SPECIES: Scientific [common]	*Parnassia kotzebuei* [Kotzebue's grass-of-Parnassus]
Forest:	Bridger-Teton National Forest
Forest Reviewer:	**R.Lehman**
Date of Review:	**4/8/20; 4/7/21**
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[1]
8/8/1925	Unknown	Bridger-Teton National Forest: Bridger Wilderness: In the vicinity of Green River Lakes: White Rock Mountain. 43.2578° N, 109.7994° W; uncertainty 1 mi.	Limestone/sandstone boulder field on rocky spire. In flower and fruit. Elev. 11200 ft.	Collector: Edwin B. Payson, 4617. EO #8 (Rocky Mountain Herbarium 2020; WYNDD 2019)
7/28/1980	Unknown	Northern border of Bridger-Teton National Forest. 0.5 miles	In moss in small rivulet. Associated with *Ranunculus pygmaeus*.	Erwin F. Evert EO #14 (WYNDD 2019)

		southeast of the summit of Chaos Mountain. Possibly outside national forest.		
8/17/1991	Unknown	Bridger-Teton National Forest: Teton Wilderness: West Slope Wind River Range: East and west face of White Rock Mountain, ca 27 air mi N of Pinedale. 43.2578° N, 109.7994° W; uncertainty 1 mi.	Limestone/sandstone boulder field on rocky spine and east-facing slope. Summit of east face of White Rock Mountain. Elev. 10000-11200 ft.	Collector: Walter Fertig, 11607. EO #8 (Rocky Mountain Herbarium 2020; SEINet 2020; WYNDD 2019)
7/30/1994	Unknown	Bridger-Teton National Forest: Teton Wilderness: Absaroka Mountains: at head of Camp Creek, ca 6 mi S of Thorofare Creek, ca 45 mi NW of Dubois. 44.04° N, 109.9217° W	Wet tundra with *Caltha leptosepala*, *Carex nigricans*, and *Juncus mertensianus*. Elev. 10400 ft.	Collector: Erwin F. Evert, 28470 (Rocky Mountain Herbarium 2020; SEINet 2020)
8/4/1998	Unknown	Bridger-Teton National Forest: Gros Ventre Wilderness: Gros Ventre Range: base of Triangle Peak above southeast shore of Brewster Lake, ca 11.5 mi NE of Bondurant. 43.371° N, 110.2735° W; uncertainty 0.25 mi.	Moist ledge below steep talus slope; area wet from snow melt; grassy, wet tundra on thin clay soil on bench; vegetative cover 85%; dominated by *Salix rotundifolia*, *Kobresia myosuroides*, and *Festuca brachyphylla*. Elev. 10000 ft.	Collector: Walter Fertig, 18486. EO #11 (Rocky Mountain Herbarium 2020; SEINet 2020; WYNDD 2019)

[1]The Consortium of Pacific Northwest Herbaria (Consortium of Pacific Northwest Herbaria 2020) was also searched, and no additional occurrences on the Bridger-Teton National Forest were found.

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?

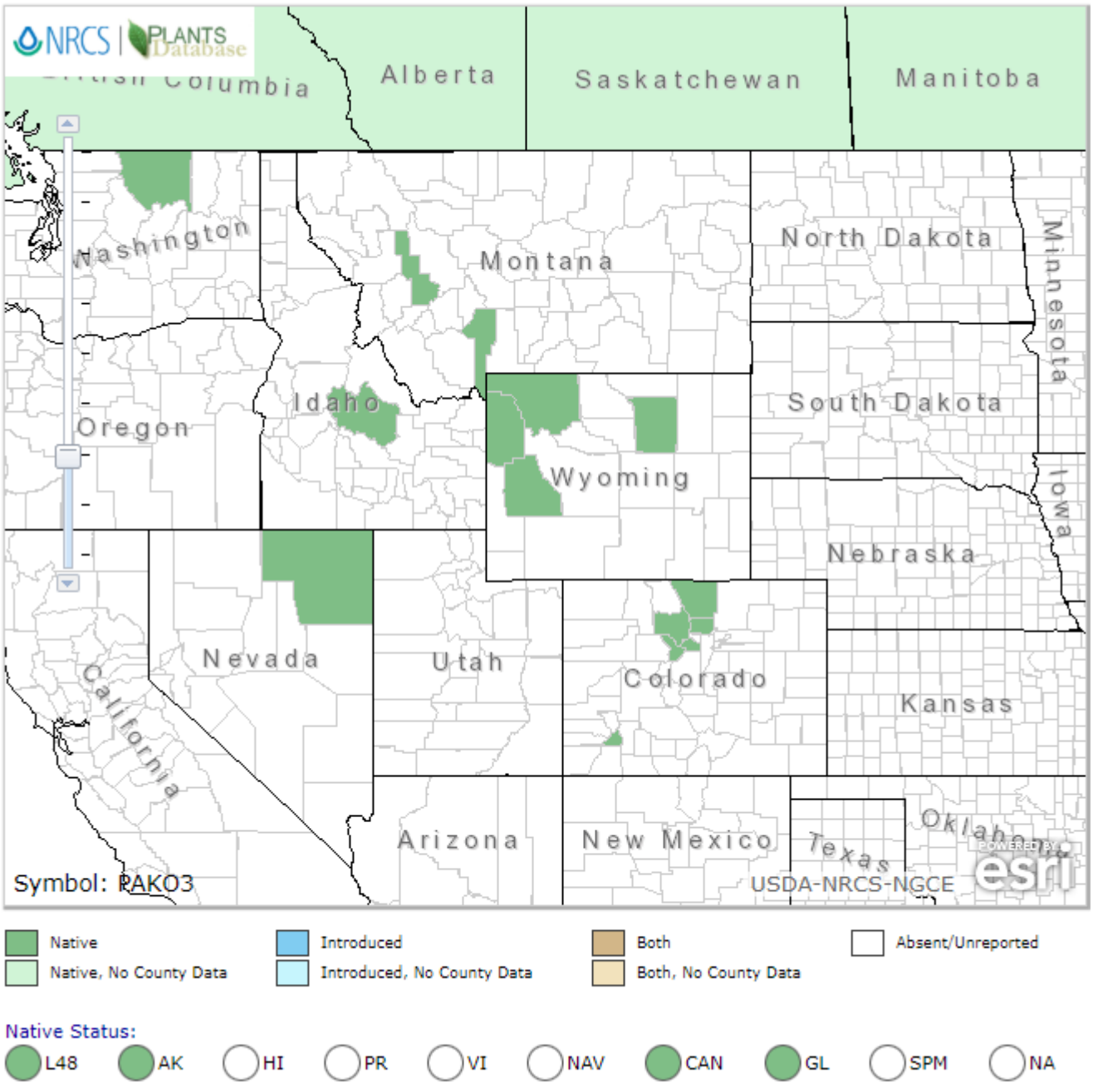
Yes___ No___

Provide explanation for determination

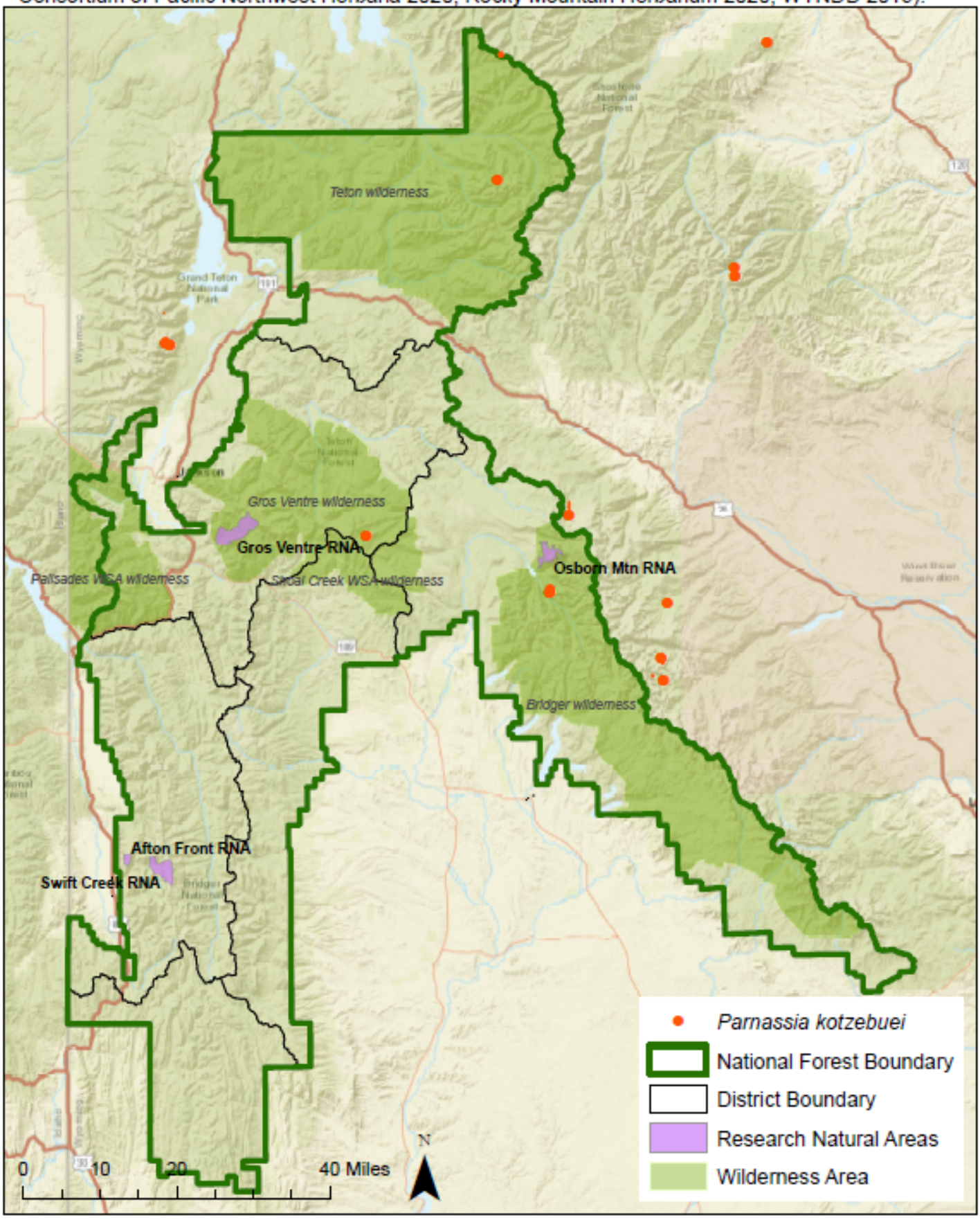
N/A–Occurrences have been documented since 1990.

If determination is no, stop assessment

Map 1, *Parnassia kotzebuei* range in Wyoming and surrounding states (NRCS 2019).



Map 2, *P. kotzebuei* occurrences in Bridger-Teton National Forest vicinity (SEINet 2020; Consortium of Pacific Northwest Herbaria 2020; Rocky Mountain Herbarium 2020, WYNDD 2019).



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	**G5—Secure** *Common; widespread and abundant.*
NatureServe State Status	**S2—Imperiled** *At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.*
WYNDD	**Plant Species of Potential Concern** *Species that appear to be secure at present, but because they have limited distribution as regional or state endemics they could become vulnerable under large-scale changes. Species with this status warrant periodic checks.* (Wyoming Natural Diversity Database - Species of Concern)
USDA Forest Service	Not Region 4 Sensitive
USDOI FWS	Not listed
USDOI BLM	Not listed
IUCN	**LC – Least Concern** *A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.* (IUCN – Red List Categories and Criteria)

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

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

Criteria	Rationale
Distribution on the Bridger-Teton National Forest	*Parnassia kotzebuei* is known from 3 contemporary (post-1990) collections on the Bridger-Teton National Forest, though the most recent collection was made in 1998 (**Table 1, Map 2**; Rocky Mountain Herbarium 2020, SEINet 2020). Contemporary collections from the forest are from the Teton Wilderness in the Wind River and Absaroka ranges, and the Gros Ventre Wilderness in the Gros Ventre range. Prior to 1990, 1 collection was made on the forest, from 1925 (Rocky Mountain Herbarium 2020, SEINet 2020, Table 1). This is from White Rock Mountain in the Wyoming Range.
Distribution outside the Bridger-Teton National Forest	*Parnassia kotzebuei* occurs from Alaska to Greenland, across most of Canada, and south in the Rocky Mountains to Colorado, also in Idaho, Nevada, and Washington. In Wyoming, it is known from the Absaroka, Beartooth, Big Horn, Gros Ventre, Teton and Wind River Ranges (Fremont, Hot Springs, Johnson, Park, Sublette, Teton; WYNDD 2020).
Abundance on the Bridger-Teton National Forest	Occurrences are based on collections with no abundance or population information, so a precise abundance estimate cannot be made. Kesonia and Hartman (2011) include *Parnassia kotzebuei* on their checklist for the floristic inventory of Grand Teton National Park, Pinyon Peak Highlands, and vicinity. However, no abundance data is included for this species.
Population Trend on the Bridger-Teton National Forest	Population size may vary from year to year based on moisture availability, but long-term trends have not been studied (WYNDD 2020). Trends for this species are not known, but probably stable, with low confidence (Heidel 2018).
Habitat Trend on the Bridger-Teton National Forest	Habitat for *Parnassia kotzebuei* in Wyoming is in alpine and subalpine wet meadows, fens, seep banks, moist rocky slopes and dripping cliffs (WYNDD 2020). All known populations are located within designated Wilderness areas on the forest (**Table 1, Map 2**). These high-altitude communities receive minimal disturbance from forest management activities including recreation, motorized vehicle travel, and vegetation treatments, though habitats may be impacted (e.g., trampled) by some forms of recreation (WYNDD 2020). Alpine habitats are likely stable on the forest but may decrease due to climate change effects (see below).
Threats to the Species and its Habitat on the Bridger-Teton National Forest	In order of decreasing severity, potential threats to this species include effects of small population size, global climate change, motorized recreation, grazing, non-motorized recreation, exotic species invasion, mining, and pollution (Panjabi and Anderson 2007). As noted by WYNDD (2020), threats are generally low due to the species alpine habitat. Climate change effects may change the distribution and establishment of alpine species. Alpine

Criteria	Rationale
	communities are possibly the ecosystems in the region that are most at risk from the effects of climate change. According to Intermountain Adaptation Partnership (IAP) assessments, alpine communities have a high sensitivity to climate change, a low adaptive capacity, and very high vulnerability to climate change (Halofsky, et al. 2018). The length and depth of snow cover, which are strongly correlated with mean temperature and precipitation, are key factors controlling alpine ecosystems. Snow cover provides frost protection for alpine plants in the winter, as well as the water supply in spring. The composition and distribution of alpine ecosystems will be affected by decreasing snowpack. For high-elevation vegetation, climate change may affect seed germination and survival by modifying moisture availability and therefore result in reduced plant success. Specific effects will depend on vulnerability thresholds of the characteristic species and the rate and magnitude of changes over time. Reduced snowpack with warming is likely to cause major changes in alpine plant communities (Halofsky, et al. 2018). The composition and distribution of alpine ecosystems will be affected by decreasing snowpack, altering plant vigor and regeneration. Specific effects will depend on vulnerability thresholds of diverse species and the rate and magnitude of changes over time. Some species may be able to persist or migrate to suitable habitat, but the lower extent of some communities will be compromised by tree establishment (Halofsky et al. 2018). Climate change is a primary threat for riparian and wetland communities. Climate related effects and drying of wetlands could reduce habitat and viability for rare species. Warming temperatures and reduced snowpack may result in the loss of high-elevation riparian and wetland habitats, resulting in drier, less productive systems. With rising temperatures, frigid snow- and water-dependent ecosystems in the upper portions of watersheds will have very little room to move upslope. According to the Intermountain Adaption Partnership assessments, high-elevation riparian and wetland communities have a moderate to high sensitivity to climate change, a low to moderate adaptive capacity, and high vulnerability to climate change (Halofsky et al. 2018). To analyze trends in occupied habitat, aerial imagery and a USFS GIS database of invasive plant populations, historical wildfires, trails, roads, Wilderness Areas, and Research Natural Areas was assessed at each contemporary occurrence on the Forest (WYNDD GIS 2019, Google Earth Pro 2019). Assessed threats for each occurrence are summarized below: All occurrences on the forest (**Table 1**) are in designated Wilderness Areas. A Wilderness Area is “an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions" (Wilderness Act of 1964), indicating that effects from anthropogenic activities area likely minimal. Additionally, no roads exist near these occurrences, which further confirms the low potential for human effects. Proximity (within 0.5 miles) of all occurrences to non-motorized hiking trails may slightly increase potential for human presence

Criteria	Rationale
	and trampling impacts, but because the occurrences are in remote, alpine locations, they likely seldom see human visitors. None of the occurrences are in close proximity to large wildfires or mapped nonnative plant invasions; it is, therefore, unlikely that populations and surrounding habitat have been affected by fire or invasive plants. One of the three contemporary occurrences (Fertig, 18486, EO #11) is within the Upper Gros Ventre livestock grazing allotment. However, impacts from livestock are likely minimal to non-existent given the occurrence's alpine environment which is unsuitable for livestock. The above analysis suggests that habitat for *Parnassia kotzebuei* has likely experienced low effects from natural and anthropogenic disturbances, with the exception of some potential trampling from recreation.
Life history and demographic characteristics of the species	*Parnassia kotzebuei* is a perennial herb with usually a single stem growing to 12 cm tall. The leaves are in a basal rosette, pointed and ovate to nearly elliptic with blades 0.5-2.0 cm long and petioles equaling or much longer than the blades. The inflorescence is a single, terminal flower, on a naked stem or with a single bract close to the base. The 5 petals are white, smooth-margined, approximately 7 mm long, and are 1 to 3 veined. The capsule is up to 1 cm long. This species blooms from late June to August (Handley 2008, WYNDD 2020).
Date: March 14, 2020 Reviewer: Morgan Trieger	

Summary and Recommendations
Species (Scientific and Common Name): ***Parnassia kotzebuei*** (Kotzebue's grass-of-Parnassus)
Parnassia kotzebuei has a conservation ranking of G5 S2. It has an arctic alpine found throughout Canada with populations extending as far south as Nevada and Colorado. There are fourteen occurrences in Wyoming. Four of these fall within the BT, represented by five herbarium records. One of these occurrences falls on the Bridger-Teton Forest boundary and its precise location is not known. Habitat for *P. kotzebuei* in Wyoming is in alpine and subalpine wet meadows, fens, seep banks, moist rocky slopes and dripping cliffs (WYNDD 2020). All known populations are located within designated Wilderness areas on the forest. Communities in which P. kotzebuei occurs receive minimal disturbance from forest management activities including recreation, motorized vehicle travel, and vegetation treatments, though habitats may be impacted (e.g., trampled) by some forms of recreation (WYNDD 2020). Alpine habitats are likely stable on the forest but may decrease due to climate change effects. One of the three contemporary occurrences (Fertig, 18486, EO #11) is within the Upper Gros Ventre livestock grazing allotment. However, impacts from livestock are likely minimal to non-existent given the occurrence's alpine environment which is unsuitable for livestock. Given consideration of existing threats and mitigating factors, it is not recommended that Parnassia kotzebuei be included as a species of conservation concern.
Evaluator: Jessica Irwin & Rose Lehman Date: 04/2021;

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