SPECIES: Scientific [common]	***Orobanche corymbosa var. corymbosa* [Flat-top broomrape]** Synonyms: *Orobanche corymbosa* ssp. *corymbosa*
Forest:	Bridger-Teton National Forest
Forest Reviewer:	Randall Griebel
Date of Review:	10/14/2021
Forest concurrence (or recommendation if new) for inclusion of species on list of potential SCC: (Enter Yes or No)	NO

FOREST REVIEW RESULTS:

1. The Forest concurs or recommends the species for inclusion on the list of potential SCC:
   Yes___ No_X__

2. Rationale for not concurring is based on (check all that apply):
   Species is not native to the plan area _____
   Species is not known to occur in the plan area _____
   Species persistence in the plan area is not of substantial concern ___X____

FOREST REVIEW INFORMATION:

1. Is the Species Native to the Plan Area? Yes_X__ No___

   If no, provide explanation and stop assessment.

2. Is the Species Known to Occur within the Planning Area? Yes_X__ No____

   If no, stop assessment.

Table 1. All Known Occurrences, Years, and Frequency within the Planning Area

Year Observed	Number of Individuals	Location of Observations (USFS District, Town, River, Road Intersection, HUC etc.)	Habitat Description	Source of Information
1922	Unknown	**On Bridger-Teton National Forest:** Township WY060380N1140W0	No information available.	Taxon ID: 14268 (WYNDD 2021a)
7/28/1992	Unknown	**On Bridger-Teton National Forest:** U.S.A., Wyoming, Sublette County: East Slope Wyoming Range; ridge	South-facing rocky sagebrush ridge in sandy soil. Stem mostly buried in sand. Phenology: flowering.	Collector: Walter Fertig, 13215. (Rocky Mountain Herbarium

		on northeast bank of West Fork Nylander Creek, ca 35 air mi NW of Big Piney. Elev. 8200 ft.		2021, SEINET 2021, WYNDD 2021a)
9/11/1998	Unknown	**Outside Bridger-Teton National Forest:** U.S.A., Wyoming, Teton County: Grand Teton National Park: sagebrush flat, 100 ft E of Lake Moraine Horse Trail, ca 0.5 air mi NE of Jenny Lake Ranger Station.	Corridor of sagebrush dominated by *Artemisia tridentata, Artemisia arbuscula, Poa pratensis* and *Eriogonum umbellatum,* bordered by *Pinus contorta, Pseudotsuga menziesii* and *Abies lasiocarpa*. Elev. 6800 ft. Phenology: flowering.	Collector: Stuart Markow, 11789. (Rocky Mountain Herbarium 2021, WYNDD 2021a)
7/30/2000	Unknown	**Outside Bridger-Teton National Forest**: U.S.A., Wyoming, Teton County: Grand Teton National Park: north end of sagebrush flat ca 100 ft S of boundary of R Lazy S Ranch, ca 0.5 air mi E of Moose-Wilson Road, ca 200 yds W of Snake River, ca 3.5 air mi S of Moose.	Sagebrush-steppe with *Artemisia tridentata* var. *vaseyana, Poa pratensis, Festuca idahoensis, Koeleria macrantha, Lomatium ambiguum*. Elev. 6400 ft. Phenology: flowering & fruiting.	Collector: Stuart Markow, 12044. (Rocky Mountain Herbarium 2021, WYNDD 2021a)
7/8/2002	Unknown	**Outside Bridger-Teton National Forest**: U.S.A., Wyoming, Teton County: Grand Teton National Park: hillside ca 1.5 air mi NE of Wolfe Ranch, 2.5 air mi S of Moran. Elev. 6900 ft.	Big sagebrush on southwest facing slope with bunchgrass and low forbs. Var./ssp. unidentified Phenology: flowering.	Collector: Valerie Kurth, with L. Darby, C. Bolen, collector # unknown (Rocky Mountain Herbarium 2021, WYNDD 2021a)
2004	Unknown	**Outside Bridger-Teton National Forest**: U.S.A., Wyoming, Teton County: Grand Teton National Park	No information available.	Taxon ID: 14268 (WYNDD 2021a)

The Consortium of Pacific Northwest Herbaria was also searched, and no additional occurrences were found (Consortium of Pacific Northwest Herbaria 2021).

a. Are all Species Occurrences Only Accidental or Transient?

Yes___ No_X__

If yes, document source for determination and stop assessment.

b. For species with known occurrences on the Forest since 1990, based on the number of observations and/or year of last observation, can the species be presumed to be established or becoming established in the plan area?

Yes_X_ No___

If no, provide explanation and stop assessment

c. For species with known occurrences on the Forest predating 1990, does the weight of evidence suggest the species still occurs in the plan area?

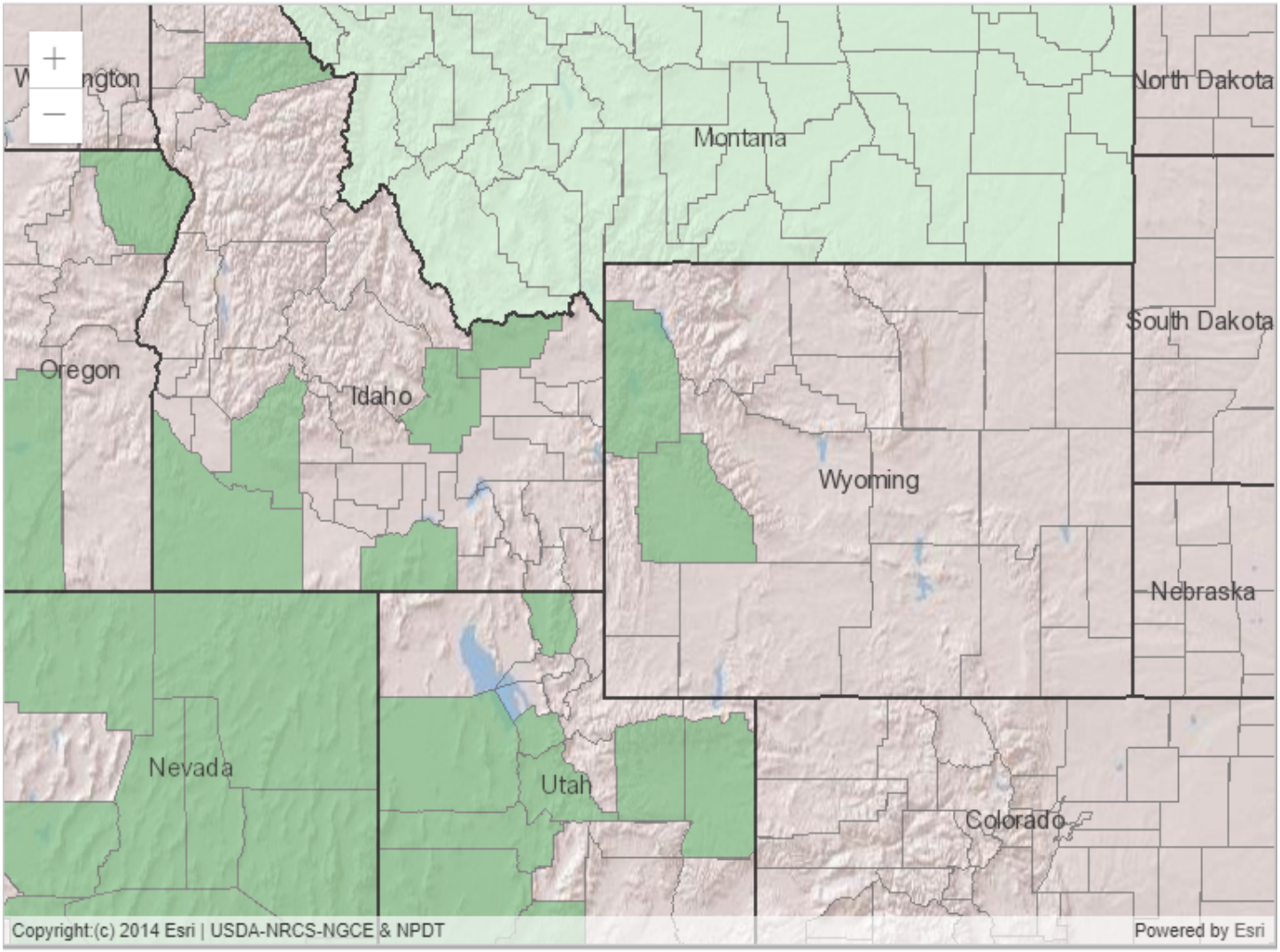
Yes___ No___

Provide explanation for determination

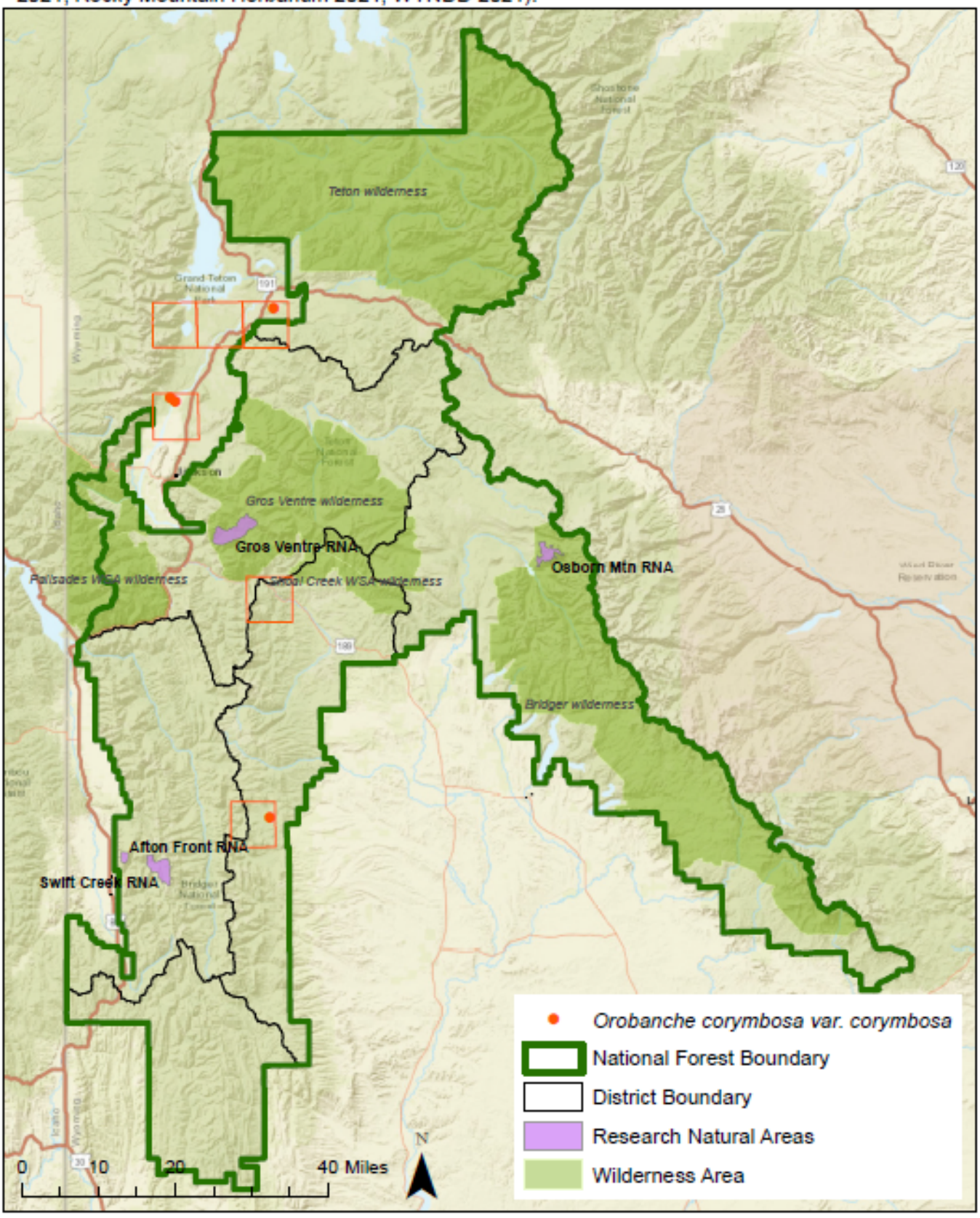
N/A-Occurrences have been documented since 1990

If determination is no, stop assessment

d. **Map 1**, *Orobanche corymbosa* ssp. *corymbosa* range in Wyoming and surrounding states (NRCS 2021).



Map 2, *O. corymbosa var. corymbosa* occurrences in Bridger-Teton National Forest vicinity (SEINet 2021, Rocky Mountain Herbarium 2021, WYNDD 2021).



3. Is There Substantial Concern for the Species' Capability to persist Over the Long-term in the Plan Area Based on Best Available Scientific Information?

Table 2. Status summary based on existing conservation assessments

Entity	Status/Rank (include definition)
NatureServe Global Status	**G4 –Apparently Secure** *At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors (apparently secure).*
NatureServe State Status	**S1S2 – Critically Imperiled to Imperiled** *At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors (critically imperiled); At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors (imperiled).*
WYNDD	**Species of Concern** **G4/S1S2** *Species vulnerable to extirpation at the global or state level due to:* *a. their rarity (e.g., restricted distribution, small population size, low population density)* *b. inherent vulnerability (e.g., specialized habitat requirements, restrictive life history)* *c. threats (e.g., significant loss of habitat, sensitivity to disturbances)*
USDA Forest Service	Not Region 4 Sensitive
USDOI FWS	Not Listed
USDOI BLM	Not Listed
IUCN	Not Listed

Sources: Heidel 2018; IUCN 2021; NatureServe 2021; USDA Forest Service Regions 2 and 4 Sensitive Species Lists; WYNDD 2020b

Table 3. Status summary based on best available scientific information.

Criteria	Rationale
Distribution on the Bridger-Teton National Forest	There is one recent and one historic documented occurrence of *O. corymbosa* var. *corymbosa* on the Bridger-Teton National Forest; the more recent (1992) occurrence is from a rocky sagebrush ridge on the East Slope Wyoming Range (Table 1 and Map 2). An additional four occurrences have been documented within sagebrush communities in proximity to, but outside the border of, the Bridger-Teton National Forest. The scarcity of recent occurrences directly on the Bridger-Teton National Forest suggests the species may be sparsely distributed on the Forest, but further surveying effort is needed to better define the distribution.
Distribution outside the Bridger-Teton National Forest	The range of *O. corymbosa* var. *corymbosa* extends from eastern Washington to northwestern Wyoming, south to California, Nevada, and western Utah (NatureServe 2021; WYNDD 2021b). It is known from 10 occurrences in Wyoming, in Jackson Hole and the Absaroka and Wyoming Ranges (Sublette, Park, and Teton Counties) (Rocky Mountain Herbarium 2021; WYNDD 2021a, 2021b). This subspecies occurs in Yellowstone and Grand Teton National Parks and on lands managed by Bridger-Teton and Shoshone National Forests
Abundance on the Bridger-Teton National Forest	*O. corymbosa* var. *corymbosa* is considered rare in Wyoming (Heidel 2018). It may also be rare on the Bridger-Teton National Forest, however as records do not report abundance, overall abundance on the Bridger-Teton National Forest cannot be assessed.
Population Trend on the Bridger-Teton National Forest	Population trends for this species are reported as moderate in Wyoming (Heidel 2018). This indicates trends may also be moderate or stable on the Bridger-Teton National Forest, but further surveys are needed for verification.
Habitat Trend on the Bridger-Teton National Forest	*O. corymbosa* var. *corymbosa* occurs on open slopes in the foothills and valleys, commonly parasitic on *Artemisia tridentata*. Wyoming populations are in sagebrush grasslands, juniper communities, and forest openings (WYNDD 2021b). The 1992 occurrence on the BTNF was on a south-facing rocky sagebrush ridge in sandy soil, but habitat for the historic (1922) occurrence is not available (Table 1). Vegetation mapping on the Bridger-Teton National Forest shows that 11 percent of the Forest area is classified as the Inter-Mountain Basins Montane Sagebrush Steppe biophysical setting (BpS), indicating that habitat for *O. corymbosa* var. *corymbosa* is available on the Forest (Helmbrecht et al. 2012). Mapping also

Criteria	Rationale
	indicates that this habitat may be subject to high-severity fires (Helmbrecht et al. 2012). In general, nonforest ecosystems of the Intermountain West have been affected by agriculture, livestock grazing, and invasive species (Halofsky et al. 2018). Rangelands form a major component of ecosystems in the Bridger-Teton National Forest, and there are open rangelands throughout the Forest, which likely overlap habitat for the species (USFS GIS 2019). Grazing may have impacted habitat to some extent by compacting sediment, trampling herbaceous vegetation, increasing bare ground, and facilitating noxious weed expansion, but adherence to rangeland management plans has likely limited impacts. In general, the rocky ridge where the 1992 occurrence of *O. corymbosa* var. *corymbosa* occurs is likely stable with low potential to change from forest management activities. To analyze trends in occupied habitat, aerial imagery and a USFS GIS database of existing grazing allotments, invasive plant populations, historical wildfires, trails, roads, Wilderness Areas, and Research Natural Areas were assessed at each occurrence on the Forest (USFS GIS 2019; Google Earth Pro 2021). None of the mapped occurrences occur within Wilderness Areas or Research Natural Areas, and thus habitat is not receiving protections from anthropogenic activities otherwise afforded by these designations. Both occurrences are in the vicinity of roads and/or trails. Road use may have facilitated human presence into the species' habitat, which could cause habitat degradation and damage to individuals (e.g., through trampling). Both occurrences are also within active RMUs, and it is likely that habitat has been impacted by grazing. Both occurrences are near (within 5 mi) invasions of the non-native plants, Canadian thistle (*Cirsium arvense*) or nodding plumeless thistle (*Carduus nutans*). Both these invasive species grow under a wide range of environmental conditions (Zouhar 2001, 2002), and may thus compete for habitat with *O. corymbosa* var. *corymbose* and degrade habitat conditions. The historic (1922) occurrence occurs near or within the perimeter of several large fire events, and there is a good chance the population and habitat has been impacted by burning, including potential loss of individuals or populations. The above analysis suggests that habitat for *O. corymbosa* var. *corymbosa* has likely experienced moderate to high effects from natural and anthropogenic disturbances.

Criteria	Rationale
	Climate change may cause further effects as described below.
Threats to the Species and its Habitat on the Bridger-Teton National Forest	Trampling is a potential threat to *O. corymbosa* var. *corymbosa* (WYNDD 2021b), particularly since rangelands likely overlap habitat for the species (USFS GIS 2019). Climate change is likely a significant threat to nonforest ecosystems of the Intermountain West. Projections for the Intermountain Adaptation Partnership region estimate that average annual minimum and maximum temperatures are likely to increase by 5 to 12 deg F, mean annual precipitation will remain the same or increase slightly, extreme events (e.g., drought and extreme precipitation events) will occur more frequently and be more severe, and greenhouse gas concentrations will continue to increase through the end of the 21st century. Increased minimum daily temperatures have resulted in longer frost-free periods. Projections vary by subregion, but even where precipitation is projected to increase slightly, higher temperatures are likely to increase effective drought and soil water deficit (Halofsky et al. 2018). Changes in temperature and precipitation may also lead to greater variability in forb flowering, which could create an asynchronistic effect with native pollinator emergence (Halofsky et al. 2018; Miller-Struttmann et al. 2015), leading to decreased reproduction in native plants. As pollinators are critical for successful reproduction and seed set for approximately 85% of flowering species globally (Hatfield et al. 2012), this asynchronistic effect may have profound implications. Invasive plants have been identified as a major threat to the biological diversity and ecological integrity within and outside the BTNF. Invasive plants create many adverse environmental effects, including, but not limited to: displacement of native plants; reduction in functionality of habitat and forage for wildlife and livestock; threats to populations of threatened, endangered and sensitive species; alteration of physical and biological properties of soil, including productivity; changes to the intensity and frequency of fires; facilitation of further invasive species invasions; and loss of recreational opportunities (Halofsky et al. 2018). The presence of invasive plant species may be compounded by the presence of cattle which may create an environment more conducive to the establishment of invasive plant species (Halofsky et al. 2018).

Criteria	Rationale
Life history and demographic characteristics of the species	*O. corymbosa* var. *corymbosa* is a fleshy, root-parasitic herb with reddish-purple to violet, glabrous or glandular stems 5-12 cm tall. The inflorescence is a short, densely-flowered corymb 2.5-5 cm long. Flowers are nearly sessile or borne on stalks less than 3 cm long and are subtended by 1-2 linear bracts and 1 broader bract. The calyx is 12-24 mm long and deeply divided into 5 subequal, narrow lobes. The calyx is equal to or shorter than the corolla. The tubular corolla is glandular, 18-28 mm long and is light purple with pink nectar guidelines or yellow blotches on the 3-6 mm long lobes. Anthers are woolly-pubescent. The fruit is a capsule 8-14 mm long (Jones et al. 2001; WYNDD 2021b).
Date: Lindsay Chipman Reviewer: October 1, 2021	

Summary and Recommendations

Orobanche corymbosa var. corymbosa is ranked as apparently secure throughout its range, and critically imperiled to imperiled and a plant species of concern in the state of Wyoming, where it is known from Sublette, Park, and Teton Counties. There are two documented occurrences on the Bridger-Teton National Forest, and several additional occurrences in proximity to, but outside the border of, the Bridger-Teton National Forest, primarily sagebrush grasslands, juniper communities, and forest openings. Abundance on the Forest is unknown; population trends are moderate in Wyoming, and populations on Bridger-Teton National Forest may also be moderate or stable but further surveys are needed for verification. Trampling and climate change are potential threats to the subspecies, and habitat, though somewhat abundant, has likely experienced moderate to high effects from natural and anthropogenic disturbances. Due to a lack of information on population trends and abundance directly on the Bridger-Teton National Forest, *O. corymbosa var. corymbosa* is not recommended as a species of conservation concern at this time; if future surveys indicate concerns based on population trends and abundance, the species should be reassessed.

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