Petition to list rough goldenweed (*Pyrrocoma scaberula*) under the Endangered Species Act and to concurrently designate critical habitat

Credit: Gene Yates 2013/Oregon Flora.

CENTER FOR BIOLOGICAL DIVERSITY

11 June 2026

Notice of Petition

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Pursuant to Section 4(b) of the Endangered Species Act ("ESA"), 16 U.S.C. § 1533(b); Section 553(e) of the Administrative Procedure Act ("APA"), 5 U.S.C. § 553(2); and 50 C.F.R. § 424.14(a), the Center for Biological Diversity hereby petitions the Secretary of the Interior, through the United States Fish and Wildlife Service ("FWS" or "Service"), to protect rough goldenweed (*Pyrrocoma scaberula*) as a threatened or endangered species under the ESA.

FWS has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on the Service. Specifically, the Service must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C § 1533(b)(3)(A). FWS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition." Id. If FWS makes a positive initial finding, it must then determine within 12 months after receiving the petition whether the petitioned action is warranted, and if so, the Secretary shall "promptly" propose to implement the listing action with a general notice. 16 U.S.C. § 1533(b)(3)(B). Finally, the Secretary shall finalize the regulation to implement their listing determination "within the one-year period beginning on the date on which general notice is published." 16 U.S.C. § 1533(b)(6)(A). The petitioner also requests that critical habitat be designated for rough goldenweed concurrently with the species being listed, pursuant to 16 U.S.C. § 1533(a)(3)(A) and 50 C.F.R. § 424.12. References cited in this petition will be available through Dropbox at the following link: https://diversity.box.com/s/1l9uc7kjd2w9h8l65h5169qtyjnc1sxo.

The Center for Biological Diversity ("Center") is a nonprofit, public interest environmental organization dedicated to the protection of imperiled species and the habitat and climate they need to survive through science, policy, law, and creative media. The Center is supported by more than 1.7 million members and online supporters across the country. The Center works to secure a future for all species, great and small, hovering on the brink of extinction. The Center submits this petition on its own behalf and on behalf of its members and staff with an interest in protecting rough goldenweed and its habitat.

Submitted 11 of June 2026.

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Executive Summary

Rough goldenweed (*Pyrrocoma scaberula*) is an imperiled wildflower with fragmented populations native to a small area of southeastern Washington, northeastern Oregon, and adjacent far western Idaho. As a narrow endemic in an area heavily affected by anthropogenic activity, rough goldenweed is greatly threatened by four of the five ESA listing factors: historic and contemporary habitat loss due to livestock grazing and agricultural expansion; predation and parasitization by insects; insufficient state and federal regulations; and other factors including invasive species, wildfire, drought, climate change, and small, isolated populations with limited gene flow.

Current protections are insufficient to safeguard rough goldenweed from extinction. Despite being recognized as a species of concern by the Bureau of Land Management and US Forest Service, federal grazing allotments which contain rough goldenweed are still actively grazed, and federal grassland programs fail to adequately protect or restore native grasslands. At the state level, both Idaho and Washington lack Endangered Species Act provisions for imperiled plants, and Oregon—which has state-listed rough goldenweed as of 2024—does not have any populations of rough goldenweed on state-owned land or non-federal public lands (Marshall 2024, 6).

This petition seeks Endangered Species Act protection and critical habitat designation for rough goldenweed. Throughout its range, rough goldenweed has already been subjected to significant habitat loss; today, it is confined to small fragments of native prairieland which still face threats from grazing and aggressive noxious invasive species encroachment. Many remaining populations are far enough apart to be genetically isolated, but sufficiently clustered that singular stochastic catastrophic events, such as wildfire or drought, could cause devastating damage to multiple populations at once. Cumulatively, these threats place rough goldenweed at risk of decline or extirpation across a significant portion of its range. The U.S. Fish and Wildlife Service must take action to ensure the survival of this imperiled wildflower.

Introduction

North America's western grasslands have been significantly altered by nearly 200 years of European-American farming and grazing practices. Millions of acres of bunchgrass prairie have been converted to fields of wheat, lentils, and alfalfa, transformed into pasture, and fragmented into vulnerable patches of remaining native habitat (Looney and Eigenbrode 2012, 75; Weddell and Lichthardt 2000, 1). Noss et al. (1995) estimated that over half of the critically endangered (>98% decline) ecosystems in the US are grasslands and shrublands (p 9). The Snake River Canyon and Camas Prairie regions of the Pacific Northwest are no exception, with an estimated 2–2.43 million hectares of sagebrush-grass steppe in the western Snake River basin converted to exotic annual grasslands and >90% of native shrub-steppe grasslands in Oregon and southwestern Washington lost (pp. 74–75). Similarly, most remaining bunchgrass prairies now harbor a suite of invasive annual grasses and weedy forbs which spread rapidly and tend to move into new areas on the heels of disturbances such as wildfire, overgrazing, and rodent incursions (Gray and Lichthardt 2003, 11; Weddell and Lichthardt 2000, 6). These non-native species alter ecosystem processes, shepherd in more frequent wildfires, and competitively exclude native species (Gray et al. 2005, 12; WNHP 2025). The protection of remaining native grasslands and grassland endemic species is urgently needed.

Rough goldenweed (*Pyrrocoma scaberula*) is a perennial, late-summer blooming wildflower in the Asteraceae family. Recognizable by its yellow-rayed flowering heads, rough goldenweed is a narrow endemic found only in xeric bunchgrass prairies in the Snake River Canyon and Camas Prairie regions of southeastern Washington, northeastern Oregon, and adjacent western Idaho. Until approximately 15 years ago, rough goldenweed was merged with *Pyrrocoma liatriformis*, which occupies the Palouse habitat just north of rough goldenweed's range (Björk and Darrach 2009). The resurrection of *P. scaberula* has left botanists and conservationists with two species which each possess even more limited ranges and smaller populations than the singular species they were previously believed to comprise.

In 2005, surveyors with the Idaho Department of Fish and Game reported that the rarity of the species merited conservation action in order to prevent a need for future ESA listing (see Gray et al. 2005). Unfortunately, there is little evidence that such actions occurred until 2024, when the Oregon Department of Agriculture conducted a species status assessment of their own (Marshall 2024) and listed the species as endangered within the state. Their report found that nearly all extant rough goldenweed populations are smaller than 1,000 individuals; that most of those populations are threatened by multiple ESA listing factors; and that the natural reproductive potential of the species is "in danger of imminent or continual failure" (p 12). Unfortunately, a lack of federal protection and paucity of effective state regulations continue to hamper its conservation in all range states. In order to prevent rough goldenweed from greater decline across a significant portion of its range, federal protections for this wildflower and its habitat must be implemented through the Endangered Species Act.

Biology

I. Taxonomy

Kingdom: Plantae
Phylum: Anthophyta
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae
Genus: *Pyrrocoma*

Species: *P. scaberula* Greene
Rough goldenweed, scabrous goldenweed

Pyrrocoma scaberula was first described by E. L. Greene in 1909 alongside several other species of *Pyrrocoma*, including *liatriformis* (Greene 1909, 17–19). Throughout the last century, these two species have brought some consternation to taxonomists and led to a number of reassignments. Hall (1928) and Davis (1952) viewed the two as subspecies of *Haplopappus integrifolius*, ssp. *liatriformis* and *scaberula/scaberulus*. Cronquist (1955) condensed them under *Haplopappus liatriformis*, a decision which Mayes (1976) upheld when shifting the genus back to *Pyrrocoma* and conserving the specific epithet *liatriformis* (Gray et al. 2005, 3).

This remained the preferred taxon name until Björk and Darrach (2009) resurrected *P. scaberula* from within *P. liatriformis* on the basis of geographic separation and morphological differentiation. Shortly afterward, Smith et al. (2010) published genetic work which used AFLP data to reinforce Björk and Darrach's conclusions and support the presence of two species.

Pyrrocoma scaberula is presently recognized as its own species in *Flora of Oregon,* Volume 2 (2020) and by the US Department of Agriculture.[1]

[1] https://plants.usda.gov/plant-profile/PYSC4. Accessed 7 January 2024.

Credit: Blair McClarin 2011/Oregon Flora

II. Description

Pyrrocoma is a genus in the family Asteraceae. Members of this genus are herbaceous, taprooted perennial plants with leafy stems arising from basal rosettes. All are characterized by compound flower heads with yellow ray florets (Björk and Darrach 2009, 231).

Pyrrocoma scaberula can grow to a height of approximately 30–70 cm and has one to several branched, erect stems. Basal leaves are lanceolate to oblanceolate in shape, petiolate in attachment, and approximately 7–20 cm long by 6–19 mm wide (Oregon Flora 2025). Leaf margins are smooth, without teeth, and the basal leaf surface is characterized by a reticulate, net-like pattern of veins (Greene 1909, 19). Cauline (stem-borne) leaves are distally reduced, lance-linear in shape, and may be sessile or petiolate in attachment (Greene 1909, 19; Oregon Flora 2025).

Flowering occurs between June and September. Between 4 and 12 short flower stalks (1–20 mm) are produced at regular intervals along a central stem, with each stalk supporting one flower head. The flower capitula is formed of yellow disc and ray florets. There are typically 12–25 conspicuous ray florets, each ligule being 6–10 mm in length, encircling 35-50 disc florets 7-11 mm in length (Oregon Flora 2025), though note that there is one unique population located in

Asotin County, Washington in which all plants are entirely rayless (M. Darrach, pers comm, 19 November 2024). Capitula range from (9)11-21 mm long and 6-14 mm wide (Björk and Darrach 2009, 234). Achenes are 4.5–6.5 mm in length with a pappus 6–8 mm long (Oregon Flora 2025).

Several morphological characteristics differentiate rough goldenweed from its congener Palouse goldenweed (*P. liatriformis*). Greene (1909) describes rough goldenweed as being scabro-hirtellous, possessing shortish, rougher hairs on both faces of the basal leaves (p 19). Björk and Darrach (2009) concur that it has "harsh, curled hairs" on the stems and peduncles. In contrast, Palouse goldenweed is characterized by softer lanate hairs; it also lacks the resinous glands present on rough goldenweed (p 233). Other distinctions include that rough goldenweed has, on average, a lower number of lateral branches; fewer inflorescences; larger flower heads; and wider, longer bracts and cauline leaves than Palouse goldenweed (p 234).

Geographic distribution may ultimately be the simplest way to differentiate between the two species, as there is no documented overlap in their ranges aside from a handful of potentially hybridized populations (Björk and Darrach 2009, 236).

Pyrrocoma scaberula. Credit: Blair McClarin 2013/Burke Herbarium.

III. Habitat

Rough goldenweed grows in bluebunch wheatgrass (*Pseudoroegneria spicata*) dominated bunchgrass grasslands in the Snake River Canyon/Camas Prairie region of southeast Washington, northeast Oregon, and adjoining Idaho. This habitat is part of the Columbia Plateau and Blue Mountains ecoregions (Fertig 2020, 80), but is distinct from the more northern Palouse grasslands, despite the term "Palouse prairie" sometimes being used as an umbrella term (Tisdale 1982, 223). The areas inhabited by rough goldenweed can be broadly described as Pacific Northwest bunchgrass grasslands (see Tisdale 1982) and associated bunchgrass/conifer forest ecotones.

Rough goldenweed is commonly found in bunchgrass prairies co-dominated by *Festuca idahoensis* (Idaho fescue) and *Pseudoroegneria spicata* (bluebunch wheatgrass), typically where there is more *P. spicata* than *F. idahoensis* (M. Darrach, personal communication, 5 December 2024). It may also be found growing in association with either species, often with subdominant amounts of *Koeleria macrantha* (prairie junegrass). This includes prairie-forest ecotones and grassy forest clearings, particularly in forests dominated by *Pseudotsuga menziesii* (Douglas fir) or *Pinus ponderosa* (Ponderosa pine) (Fertig 2020, 80). Ecotones adjacent to *P. menziesii* associations, including those with *Symphoricarpos albus* (common snowberry) or *Carex geyeri*

(elk sedge), are an especially common location in which to find larger populations of rough goldenweed (M. Darrach, personal communication, 5 December 2024). Areas of high invasive species coverage or high grazing intensity are considered poor-quality habitat for rough goldenweed and may not support healthy populations of this species (WNHP 2025).

Canyon grasslands are generally xeric, averaging 12–25 cm of rain per year in the case of the Snake River Canyon area of southeastern Washington (Rocchio and Crawford 2015, 168). Higher-elevation northern aspects of steep slopes are cooler and more mesic. The bunchgrass *Festuca idahoensis* (Idaho fescue) is often the dominant species at such sites (Tisdale 1982, 235). Rough goldenweed favors ridgetops and slopes of less than 35% grade between 730–1300 m elevation (Yates 2013, 1), growing in fine, silty loess soil over basalt or limestone (Fertig 2020, 80).

Many populations of rough goldenweed today are found growing in steep areas of thin, rocky soil (IDFG, unpublished data; WNHP 2025). This may at first suggest that the species was not gravely affected by the historic large-scale conversion of deep loessal soils to agricultural lands in the 1800s; however, some populations today are still found growing in deeper soils, and in association with other grassland endemics known to require deeper soils, such as Spalding's catchfly (*Silene spaldingii*) (Gray et al. 2005, 6). Given this fact, we assert that rough goldenweed can, and does, inhabit the same agricultural-quality soils that have been so heavily cultivated in recent centuries (M. Darrach, personal communication 21 May 2025).

IV. Distribution

Rough goldenweed is a narrow endemic with a range which may be greatly reduced from its original distribution, primarily due to prairie loss during European colonization and agricultural expansion in the 1800s (Endress et al. 2020, 54). Today, its distribution is limited to the Camas Prairie and Snake River Canyon region of southeastern Washington (Asotin County), northeastern Oregon (Wallowa County), and adjacent Idaho (Idaho, Lewis, Nez Perce, and Washington counties).

Figure 1 shows the currently understood ranges of both rough goldenweed and Palouse goldenweed, approximately separated by the Clearwater River. While not all populations have been genetically tested to confirm species identity, our assignments follow the geographic patterns found by Björk and Darrach (2009) and Smith et al. (2010), and M. Darrach supports the below map as a representation of the best available data (personal communication, 7 January 2024).

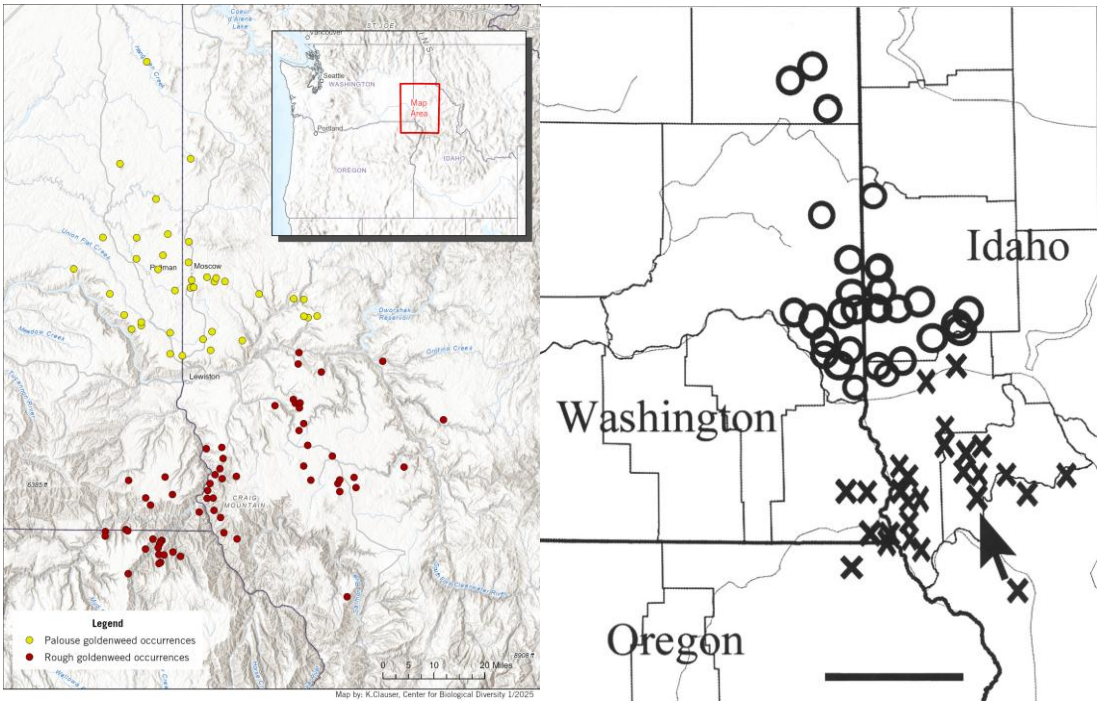

Figure 1. Left: Currently understood geographic ranges of rough goldenweed (red dots) and Palouse goldenweed (yellow dots). Right: original morphology-based assignments of rough goldenweed (x's) and Palouse goldenweed (o's) from Björk and Darrach (2009).

V. Population status

Rough goldenweed is confined to small fragments of habitat in most parts of its range. Presently, NatureServe ranks rough goldenweed as a G2 (Globally Imperiled) species, an S2 (Imperiled) species in Idaho, and an S1 (Critically Imperiled) species in Washington and Oregon (NatureServe). It is listed as a 'Sensitive' species in both Washington and Oregon per those states' joint USFS-BLM Interagency Special Status/Sensitive Species Program. In Idaho, it is ranked by the BLM as Type 2 (Rangewide/Globally Imperiled Species–High Endangerment). Yates (2013) notes, "Many populations are presumed extirpated by development of lands for cultivation." (p 2).

In the years since rough goldenweed was resurrected as a valid species, surveys have been conducted in areas adjacent to its known range, such as the Hells Canyon National Recreation Area, and no new populations have been found (Yates 2013, 5; Marshall 2024, 7). Therefore, it is unlikely that this species has undiscovered population strongholds.

Idaho

Idaho has up to 79 populations of rough goldenweed, the most of any state (IDFG, unpublished data). Most are smaller than 1,000 individuals, and nearly half are smaller than 100 (Fig. 2). In a 2005 survey, researchers with the IDFG report that the species is "rare" and in need of conservation action (Gray et al. 2005, 1). Threats include historic habitat loss and contemporary fragmentation and degradation; small population size; livestock grazing; invasive species; changing fire frequency; and climate change.

Many Idaho rough goldenweed populations occur on the Nez Perce Reservation, located in West-Central Idaho. Other populations are generally concentrated to the southwest in the Craig Mountain Wildlife Management Area (WMA), a land reserve which is jointly managed by the BLM and State and includes parcels owned by Tribal, State, Federal, and nonprofit entities. Most of the remainder are on private lands (IDFG, unpublished data; Fig. 2).

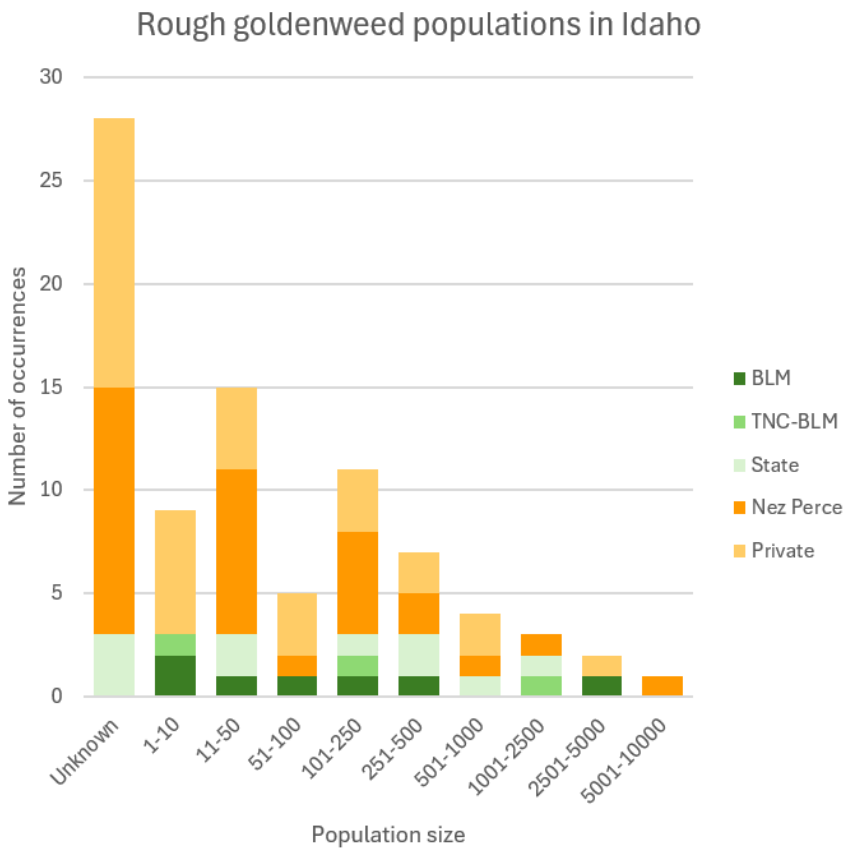

Figure 2. Population sizes and land ownership for rough goldenweed in Idaho. Subpopulations are combined except where they cross ownership boundaries, in which case the section with different land ownership is counted separately from the rest of the population. (Data source: IDFG, unpublished data; Figure source: GM)

Craig Mountain WMA holds intact swaths of suitable canyon grasslands habitat which are currently threatened by ongoing degradation due to livestock grazing, invasive species, and altered fire regimes. Grazing was extensive across Craig Mountain in the past, and though it was recently curtailed, some parts of the habitat are altered from decades of livestock presence, and some areas of the WMA continue to be grazed (Barrett 2014, 12). Trespass cattle are another concern: the BLM has noted unauthorized cattle as a direct threat to rough goldenweed in at least one population on Craig Mountain (IDFG, unpublished data).

Outside of the Craig Mountain WMA, large-scale agricultural conversion has historically eliminated rough goldenweed habitat in Idaho. Today, many of the state's populations of rough goldenweed occur adjacent to converted cropland, suggesting other populations were likely extirpated when those lands were originally tilled. Though active habitat loss is no longer ongoing from this threat, rough goldenweed in these locations remains at risk due to small population sizes, fragmented habitat, possible herbicide drift, and invasive weed spread (Gray et

al. 2005, 11). IDFG has also noted that some landowners currently graze cattle on private lands which harbor rough goldenweed populations (IDFG, unpublished data).

Livestock are also partly responsible for the transmission of invasive species, which are spreading rapidly and threatening the integrity of rough goldenweed habitat. Rough goldenweed is potentially crowded out by high-density invasives, with ventenata (*Ventenata dubia*), annual bromes (*Bromus* spp.), and various species of knapweed (*Centaurea* spp.) cited as some of the most concerning invasives in western states (Hill and Gray 2004, 67). Both are noted by the IDFG near many rough goldenweed populations (IDFG, unpublished data).

Populations in the state sometimes cross land ownership boundaries, making clear guidelines and regulations imperative for safeguarding remaining strongholds. This is particularly true for Idaho's largest rough goldenweed populations. Seven documented occurrences, totaling around 24,000 plants, make up a vast majority of both state and global extant rough goldenweed abundance (Fig. 2) (IDFG, unpublished data; WNHP 2025). These sites are varyingly threatened by quality of habitat, landscape connectivity, and (to a lesser extent) subpopulation vigor. On landscape connectivity in particular, subpopulations in the largest populations often scored a "C" (moderately fragmented) or "D" (highly fragmented) according to IDFG's most recent data, and only two "A" grades were assigned across three categories and 37 subpopulations (IDFG, unpublished data). Indeed, reviewing these locations in Google Maps reveals that many of the largest sites are surrounded by roads and agricultural fields, often on multiple sides. Because ownership differs by population, care must be taken to ensure each one is managed and conserved properly. The preponderance of small populations places an enormous conservation weight on these few large sites, as the loss of even one would represent a significant global population loss for the species.

Oregon

Oregon harbors 15 populations of rough goldenweed (Marshall 2024, 6). The most recent available data indicate that 11 of those populations are smaller than 100 individuals, and all 15 are smaller than 1,000 (p 9). The total number of rough goldenweed plants in the state is estimated to be fewer than 2,000 (p 6). A 2010 state-level assessment of the species placed rough goldenweed at a S3 (Vulnerable) rank (Vrilakas 2010); as of 2024, that has been upgraded to S1 (Critically Imperiled) and the species has been state-listed as endangered (ODA 2024).

The Oregon Department of Agriculture's recent assessment of this species drew attention to many potential points of concern for rough goldenweed populations within the state. These threats include grazing, insect predation, lack of protective regulations, proliferation of invasive plant species, environmental changes caused by fire suppression and drought, and small population sizes (see Marshall 2024, entire). The assessment concluded that rough goldenweed should be considered for state listing as endangered because the natural reproductive potential of

the species is “in danger of imminent or continual failure” (p 12). The species is now listed under Oregon’s most recent list of threatened and endangered plants as an endangered species (ODA 2025).

Another major source of concern for Oregon’s rough goldenweed is the fact that all populations are tightly clustered, each occurring within 24 km (15 mi) of the others (Marshall 2024, 11; Fig. 1). Most are concentrated on the Nez Perce Precious Lands, an area of approximately ~65 sq km, which harbors 11 of 15 populations; the remainder are located on USFS land (1), BLM land (1), and private land (1) (p 6). These populations are clustered enough that large-scale disturbance events, such as drought, will be more likely to negatively impact multiple populations simultaneously. Therefore, Oregon’s rough goldenweed populations are not only at risk of local extirpation due to the small number of individuals harbored in many populations and the small number of plants within the state; they are also at risk on a broader scale due to their clustered distribution.

Washington

Washington has just 8 extant populations of rough goldenweed with only ~1,300 plants in total (Fertig 2020, 80). Occurrences include Chief Joseph State Wildlife Area, Fields Spring State Park, Grande Ronde Area of Critical Environmental Concern, Umatilla National Forest, and the Vale District under the Bureau of Land Management (Miller et al. 2024, 42). The Umatilla NF population is notable and unique: the flower heads in this population are completely rayless, composed only of disc florets. This population is deserving of separate taxonomic status as a subspecies but has not been addressed in a peer-reviewed publication (M. Darrach, personal communication 26 November 2024).

Many of Washington’s populations are under threat due to multiple ESA listing factors, and there are no populations given a quality rank above “Good” by the WA Natural Heritage Program. A number of these populations are extremely small, with most recent surveys documenting 12, 47, and 80 individuals at three of those populations (WNHP 2025). The remaining populations are between one and several hundred, in addition to an incidental spotting of “several thousand” on a hike in 2003 which was never confirmed (WNHP 2025). This petition uses the figure of 1,300 plants in the state because it represents the WA DNR’s more recently published data (Fertig 2020, 80), while the incidental spotting of this population was in 2011 (WNHP 2025).

Rough goldenweed populations in Washington are all growing in habitats that are either degraded, limited, or at risk of becoming so. Habitat suitability and availability constraints serve to limit the extent of rough goldenweed in the state. Multiple populations are within or very close to BLM and USFS grazing allotments (Fig. 4), with grazing referenced as either an ongoing or a potential issue by surveyors. Even when grazing does not occur directly on rough goldenweed

populations, proximal grazing may result in eventual damage by trespass cows that escape federal grazing allotments or private pastures. The presence of invasive species at many of these sites further indicates that rapid and severe habitat degradation can occur at any time. Umatilla NF's rayless population is small, isolated, and threatened by the invasive grass *Ventenata dubia* (M. Darrach, personal communication 26 November 2024).

Washington's Endangered Species Act does not include legislation for plant species (WAC 220-610), but rough goldenweed is considered endangered within the state by the Washington Natural Heritage Program (WNHP) and is ranked S1 (Critically Imperiled) by NatureServe. In recent years, the Department of Natural Resources has twice earmarked this species as needing conservation actions (Fertig 2020, Fertig and Kleinknecht 2020). In Washington, this species is found in two ecoregions—Blue Mountains and Columbia Plateau—and is unprotected everywhere it occurs in the Columbia Plateau ecoregion because all populations occur on private or multi-use lands (Fertig and Kleinknecht 2020, 154).

Threats

Under the ESA, 16 U.S.C. § 1533(a)(1), FWS is required to list rough goldenweed if it is in danger of extinction or likely to become endangered across all or a significant portion of its range. This species must meet at least one of the factors enumerated in section 4(a):

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;
(B) Overutilization for commercial, recreational, scientific, or educational purposes;
(C) Disease or predation;
(D) The inadequacy of existing regulatory mechanisms;
(E) Other natural or manmade factors affecting its continued existence.

16 U.S.C. § 1533(a)(1)(A)-(E); 50 C.F.R. § 421.11(c)(1)-(5).

The review and determination by FWS must be based solely on the best scientific and commercial data available.

Rough goldenweed is threatened by 4 of the 5 ESA listing factors: (A) Habitat loss due to agricultural expansion and livestock grazing; (C) Predation by native insect species; (D) A lack of existing federal protections and paucity of effective state regulations; and (E) Other factors, including changes in precipitation due to climate change; invasive grasses and forbs; and altered wildfire frequency regimes due to shifting grassland composition and fire suppression activities.

Present or threatened destruction, modification, or curtailment of habitat

Bunchgrass prairieland once sprawled across approximately 8 million hectares of Washington, Oregon, Idaho, and Canada; today, it is estimated that up to 99.9% of those grasslands are gone, primarily due to land conversion for agriculture (Noss et al. 1995, 76). Fragments of remnant habitat can still be found in clearings of high-elevation conifer forests, on steep canyon slopes, and within the agricultural matrix. Rough goldenweed populations dwelling in these remaining intact grasslands are imperiled by other types of habitat modification, even where there is low risk of agricultural conversion due to poor soil quality or other site-level factors.

Agriculture

The conversion of grasslands for agricultural use is a noted threat to rough goldenweed populations in Washington (Fertig and Kleinknecht 2020, 154) and is likely responsible for an extensive historical loss of habitat for the species (Yates 2013, 1).

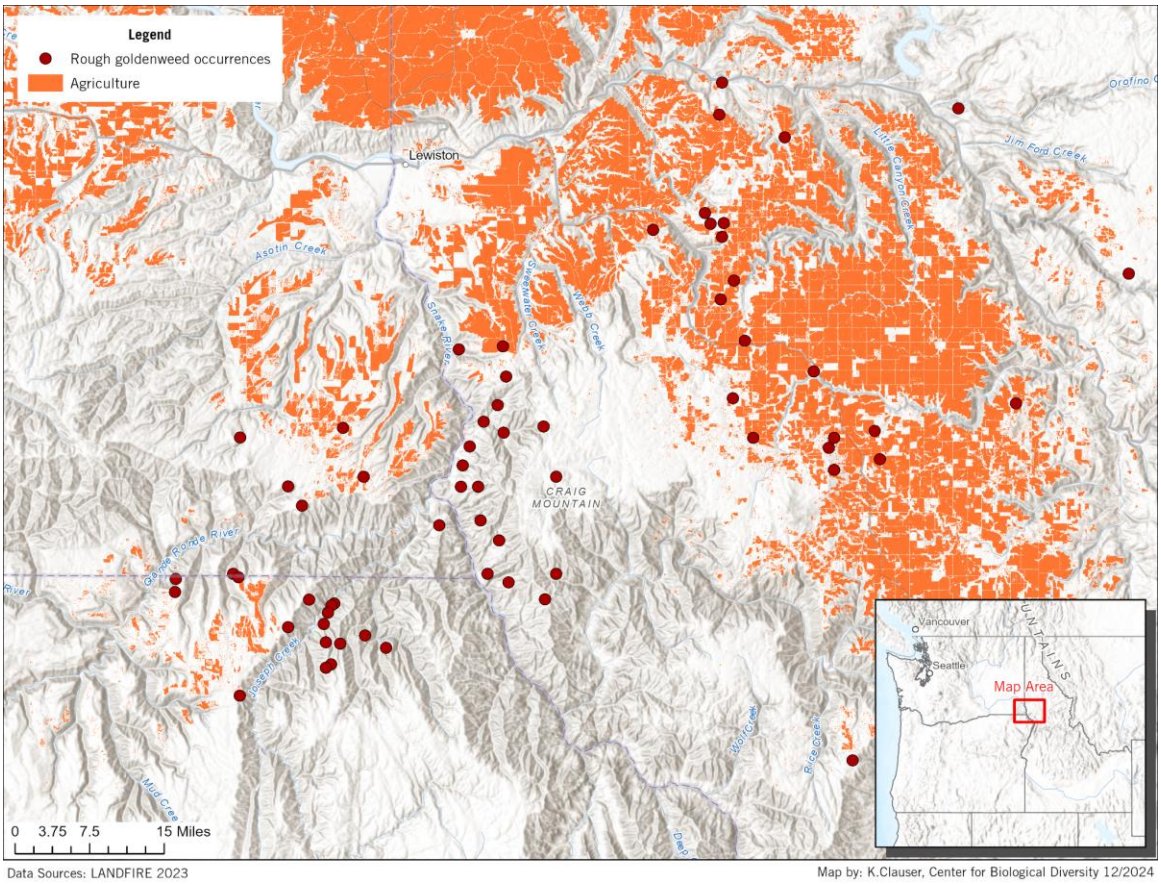

Figure 3. Locations of rough goldenweed (red dots) compared with the existing agricultural matrix (orange) in the region.

Today, many of the remaining rough goldenweed populations in Idaho, along with several in Washington and Oregon, are located within the agricultural matrix (Fig. 3). These habitats are often small, fragmented, and located on private property, which can make adequate conservation actions difficult or impossible. Because these isolated fragments still contain rough goldenweed, it is likely that conversion to agricultural land in the past has already destroyed countless rough goldenweed populations and eliminated swaths of suitable habitat. Remaining habitat fragments are likely to be threatened by herbicide drift, which has been seen to affect rough goldenweed in Craig Mountain Wildlife Management Area (Gray et al. 2005, 9).

The agricultural industry is also responsible for multiple exotic plant introductions which have ultimately degraded the surrounding habitat. The invasive yellow starthistle (*Centaurea solstitialis*) is believed to have originated in alfalfa and wheat seeds brought from southern California, which carried non-native species from alfalfa's original range in the Mediterranean Basin (Gerlach 1997, 5). Today, yellow starthistle is an invasive of concern in rough goldenweed habitat from all three states, as it can spread rapidly when conditions are right (Sondenaa and McClarin 2017, 12; WNHP 2025; Gray and Lichthardt 2003, 4). ventenata (*Ventenata dubia*), an invasive grass which is devastating Pacific Northwestern grasslands, is another species which

may have been introduced from its home range due to lax agricultural practices. A recent study indicates that this invader was likely introduced to the Pacific Northwest multiple times (Pervukhina-Smith et al. 2020, 3586).

Over the past half century or so, many privately owned grasslands in the US have been lost. Between 1982 and 2003, the amount of grassland on privately owned land declined by 25 million acres, with 10 million of those acres being native grassland (GAO 2007, 12). This loss may be difficult or impossible to reverse, as restoration of native grasslands is an expensive and time-consuming process (p 9). Protecting the native bunchgrass grasslands which remain is of paramount importance.

Further, federal programs may also encourage changes to farmed and arable land in ways that negatively impact rough goldenweed. The Conservation Reserve Program (CRP) allows farmers to remove land from agricultural production and receive federal rent payments in return, but farmers frequently plant introduced grasses or, when enrolling existing grasslands in the program, continue to graze livestock on these plots (USDA FSA 2024).

Livestock grazing

Large, native grazers are naturally sparse in the Western grasslands of the United States. Unlike the Great Plains region of the Midwest, which once supported vast herds of American bison, pronghorn, and elk (Shaw and Lee 1997, entire), Northwest bunchgrass ecosystems are not adapted to withstand heavy grazing and trampling pressure (Belsky and Gelbard 2000, 11). Large herds of cattle or sheep can browse and trample native plants, reducing population size and vigor (p 14). The movement of countless hooves and heavy animals over these landscapes can also compact the soil, lowering habitat quality for native plants by reducing aeration, water transportation, and redox potential within surface soils (Belsky and Gelbard 2000, 13). Native plants may respond to this disturbance by putting out roots closer to the surface. In Canadian habitats of *Festuca campestris* (rough fescue), areas heavily stocked with cattle saw significant compression of the topsoil layer which reduced the thickness from 22 cm to 7.5 cm (Dormaar and Willms 1998, 123), along with shifts in available nutrients, primarily an increase in nitrogen and decrease in carbon (p 124).

Another impact of grazer trampling is the destruction of biological soil crusts (biocrusts) which cover ‘bare’ ground in grassland habitats. These fragile communities of moss, lichen, fungus, and bacteria have been implicated in critical ecosystem functions including nutrient fixation, erosion control, and germination of native seeds (Belsky and Gelbard 2000, 14). Grazers may trample, compress, and break up biocrusts, leading to areas of truly bare ground (Kaltenecker et al. 1999, 223; Belnap and Eldridge 2001, 367) which may be more prone to erosion and invasion by non-native species (Peterson 2013, 5).

Invasive species introduction and facilitation is perhaps the most significant concern surrounding grazer presence in bunchgrass prairies (see Belsky and Gelbard 2000, entire, and references therein). Cattle and sheep may transport seeds of invasive plants in the gut, as burrs on their coats, or in mud on their hooves and legs, with a single animal reportedly capable of transporting tens of thousands of viable seeds per day and hundreds of thousands over a season (Belsky and Gelbard 2000, 9). When the soil, native grasses, and biocrusts are disturbed by grazers, these introduced seeds may face less competition in their new environment and become established as a result.

Rough goldenweed on both private and public lands is threatened by livestock grazing, including the grazing of trespass cows which have not been sufficiently prevented from accessing areas where grazing is not allowed (IDFG, unpublished data). Three of Oregon's populations (all but one of the populations outside the Nez Perce Precious Lands) are on BLM and USFS lands with active grazing allotments (Fig. 4). Similarly, the only reported USFS occurrence of this species in Washington is also within an active grazing allotment, and grazing is implicated as a threat to the ecosystems in Washington where rough goldenweed is found (Rocchio and Crawford 2015, 55, 169). These populations on federal land represent some of the more dispersed occurrences of this species, and their loss would collapse the already-small geographic range of rough goldenweed even further.

Surveys in Washington have noted at least two populations of rough goldenweed with evidence of flower heads removed by grazers (WNHP 2025). Removal of flower stems impacts not only the plants themselves but also the reproductive potential of the population in that year and future years. Grazing damage in Asteraceae has been associated with considerably lower reproductive success, with browsed Canada lettuce (*Lactuca canadensis*) having seven-fold fewer flowers and overall smaller fruits than those from unbrowsed plants (Shelton and Inouye 1995, 336). Rough goldenweed populations are under direct threat due to the continued grazing of livestock and trespass cattle in bunchgrass prairies. Livestock grazing is not managed in a way that allows for the maintenance of pristine ecosystems where rough goldenweed can thrive.

Predation

Insect predation on rough goldenweed has been noted at multiple sites. In the Nez Perce Precious Lands, rough goldenweed heads are damaged by boring and egg-laying activity from weevils, and later from the emerging larvae feeding on the flower heads (Yates 2013, 2). This has also been identified in sites in Craig Mountain WMA (Idaho), where the weevil *Anthonomus squamosus* was observed boring into flower heads and affecting reproductive capacity of the plants (Gray et al. 2005, 10). This predation is widely observed by multiple researchers, with comments citing "heavy predation" by weevils and noting this trend across many surveyed populations (Marshall 2024, 8). Moth caterpillars have also been observed to consume rough goldenweed leaf tissue, resulting in skeletonization in Washington (Yates 2013, 2) and Idaho

(Gray et al. 2005, 11). M. Darrach, an expert on the species, regards this as perhaps the greatest threat to extant rough goldenweed populations (personal communication, 17 April 2025).

Although these are native herbivorous insects which naturally consume rough goldenweed, research suggests that the relationship between herbivorous insects and plants may change in the future as drought and temperature both increase under climate change. Drought-stressed plants may be more prone to herbivory, and warmer climates may increase the speed of insect development, leading to more life cycles and larger insect populations in future growing seasons (Hamann et al. 2020, 1897). Hamann et al. further reviewed two studies which suggest that native perennials may suffer increased floral herbivory from herbivorous insects under drought and warming conditions (p 1903). This type of predation may be able to drive populations of a host plant to local extinction (Myers and Sarfraz 2017, 218).

Insect predation on rough goldenweed flower heads and seeds has already been well-documented in multiple populations, with some populations reported to have high degrees of observed florivory (WNHP 2025; IDFG, unpublished data). An increase in severity could be catastrophic for small populations of rough goldenweed, perhaps even leading to local extirpations like those noted by Myers and Sarfraz. Even without herbivory driving local extirpations, there is concern that the negative impacts of herbivory on fitness may exacerbate other negative impacts caused by changing abiotic conditions (Myers and Sarfraz 2017, 218).

Inadequacy of existing regulatory mechanisms

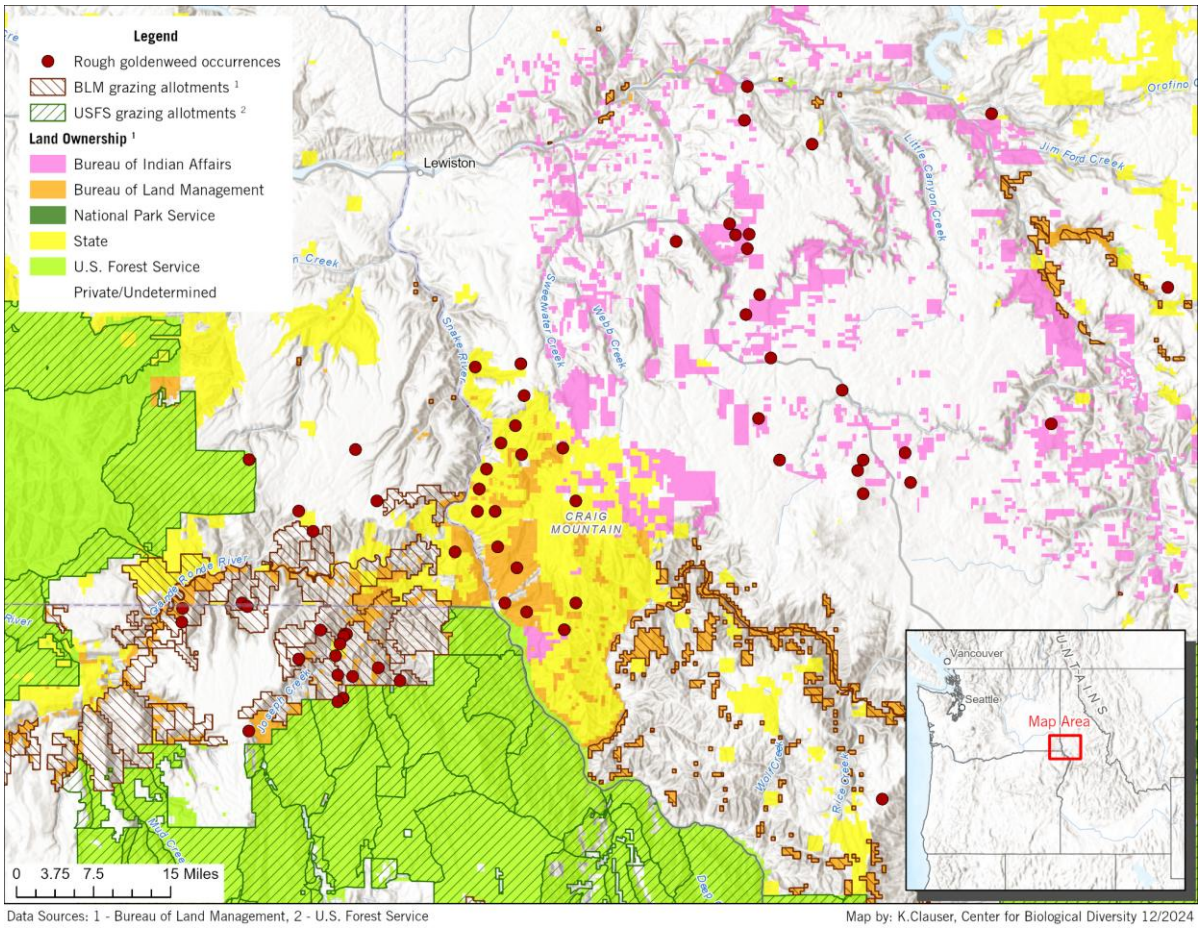

Figure 4. Map of rough goldenweed occurrences overlaid with land ownership (color) and grazing allotment (texture). Source: USFS and BLM data.

Federal management fails to adequately address grazing impacts

Despite the body of work which shows that cattle grazing significantly degrades ecosystems and is a major vector for invasive species introduction (see Belsky and Gelbard 2005, 5, and references therein), federal land management plans continue to disregard the negative environmental impacts of livestock grazing on public and wild lands. The current actions of the USFS and the BLM with regards to rough goldenweed populations fail to implement any conservation actions which meaningfully reflect these designations. Federal land and resource management plans seem to disregard the presence of rough goldenweed entirely.

US Forest Service (USFS)

Umatilla National Forest

The most recent Land Management Plan (2018) for Umatilla National Forest lists no protections for rough goldenweed, nor does it mention the species in any other context. A large portion of

Umatilla NF is actively grazed: in 2011-2013, it harbored around 7,700 cattle (USDA FS 2018a, 93). Land management in Umatilla NF is not sufficient to protect rough goldenweed.

Wallowa-Whitman National Forest

The most recent Land Management Plan (2018) for Wallowa-Whitman National Forest lists no protections for rough goldenweed, nor does it mention the species in any other context. Like Umatilla NF, Wallowa-Whitman continues to be actively grazed in habitat where rough goldenweed is found. In 2011-2013, the Wallowa-Whitman NF harbored nearly 23,000 cattle each grazing season (USDA FS 2018b, 94). Land management in Wallowa-Whitman NF is not sufficient to protect rough goldenweed.

Bureau of Land Management (BLM)

Grande Ronde Area of Critical Environmental Concern

The most recently published management document for the Grande Ronde ACEC is from 1989, where it is included in the much wider-scope Baker Resource Management Plan (RMP). Although an updated draft plan was released for public comment in 2011, it has yet to be finalized or released; therefore, the 1989 RMP still stands. This Plan of course does not mention rough goldenweed at all considering the date it was authored (BLM 1989, entire). The population of rough goldenweed at the Grande Ronde ACEC was first observed in 2003 (WNHP 2025) so the current RMP predates knowledge of this population and thus fails to protect it.

Unfortunately, ACECs may not protect the natural resources for which they are intended. ACECs are frequently ill-represented in RMPs (Sheldon and Baldwin 2017, 51) and critical resource management information for these sites is often left out of documentation (p 52). Many RMPs do not address whether or not the authorized resource use activities are actually in line with the reasons for which an ACEC was designated (p 54).

In the case of the Grande Ronde ACEC, the presence of an active BLM grazing allotment is a threat to rough goldenweed. Livestock grazing, alongside populations of the invasive yellow starthistle, have been noted in proximity to this rough goldenweed population (WNHP 2025). The Grande Ronde ACEC designation is not meaningfully protecting rough goldenweed.

Craig Mountain Wildlife Management Area

The WMA is jointly managed by the BLM and the Idaho Department of Fish and Game (IDFG). It contains large amounts of remaining rough goldenweed habitat and population and lists "*Pyrrocoma liatriformis*" (the old species designation for goldenweed at Craig Mountain, though all populations are now known to be *P. scaberula*) as a focal guild-sensitive plant species in its 2014 Management Plan (Barrett 2014, 43). The WMA Management Plan is also concerned with improvement of canyon grassland habitat where rough goldenweed is found (p 48).

The plan cites noxious weeds and invasive annual grasses as the primary threats to both canyon grasslands habitat and rough goldenweed (Barrett 2014, 46, 138). The Management Plan also acknowledges that the WMA's history of grazing has largely degraded livestock-accessible canyon grasslands habitat (p 48), yet many of the Plan sections which focus on specific threats and management targets downplay that impact to focus instead on noxious weeds. Instead of eliminating grazing within the WMA, the Plan mentions only that the use of grazing to manage habitats should be closely monitored and that the grazing plan should include "rotation plans, grazing rates, specifics for monitoring, and habitat mitigation plans" (p 21).

Around 9,000 acres (>10%) of the WMA are still grazed today (Barrett 2014, 140), and trespass grazing is a continued issue (p 58). Some managed grazing occurs in the northern part of the WMA simply because it is "an area with high levels of fragmented ownership boundaries where managed grazing is preferable to trespass grazing or spending limited resources on building and maintaining fences" (p 20). This choice, predicated in part on convenience, is unlikely to represent the best choice for the ecosystems and imperiled plants in those areas, including rough goldenweed.

While the Craig Mountain WMA is certainly providing some of the best current protections for rough goldenweed and its habitat, the continuation of grazing—which the Land Management Plan does endorse—will have no positive impacts for rough goldenweed or canyon grasslands. Cattle will continue to degrade habitat and contribute to the WMA's worsening invasive species problems for as long as they are permitted to continue grazing.

The Conservation Reserve Program

The Conservation Reserve Program (CRP) allows landowners to receive federal rental payments in exchange for making use changes to part of their land, particularly land that has been extensively farmed, is marginal for farming, or is experiencing severe erosion (FSA CRP homepage).

For competitive general enrollment, the FSA does not specifically address grassland quality or retention of native grassland species. Documentation suggests the Agency equally prioritizes the establishment of native and non-native species on general enrollment land. The two documents overviewing these practices are nearly identical, with no clear distinction to indicate the benefits of planting native species over introduced species[2] and no indication that the FSA incentivizes native species plantings which might benefit rough goldenweed. Equating these two types of grassland undermines the severity of invasive species proliferation in the American West, undervalues the contributions of native grassland species to healthy ecosystem function, and lessens the availability of ideal habitat for imperiled species such as rough goldenweed.

[2] FSA. CRP Practices Library, CP1 and CP2. https://www.fsa.usda.gov/resources/programs/conservation-reserve-program/practices-library. Accessed 21 February 2025.

This lack of FSA incentivization for native grassland restoration under general enrollment has led to an imbalance in the Pacific Northwest. While the overarching goal of the CRP is purportedly "to convert highly erodible and other environmentally sensitive acreage to vegetative cover, such as native grasses, trees, and riparian buffers" (FSA CRP homepage), introduced plantings outweigh native plantings in all states where rough goldenweed is found. That ratio is nearly 13:1 in Idaho (147k vs. 11.5k acres), 3.6:1 in Oregon (276k vs. 76k acres) and 1.2:1 in Washington (364k vs. 305k acres) (USDA FSA 2024, 23).

Both introduced and native grasslands can be enrolled under the grassland program. Native grasslands are presently much more well-represented both at a national scale and within rough goldenweed's range states (USDA FSA 2024, 28). Unfortunately, these native grasslands are registered as part of the CRP with the intention that the lands will still be grazed, per the CRP's stated goal of "preserving grasslands and promoting sustainable grazing practices" (CRP homepage). With the known detrimental impact of grazers on native grassland integrity (see Belsky and Gelbard 2005, 5, and references therein), the lands being placed under grasslands enrollment are unlikely to serve as high-quality rough goldenweed habitat.

With 26 million acres under lease as part of the CRP, this program has the potential to be a boon for imperiled native grasslands. Unfortunately, the CRP fails to actively promote the use of native species in grassland planting and therefore does not benefit native grassland plants, including rough goldenweed; on the contrary, it may contribute to habitat loss by encouraging the purposeful planting of non-native species and the continued grazing of remaining grassland fragments.

The Conservation Reserve Program harbors blind spots when it comes to prioritizing and valuing native grassland species, and its provisions are not sufficient to protect rough goldenweed from further decline.

State-level inadequacies

Idaho

The state of Idaho lacks an Endangered Species Act; this severely limits the state's ability to sufficiently protect rough goldenweed populations on non-federal public lands. In addition, many rough goldenweed populations in Idaho are in the Craig Mountain Wildlife Management Area (WMA). Land ownership of Craig Mountain is highly fragmented, owned by Idaho Department of Fish and Game, the Bureau of Land Management, the Nez Perce Tribe, the US Forest Service, the Idaho Department of Lands, and the Nature Conservancy. A relatively small part of Craig Mountain is privately owned and not considered a part of the WMA (Barrett 2014, 10). Populations of rough goldenweed which cross land ownership boundaries are more difficult to

fully survey, and conservation actions depend on collaboration and communication which can be difficult to orchestrate.

Oregon

There are no populations of rough goldenweed on state-owned lands in Oregon (Marshall 2024, 6). Therefore, Oregon's ability to protect rough goldenweed at the state level is limited and will be insufficient unless plants are found on non-federal public lands.

Washington

Of Washington's 97 Natural Area Preserves established by the state's Natural Area Preserves Act of 1972, only the BLM-owned Grande Ronde Area of Critical Environmental Concern (ACEC) contains rough goldenweed.[3] At present, the Natural Area Preserves Act is insufficient to protect rough goldenweed within the state of Washington.

Further, Washington's state Endangered Species Act does not contain provisions for plants at all (WAC 220-610), which severely limits the state's ability to sufficiently protect rough goldenweed populations on other non-federal public lands.

Private lands

Prairie remnants on private lands are not overseen or protected by any conservation authority. These prairie remnants are often intact only because the soil quality in that area is too poor to farm, limiting the plant communities that may be incidentally preserved through private landownership to those that can thrive in low-quality soils. Another issue with adequate conservation on private lands is the fact that some private landowners are leery of becoming involved in conservation due to concern over government regulations (Looney and Eigenbrode 2012, 82).

The difficulties associated with conservation of rough goldenweed populations on private lands make it even more imperative that adequate protections for rough goldenweed be implemented elsewhere. Conservation of rough goldenweed on public lands, along with education for private landowners who steward populations of imperiled plants like rough goldenweed, will be critical actions to ensure the persistence of this species.

Other natural or manmade factors affecting survival

Climate change: rising temperatures and increased drought

The most recent species report from the Oregon Biodiversity Information Center (ORBIC) places rough goldenweed as 'Highly Vulnerable' to climate change, meaning that its abundance and range extent are likely to decrease significantly by 2050 (ORBIC 2016).

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[3] https://www.dnr.wa.gov/NHPconservation. Appendix F.

The American West, and the Pacific Northwest in particular, are already experiencing shifts in temperature and precipitation which are symptomatic of global and regional climate change (Chang et al. 2023, 5). Temperatures in the PNW have increased by around 1.1℃ since 1900 and are estimated to be between 1.5 and 5.5℃ higher than in 1900 by the 2080s (*Id.*). Warmer winters are leading to reduced formation of mountain snowpack, a critical source of water throughout much of the PNW, with average snow water equivalent (a measure of depth and water content of snowpack) declining at more than 90% of measured sites (Mote et al. 2018, 2). Average annual snowpack has already declined by around 21% (p 3). Meanwhile, declining summer precipitation is further increasing the length, frequency, and severity of drought conditions (p 5).

Increased drought will have deleterious effects on Pacific Northwest bunchgrass prairies, some of which are already being observed. . In the National Bison Range, a long-protected area of intermountain bunchgrass prairie in western Montana, the temperature has increased by 0.7℃ since 1909 and precipitation has decreased by 10.9 cm in that same timeframe (Belovsky and Slade 2020, 5). Most of this change—63% of temperature increase and 21% of precipitation decline—has occurred since 1978 (p 5). As droughts become more frequent, bunchgrass prairies may struggle to recover during intervening periods of normal precipitation, and this lowered fitness may lead to poorer habitat quality for rough goldenweed.

Rough goldenweed is a natural inhabitant of xeric upland grasslands which may only receive precipitation in the winter months (Rocchio and Crawford 2015, 168). However, as anthropogenic changes continue to affect Earth's climate and weather patterns, it is likely that this area of the Pacific Northwest will see drought conditions at a higher frequency. Björk and Darrach (2009) noted such effects on populations of both rough and Palouse goldenweed in Idaho, reporting that all surveyed populations had "aborted lateral branches and flower heads" which were likely due to recent drought (p 236). This phenomenon has also been reported from at least one population in Washington (WNHP 2025).

Increasing drought in bunchgrass habitats may also serve to facilitate the proliferation of certain invasive grasses, such as cheatgrass (*Bromus tectorum*) and ventenata (*Ventenata dubia*). Many invasive grasses in the Pacific Northwest are annuals, which may benefit from drought conditions due to having higher passive and active nitrogen uptake rates than perennial species at low soil moisture levels (Everard et al. 2010, 9). This higher nitrogen uptake rate may allow annual grasses to outcompete perennial bunchgrasses in rough goldenweed's habitat.

Invasive plants

Bunchgrass grasslands and other areas of the Interior Northwest are vulnerable to invasion by non-native grasses and forbs, with the Pacific Northwest alone harboring over 860 species of

invasive plants (Belsky and Gelbard 2000, 4). Invasive grasses are both a cause of grassland decline and an active impediment to restoration (Weddell and Lichthardt 2000, 4). Jordan et al. (2008) showed that invasive species can modify native soil microbiota communities over several growth cycles, ultimately creating an environment that facilitates invasive seedling growth (p 181) and inhibits native forb growth (p 182).

Rough goldenweed's limited populations are directly threatened by invasive species. All of Washington's populations are growing in the presence of invasive species (WNHP 2025), and invasive plants are noted as the "single biggest threat" to the ecology of the Nez Perce Precious Lands wildlife area (Sondenaa and McClarin 2017, 12), where the vast majority of Oregon's rough goldenweed populations are located. In Idaho, non-native weed control is a suggested management need for multiple populations (IDFG, unpublished data) and the BLM recognizes invasive species as responsible for habitat degradation at several sites (IDFG, unpublished data).

Ventenata

Ventenata (*Ventenata dubia*) is an annual grass thought to be native to Mediterranean Europe and north Africa (McKay et al. 2017, 19). It was first identified in Washington in 1952, and by the mid-1980s had begun to spread throughout the Pacific Northwest (Fryer 2017, pp 2–3). In the Zumwalt Prairie Preserve in Oregon, where ventenata is considered the primary invader, the species has been found in both old farming plots and intact xeric grasslands (Endress et al. 2020, 58). This ability to invade both disturbed and undisturbed habitats makes its continued spread especially worrying for native bunchgrass prairie species.

Ventenata is so prolific that it may be capable of outcompeting even cheatgrass (*Bromus tectorum*). Some botanists theorize that ventenata may be allelopathic, producing chemicals which negatively impact neighboring plants and allow the species to become competitively dominant and form near-monospecific stands in places which once harbored a great diversity of native plants and forbs. In his doctoral dissertation, D. Griffith suggested that ventenata's success may come from a beneficial interaction with the pathogen *Fusarium*, wherein infection by *Fusarium* has positive effects on ventenata seedling emergence and biomass while having negative effects on both bluebunch wheatgrass and cheatgrass seedlings (Griffith 2015, 39).

Invasion of ventenata may lower the abundance and health of native species. One survey at a site in Washington noted that rough goldenweed was not found in areas of high ventenata cover (WNHP 2025). In a greenhouse experiment, ventenata was also found to reduce shoot biomass of bluebunch wheatgrass (*Pseudoroegneria spicata*) by 20% when the two were grown together (McKay et al. 2017, 20), potentially due to overlap in root depth and time of emergence (p 21). As rough goldenweed is commonly found in habitats dominated by bluebunch wheatgrass (M. Darrach, personal communication, 5 December 2024), the effects of ventenata on this bunchgrass will further impact rough goldenweed habitat where they overlap.

Cattle grazing is frequently proposed as a method for controlling invasive species, including ventenata, but there is evidence that livestock forage preferences may not align with this goal (Belsky and Gelbard 2000, 12). One study found ventenata was only palatable to livestock early in the season, when it was still shorter than surrounding bunchgrasses, and that it became unpalatable due to its high silica content by the time it outgrew native neighbors (Brummer et al. 2023, 92).

Other invasive plants

Cheatgrass (*Bromus tectorum*) has been observed in the Nez Perce Precious Lands in Oregon (Sondenaa and McClarin 2017, 12); at Craig Mountain in Idaho (Gray and Lichthardt 2003, 5) and in numerous rough goldenweed populations in Washington (WNHP 2025). Other annual bromes, including *B. inermis, B. hordeaceus,* and *B. japonicus* have also been noted at some of these and other Washington populations. Other grasses include medusahead (*Taeniatherum caput-medusae*), tall oat-grass (*Arrhenatherum* elatius), timothy (*Phleum pratense*), and orchard grass (*Dactylis glomerata*) (see Sondenaa and McClarin 2017, 12; WNHP 2025; and Gray and Lichthardt 2003, pp 5, 9, 10 for breakdowns by location).

Jordan et al (2008) observed a negative impact of invasive grasses on native forbs in a greenhouse experiment. White heath aster (*Symphyotrichum [=Aster] ericoides*), a native forb in the same family as rough goldenweed, performed poorly when grown in native soil which had its native biota altered by growth of invasive species (Cox and Allen 2011, 182–184). Rough goldenweed may experience similar detrimental effects when growing in areas of high invasive cover, particularly if those invasives are well-established.

In addition to grasses, many invasive forbs—some equally noxious and capable of competitive dominance—have been documented in and around rough goldenweed habitat. Yellow starthistle (*Centaurea solstitialis*) has been present in the Pacific Northwest since the late 1800s (Gerlach 1997, 5). This weedy forb has been noted near rough goldenweed populations in all states (Sondenaa and McClarin, 12; WNHP 2025; Gray and Lichthardt 2003, 10). Its presence was noted specifically near rough goldenweed in Washington, with surveyors commenting "nonnatives, especially *Centaurea solstitialis*, should be brought under control" to better steward the rough goldenweed at the site (WNHP 2025). Another member of the genus, spotted knapweed (*Centaurea maculosa*), is a noxious weed in the Palouse prairielands, where it may inhibit native plant growth by releasing chemicals into the soil (Ridenour and Callaway 2000, 444). Seedlings of the native bunchgrass Idaho fescue (*Festuca idahoensis*) grown in proximity to spotted knapweed had a biomass that was 50% lower than those grown in the control treatment (p 448). This allelopathy may be part of what has allowed spotted knapweed to establish near-monospecific stands in parts of the Palouse prairie and suggests the severity of an invasion by a similar species near rough goldenweed populations.

Other forbs which have been documented in proximity of rough goldenweed include rush skeletonweed (*Chondrilla juncea*), common crupina (*Crupina vulgaris*), sulfur cinquefoil (*Potentilla recta*), and bachelor button (*Centaurea cyanus*) in Oregon (Sondenaa and McClarin 2017, 12); bur chervil (*Anthriscus caucalis*), and teasel (*Dipsacus* sp.) in Washington (WNHP 2025); and tumblemustard (*Sisymbrium altissimum*) at Craig Mountain in Idaho (Gray and Lichthardt 2003, pp 5, 9, 10).

Mitigating disturbance is important to slow the spread of non-native plants

In general, successful invaders tend to be cosmopolitan, opportunistic, and disturbance-adapted (Gray and Lichthardt 2003, 11; Weddell and Lichthardt 2000, 6). They may move into grasslands after grazing disturbance or wildfire, both of which can disrupt normal ecological processes. After the ground has been cleared of native species and protective biocrusts, seeds from non-native plants which were transported on livestock or present in the seed banks of nearby areas will have an easier time taking root and spreading (Weddell and Lichthardt 2000, 6). One study in the Great Basin ecoregion found that as cattle grazing disturbance increased, biocrust cover decreased and invasive cover increased (Peterson 2013, 5).

Seabloom et al. (2003) also found that disturbance is likely to play a critical role in the successful establishment of non-native species. In southern California, where invasive annual grasses have come to dominate millions of hectares of grassland, introducing exotic seeds into stands of native perennial grass was not enough to promote successful invasion; this was potentially because the resident grasses did not leave enough sunlight, soil moisture, or nitrogen for exotic seedlings to establish (Seabloom et al. 2003, 13387). Conversely, native seeds introduced to invasive-dominated patches were able to germinate and grow, ultimately leading to a reduction in annual cover after several years (p 13387). This pattern only held true for undisturbed patches; when fire, soil disturbance, or mowing were introduced, coverage by annual invasives greatly increased (p 13386). As long as these disturbances are perpetuated across rough goldenweed habitat, the threat of invasive species will continue to creep further into bunchgrass prairies and endanger the numerous rare and imperiled plants in these ecosystems, rough goldenweed among them.

Wildfires

Invasive species, particularly invasive grasses, alter the fire cycle in bunchgrass prairies by providing an overabundance of dry tinder earlier in the season and leading to an increase in the number of fires; this, in turn, may help facilitate turnover from native species to the quick-colonizing, disturbance-tolerant invasive species (Gray et al. 2005, 12). Evidence suggests the western United States is experiencing an ongoing increase in frequency, severity, and extent of wildfires, as well as an increase in the duration of fire season. Between 1984 and 2008, fire season in Washington and Oregon has grown in duration by nearly 2 months (Wing and Long

2015, 125), with the number of large fires and the average area burned each year both doubling in that same timespan (p 122).

Conversely, fire suppression in some systems may be causing further problems, with a reduction in the frequency of low-intensity fires leading to an increase in the number of high-severity fires after a buildup of undergrowth and debris (Rocchio and Crawford 2015, 57).

Direct impact of fire on goldenweed populations is a concern of some resource managers. A 2000 wildfire at a site in the Craig Mountain WMA in Idaho potentially led to a decrease in number of *Pyrrocoma* observed, from 103 plants in 1998 to 27 in 2004, with the fire having occurred in 2000 (Gray et al. 2005, 12). Another wildfire in Craig Mountain was not noted to severely disrupt *Pyrrocoma* populations, but surveyors did observe encroachment of invasive weeds at those sites following the fire (Gray et al. 2005, 8). As wildfire cycles continue to change, greater impact on even the most protected and largest populations of rough goldenweed may be inevitable.

Small, fragmented populations

Small populations of rough goldenweed are vulnerable to demographic and environmental stochasticity, which put this species at risk of local extinction across many of its populations. All populations of rough goldenweed in Washington and Oregon, along with the vast majority in Idaho, are fewer than 1,000 plants, and many are smaller than 100 (Marshall 2024; WNHP 2025; IDFG, unpublished data). Small populations face genetic consequences, including inbreeding and associated loss of genetic diversity, which can impact long-term fitness and stability at that site and ultimately contribute to stochastic losses (Ellstrand and Elam 1993, 219). One study of rare plants found an extirpation rate of 27% over ten years, with highest rates of extinction for the smallest (<100 individuals) and most isolated populations (Matthies et al. 2004, 484).

Another mediator of genetic diversity is pollinator foraging distance, which limits gene flow between populations if they are too far apart. The specific pollinators of rough goldenweed have not been identified, but Oregon State University's Oregon Bee Atlas identifies potential pollinators as primarily Apidae (honeybees and bumblebees), Halictidae (sweat bees), and Megachilidae (mason, leafcutter, carder, and resin bees), with a few specimens of Andrenidae (miner and fairy bees) and Colletidae (plasterer bees) identified as well (OSU 2025). Many native bees have small forage distances, so it is likely that gene flow between populations is limited or, at many sites, absent (M. Darrach, personal communication, 17 April 2025; Marshall 2024, 11). Small population sizes and fragmented population distribution both present a threat to the continued health of rough goldenweed populations and may lead to stochastic extinctions in the near future.

Request for critical habitat designation

Critical habitat as defined by Section 3 of the ESA is: "(i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) the specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species." (16 U.S.C. § 1532(5)).

Congress recognized that the protection of habitat is essential to the recovery and/or survival of listed species, stating that: "classifying a species as endangered or threatened is only the first step in ensuring its survival. Of equal or more importance is the determination of the habitat necessary for that species' continued existence... If the protection of endangered and threatened species depends in large measure on the preservation of the species' habitat, then the ultimate effectiveness of the Endangered Species Act will depend on the designation of critical habitat." H. Rep. No. 94-887 at 3 (1976).

The Center requests that the Service propose to designate critical habitat concurrently with rough goldenweed's proposed listing. As bunchgrass prairies continue to shrink and change in response to anthropogenic activity, the spread of invasive species, and the persistently shifting climate, action must be taken to preserve rough goldenweed's already small, fragmented habitat from further loss and degradation.

In addition, the rayless population of rough goldenweed, located in Asotin County, WA (WNHP 2025), should be protected. This morphologically unique subset of the species is located within a USFS grazing allotment, placing it at risk of extirpation due to the direct and indirect impacts of grazing and an encroaching ventenata invasion (M. Darrach, personal communication 26 November 2024). A designation of critical habitat will help ensure its preservation.

Conclusion

The best available scientific data strongly indicates that rough goldenweed is imperiled across a significant portion of its range. Historic habitat loss has curtailed and fragmented the bunchgrass prairies where it grows, leaving most populations small and isolated amidst large monoculture tracts of dryland agriculture.

Present conservation status does not provide sufficient protections to ensure the continued survival of rough goldenweed. Federally-permitted grazing on rough goldenweed habitat, along with programs which promote farmland conversion and fund the creation of non-native grasslands throughout rough goldenweed's habitat, allow invasive species to proliferate and spread. Wildfires, drought, and low population connectivity are all further threats to rough goldenweed which are expected to significantly worsen as climate change and invasive species spread persist in the immediate future.

Without formal protections in place for the largest populations of rough goldenweed, their preservation is not ensured. For example, 90% of the recently-delisted plant Bradshaw's lomatium (*Lomatium bradshawii*) was destroyed in October 2024 by the golf course which had stewarded it throughout its recovery as an ESA-listed species. This single act represented a loss of 3.7 million plants (Neumann 2024). Likewise, the presence of several large populations of rough goldenweed which today are intact and healthy is not enough to expect the long-term unlisted survival of the species, particularly without a sense of how those populations compare to historic, pre–agricultural conversion population sizes. Federal protections must be put in place, and critical habitat must be designated, to prevent the collapse of rough goldenweed's extant populations. The ESA requires that the Service promptly issue an initial finding as to whether this petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. § 1533(b)(3)(A).

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