West Virginia and critically imperiled (very high risk of extinction) in New Jersey and Nebraska. In Indiana, it has only been recorded and confirmed from a few sites (one in Greene County and one in Posey County [Deam 1940; Dolan and Moore 2023]); other records in that state were either discarded for lack of information or the population was considered to have been introduced (Deam 1940). The species is categorized as exotic in Iowa (NatureServe 2023).

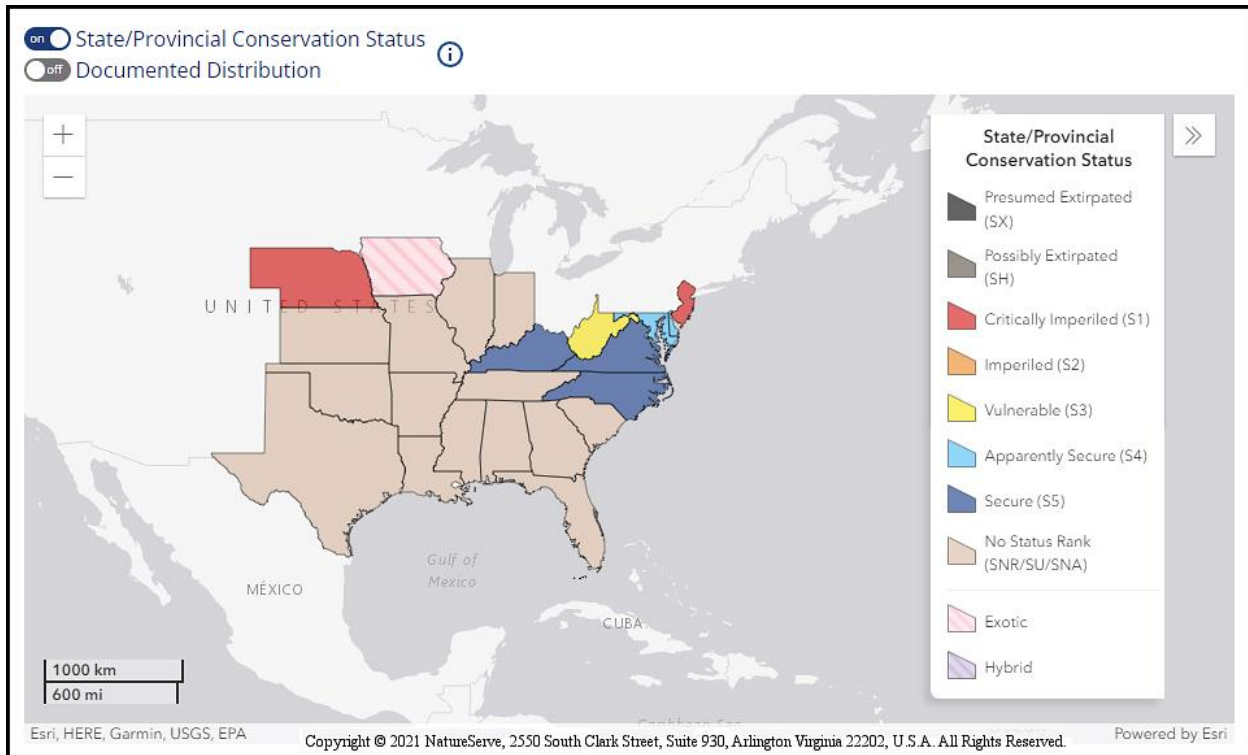


Figure 3. Conservation status of *P. carolinianus* in the United States and Canada (NatureServe 2023).

The critically imperiled (S1) status of *Pyrrhopappus carolinianus* in New Jersey signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *P. carolinianus* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities, being listed does not currently provide broad statewide protection for plants. Additional regional status codes assigned to *P. carolinianus* signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

Pyrrhopappus carolinianus was not documented in New Jersey prior to the twenty-first century. The species was first discovered in Cumberland County around 2002, and two additional populations were documented in Burlington and Ocean counties within the past five years (NJNHP 2022).

Threats

Throughout most of its range, Carolina Desert-chicory is not considered rare, and in some areas, it is considered a weed of turfgrass, fields and pastures (Yelverton 2017). For these reasons, there is little information available as to what might threaten the viability and persistence of this species. No specific threats were identified in the literature for populations in Nevada where it

has a rare status or for West Virginia populations considered vulnerable. In New Jersey, agricultural cultivation was the only threat discussed as the plants in one extant population were growing at the edges and in fallow areas of a *Sorghum* field when last observed (NJNHP 2022).

Competition with invasive species or habitat succession might be potential threats as *P. carolinianus* prefers open habitats. Regarding herbivory, Miller and Miller (2005) noted that *P. carolinianus* and other *Pyrrhopappus* species were browsed “sparingly” in the early spring by White-tailed Deer (*Odocoileus virginianus*) in the southeastern states they reviewed. USDA NRCS (2023b) further reported that the species was of minor wildlife value for large mammals including deer (defined as constituting only 2–5% of the diet and/or only used “sparsely” as cover). Although the overall impact of herbivory is determined by many factors, it appears that deer herbivory may not have a significant negative effect on *P. carolinianus* populations in the core of the species’ range. There was no mention of disease in the literature and habitat fragmentation and genetic isolation are unlikely to be major concerns as the seeds have the potential for widespread dispersal.

Climate change in New Jersey is projected to lead to higher temperatures and altered precipitation patterns, with more intense rainfall events and periods of extended summer drought becoming more common (Hill et al. 2020). Carolina Desert-chicory is an adaptable species as it tolerates a variety of soil and moisture conditions and has the potential for wide dispersal. It may benefit from warmer temperatures and a longer growing season, all of which may enable a northward range expansion in response to changing conditions if suitable habitat is available. It is also possible that changing climatic conditions may result in a pollinator mismatch between the oligolectic *Lasioglossom lustrans* and *P. carolinianus*. However, considering that other pollinators do visit the plant and it can self-pollinate, the plant may be less vulnerable than the bee species to the varied effects of future climate changes.

Management Summary and Recommendations

New Jersey populations should be revisited, as possible, and updated information gathered regarding site conditions and existing or potential threats to better develop management guidelines. In addition, maintaining open habitat for the three known populations, limiting agricultural activity as necessary, and implementing other management actions such as invasive species control (if found to be a concern) appear to be the most important actions for consideration. As the climate continues to warm, ensuring the availability of suitable open habitat for potential colonization northward by windblown seeds could be of value.

Very little is known about the distribution of *Pyrrhopappus carolinianus* along the northern edge of its range. For example, it is unclear whether New Jersey, Nevada, and Indiana’s isolated populations are outliers that have been present for years but only recently discovered or if the species is expanding its range northward and only recently arrived in those states. (Along the same border, Iowa considers it to be exotic and it is considered native, but adventive in West Virginia.) The species does appear to be doing well throughout most of its range; however, more information about seed germination requirements (e.g., scarification needs, effects of low or

freezing temperatures on germination) may be warranted for those populations considered critically rare.

Synonyms

The accepted botanical name of the species is *Pyrrhopappus carolinianus* (Walter) DC. Orthographic variants, synonyms, and common names are listed below (Britton and Brown 1913; ITIS 2021; POWO 2023; USDA NRCS 2023b; Weakley et al. 2022).

Botanical Synonyms

Common Names

<i>Pyrrhopappus carolinianus</i> var. <i>carolinianus</i> (Walter) DC.	Carolina Desert-chicory
<i>Pyrrhopappus carolinianus</i> var. <i>georgianus</i> (Shinners) H. E. Ahles	Carolina False Dandelion
<i>Pyrrhopappus carolinianus</i> var. <i>maximus</i> Nutt.	Leafy-stemmed False
<i>Pyrrhopappus georgianus</i> Shinners	Dandelion
<i>Pyrrhopappus multicaulis</i> Curtiss ex A. Gray	
<i>Barkhausia caroliniana</i> (Walter) Nutt.	
<i>Chondrilla laevigata</i> Pursh	
<i>Leontodon carolinianus</i> Walter	
<i>Sitilias caroliniana</i> (Walter) Raf.	

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