

## 5-YEAR REVIEW

### *Poa atropurpurea* (San Bernardino bluegrass)

#### GENERAL INFORMATION

**Species:** *Poa atropurpurea* (San Bernardino bluegrass)

**Date listed:** September 14, 1998

**FR citation(s):** USFWS 1998 (63 FR 49006–49022)

**Classification:** Endangered

#### Associated Rulemakings:

**Critical habitat:** 73 FR 47706–47767. On August 14, 2008, the U.S. Fish and Wildlife Service (USFWS) designated approximately 2,489 acres {ac; [1,007 hectares (ha)]} of critical habitat for *Poa atropurpurea* in San Bernardino and San Diego Counties (USFWS 2008a, p. 47706). The final rule designated eight critical habitat units for *P. atropurpurea* on Federal, State, and private lands (USFWS 2008a, pp. 47720, 47734).

**Methodology used to complete the review:** In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a 5-year review is to assess a listed species to determine whether its status has changed and it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. We used information in the 1998 listing rule, the 2008 final critical habitat rule and 5-year review, available literature, reports and information in our files. We also communicated with experts and partners familiar with the species and its habitat: Robert Soreng of the Smithsonian Institute; Tim Krantz of the University of Redlands; Jerilyn Hirshberg of JBH Botanical Surveys; Cherilyn Burton of the California Department of Fish and Wildlife (CDFW); and Scott Eliason, Kirsten Winter, and Lance Criley of the U.S. Forest Service (Forest Service).

**FR Notice citation announcing the species is under active review:** On June 18, 2018, we published a *Federal Register* notice (83 FR 28251) announcing initiation of the 5-year review of this species, and the opening of a 60-day period to receive information from the public (USFWS 2018). We received one response and incorporated pertinent information about *Poa atropurpurea*.

#### REVIEW ANALYSIS

##### Application of the 1996 Distinct Population Segment (DPS) policy

The Endangered Species Act defines “species” as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not

applicable, and the application of the DPS policy to the species' listing is not addressed further in this review.

**Recovery Plan or Outline:** There is no recovery plan for *Poa atropurpurea*.

## UPDATED INFORMATION AND CURRENT SPECIES STATUS

### BIOLOGY AND HABITAT:

Since the 2008 5-year review, no detailed life history studies have been conducted for this species. Unpublished reports and surveys at some occurrences have provided information about occurrence extent, approximate plant abundance, sex ratios, and plant phenology. Williams and Eliason (USFS and CBG 2013, p. 1) sampled population sex ratios at three *Poa atropurpurea* occurrences in the San Bernardino Mountains. They found that detectability of male plants increased at most sites during the second week of the monitoring period. The ratio of male to female plants varied between meadows and between the first and second weeks of the monitoring period, and ranged from 0.59 to 1.83 (USFS and CBG 2013, p. 6).

The CDFW monitored *Poa atropurpurea* at North Baldwin Meadow in 2018 (CDFW 2018a, entire), and Cleveland National Forest (CNF) mapped and monitored *P. atropurpurea* occurrences at Laguna Meadow, Bear Valley, and Mendenhall Valley (USFS 2008b, entire, 2009, entire, 2010, entire, 2016, entire, 2017, entire).

Rancho Santa Ana Botanic Garden (RSABG) has four accessions of *Poa atropurpurea* seeds, although one of these collections is not large enough to serve its intended purpose as a conservation seed collection (CDFW 2012, pp. 35–38). Two accessions [from the California Natural Diversity Database (CNDDDB) EO 2 and EO 10] were collected in 2010 and 2011, respectively.

One new occurrence of *Poa atropurpurea* has been discovered since 2008 (Arrastre Meadow, San Bernardino Mountains; USFS 2019, entire). Additionally, we became aware of three occurrences in the Cuyamaca Mountains (CNDDDB EOs 30, 31, and 32) which were extant at listing but previously unknown to us. However, because many occurrences have not been observed since listing—particularly on private land in the San Bernardino Mountains—a higher percentage of occurrences are presumed extant, rather than extant, and we do not have enough information to evaluate whether the species is stable or increasing across its range.

There are currently 29 occurrences of *Poa atropurpurea* across the species' range. A total of 27 occurrences are considered extant or presumed extant, 1 is vague, and 1 is extirpated. Since the last 5-year review in 2008, 9 of the 27 occurrences have been observed (Table 1).

## THREATS ANALYSIS

### Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

In the listing rule, threats identified under this factor were: urbanization, alteration of hydrological conditions, off-highway vehicle (OHV) activity, road maintenance, telephone trenching and associated soil removal, and vandalism (USFWS 1998, pp. 49012–49014). Vandalism was discussed due to a series of incidents in the early 1990s. Since the listing rule and the 2008 5-year review, we received some reports of unauthorized OHV trespass into *Poa atropurpurea*-occupied meadows. However, there have been no further incidents of vandalism or intentional grading, and we consider it unlikely that such incidents are future threats. Therefore, vandalism and intentional grading are not discussed further in this 5-year review, and unauthorized OHV trespass is discussed as a separate threat.

In 2019, the USFWS issued a Biological Opinion (BO) for ongoing activities affecting 12 mountain plant species in the San Bernardino National Forest, California. In the BO, we analyzed the impacts of the Forest Service’s Revised Land and Resource Management Plan (Forest Plan; USFS 2006, entire). The Forest Plan proposed to continue Forest Service management activities on the Mountaintop Ranger District within the San Bernardino National Forest (USFWS 2019, p. 1). In this 5-year review, we discuss Protective Measures in the 2019 BO intended to avoid and minimize effects to listed species and designated critical habitat.

#### *Land-use Conversion*

At the time of listing, we indicated that relatively unrestricted development of privately owned parcels of land was a threat to *Poa atropurpurea* and other meadow plants, and we specifically described losses due to urbanization in the Big Bear area (San Bernardino Mountains). In the 2008 5-year review, we stated that *P. atropurpurea* populations continued to be affected by urban and residential development, among other threats (USFWS 2008b, p. 6). We also stated that urban encroachment near Big Bear Lake had degraded or eliminated known populations at the time of listing, and we specifically mentioned Shay, Metcalf/Coldbrook, and China Gardens/Eagle Point Meadows (USFWS 2008b, p. 6).

Since the 2008 5-year review, the threat of land-use conversion has been ameliorated at four occurrences in the San Bernardino Mountains, as some occupied areas have been placed under conservation easement or acquired by conservation organizations. Due to these efforts, approximately 30.9 ac (12.5 ha) of habitat in meadows currently- or historically-occupied by *Poa atropurpurea* in the San Bernardino Mountains has received an elevated level of conservation. No occurrences of *P. atropurpurea* in the Peninsular Ranges are threatened by land-use conversion.

In addition to directly removing meadow habitat, land-use conversion may degrade meadow habitat by altering site hydrology, increasing access to foot and vehicular traffic, fragmenting the remaining meadow habitat, and introducing nonnative plant species. Although some occurrences have been conserved since 2008, impacts from this threat could affect *Poa atropurpurea* habitat at 9 of 20 occurrences in the San Bernardino Mountains that are not managed or owned by the

Forest Service, CDFW, California Department of Parks and Recreation, private conservation organizations, or conserved through conservation easement, deed restriction, or restrictive covenant. The majority (63 percent) of currently- or historically-occupied meadows in “good” condition have no current protection.

### ***Alteration of Hydrological Conditions***

The listing rule identified alteration of hydrological conditions as a significant threat to *Poa atropurpurea* habitat, noting potential impacts from roads and OHV activity (USFWS 1998, pp. 49012–49013). Since meadows exist as a function of hydrology, alteration of local hydrology is a threat to meadow habitat (USFS 2002a, p. 24). Any activities that affect site hydrology (e.g., lowering of water tables, water diversion, off-road driving, roads, trails, mining, and historical or recent grazing) pose threats to meadow habitat and meadow plants, including *P. atropurpurea* (USFS 2002a, pp. 22, 24).

Since before listing, restoration work has occurred at some *Poa atropurpurea*-occupied meadows across the species’ range. These measures have repaired some hydrological components and restricted vehicle access. In the 1980s, major gully repair work was completed on the main drainage through Mendenhall Valley, San Diego County (USFS 2008a, p. 2), and supplemental work was completed in the 1990s (Winter and Criley 2014, pers. comm., p. 1; Winter 2019, pers. comm., page 1). In 1992, Sage Road, which bisected Laguna Meadow, was closed and rehabilitated. In the San Bernardino Mountains, road decommissioning has occurred in Holcomb Valley.

Meadow hydrological conditions are influenced by long-term climate trends, and by human activities and infrastructure. We do not have detailed information about hydrological conditions at most meadows where *Poa atropurpurea* occurs, or information about the relative magnitude of different impacts to hydrological conditions. However, alteration of hydrological conditions is a threat at 13 meadows and a potential threat at 10 meadows. Since meadow habitat is dependent on hydrology, we believe that the overall magnitude of this threat is high.

### ***Unauthorized OHV activity***

The listing rule identified OHV activity as a threat to *Poa atropurpurea*, and noted habitat degradation from OHV use at North Baldwin Meadow, Wildhorse Meadow, and Holcomb Valley (USFWS 1998, p. 49013). Unauthorized routes—roads and trails that are not part of the USFS transportation system or otherwise authorized for public use—are a significant threat to meadow habitat. Unauthorized OHV activity in meadows is of particular concern during the spring thaw. Trespass at this time of year creates deep ruts, which can alter the surface hydrology of meadow habitats.

Despite past and ongoing efforts by land managers and partners, occasional OHV trespass into meadow habitat has continued to occur, and some areas remain vulnerable to future trespass. Given the somewhat stochastic nature of OHV trespass, it is difficult to predict where unauthorized use will occur in the future. We currently consider unauthorized OHV use to be a threat at 10 occurrences and a potential threat at 1 occurrence. At 11 occurrences, we believe that this threat has been ameliorated by the past and ongoing efforts of land managers and private landowners. However, because of the small size and fragmented nature of *Poa atropurpurea* occurrences, any

unauthorized trespass may directly or indirectly affect a significant portion of an occurrence, and unauthorized trespass may also impact and alter meadow habitat. Therefore, we believe that unauthorized OHV use presents an ongoing, high level of threat to *P. atropurpurea*.

### ***Road and Trail Construction, Use, and Maintenance***

In the listing rule, we stated that roads traverse occupied *Poa atropurpurea* habitat, and that road ruts can lead to alterations in the surface hydrology of meadow habitats [citing Krantz (USFS 1981, p. 37)] (USFWS 1998, p. 49013). In the 2008 5-year review, we concluded that *P. atropurpurea* continued to be affected by road maintenance (USFWS 2008b, p. 12). Impacts to *P. atropurpurea* from roads and trails include both direct effects (such as habitat alteration), and indirect effects, including alteration of water flow and drainage patterns, sedimentation, deposition of particulates (dust), and effects related to wildfire (USFS 2012, pp. 21–24). For example, the sinking of roadbeds has been observed in areas where roads cross hydrological systems, suggesting that soil compaction and alteration of surface hydrology are occurring (USFS 2002a, pp. 22–23). Roads, road construction, and road maintenance can also facilitate the introduction and establishment of nonnative plants by creating open, continually disturbed habitat. Nonnative plants can be transported along these road corridors by equipment and vehicles, and are often more easily established on exposed cut-and-fill slopes of roads than native plants (USFS 2005, p. 114).

Road and trail use may also impact *Poa atropurpurea* occurrences on non-Federal lands in the San Bernardino Mountains. The Big Bear Lake and Baldwin Lake areas experience heavy public use year-round, as they are in close proximity to urban areas and developed recreation sites (USFS 2012, pp. 57, 75). Periodic maintenance work on State Route 18 and county roads has the potential to impact *P. atropurpurea* and its habitat in the Baldwin Lake area (including at North Baldwin and Pan Hot Springs Meadows) (USFS 2012, p. 79). At Shay Meadow, a proposed road on a nearby county easement could impact water flow in the northern part of the meadow.

Road and trail construction, maintenance, and use has historically impacted *Poa atropurpurea*-occupied meadows. On Federal lands on the Cleveland and San Bernardino National Forests, road decommissioning and restoration efforts have occurred at some meadows. We currently consider road and trail construction, maintenance, and use a threat at 11 occurrences, a potential threat at 6 occurrences, and of unknown impact at 10 occurrences. However, the potential impacts of road and trail use have not been fully evaluated at most *P. atropurpurea* occurrences on non-Federal lands.

### ***Utilities***

Based on information in biological assessments and biological opinions, the ongoing impacts of existing utility construction, operation, and maintenance are localized. However, across the range of the species, utility activities may impact *Poa atropurpurea* at 7 of the 27 occurrences believed to be extant or presumed extant. The intensity of impacts is low in some areas, but may be moderate in others. At this time, we believe that existing utility operation and maintenance on Federal lands presents a low threat to *P. atropurpurea*. However, given that the impacts could be of greater intensity on private lands in the future, we believe that the overall threat level is moderate.

## ***Mining***

At the time of listing, mining activities were identified as a threat to pebble plain species in the Holcomb Valley area and near Baldwin Lake (USFWS 1998, p. 49014). Area meadows supporting *Poa atropurpurea* and *Taraxacum californicum* (California taraxacum) were also likely to be impacted by mining activities (USFWS 1998, p. 49014). We did not identify mining activities as threats to *P. atropurpurea* habitat outside of Holcomb Valley, Arrastre Flat, or North Baldwin Lake (USFWS 1998, p. 49014).

Small-scale mining may affect *Poa atropurpurea* habitat and plants at three meadows in Holcomb Valley. These localized effects have occurred in the past and are ongoing. The USFWS's 2019 BO contains three preventive measures applicable to small-scale mining, and additional Management Directions (MDs 24–27) that relate to mineral location and administration (USFWS 2019, Appendix A). Mining activities likely affect a relatively small amount of *P. atropurpurea* habitat. In the Peninsular Ranges, we are not aware of any ongoing or proposed mining activities that could impact *P. atropurpurea* plants or habitat. At this time, we believe that mining activities present a low overall threat to *P. atropurpurea*, but more information is needed in order to better characterize this threat.

### **Factor B: Overutilization for commercial, recreational, scientific, or educational purposes**

The potential threat from unrestricted collection by curiosity seekers was noted in the listing rule (USFWS 1998, p. 49014). Since listing, we have no new information to support this potential threat, and we do not believe that overutilization for commercial, recreational, scientific, or educational purposes poses a threat to *Poa atropurpurea* at this time.

### **Factor C: Disease or Predation**

**Disease:** Disease was not known to be a threat to *Poa atropurpurea* at the time of listing (USFWS 1998, p. 49014) or at the time of our 2008 5-year review (USFWS 2008b, p. 7). Since the 2008 review, we have no new information to indicate that disease poses a current threat to this species.

**Predation:** In the listing rule, we suggested that thrip damage to *Poa atropurpurea* in the Big Bear area may cause a reduction in seed set (USFWS 1998, p. 49014). We have not received any further reports of thrip damage since listing.

Herbivores find most *Poa* taxa both palatable and nutritious (Soreng 2007a, p. 487). However, we have no information whether grazing by native ungulates (such as mule deer) poses a significant threat to *P. atropurpurea* individuals, and so we do not consider potential impacts from native herbivores to be at threat at this time. Impacts from horse, burro, and cattle grazing are discussed under **Factor E**, because agriculture or recreation are the sources of these threats.

### **Factor D: Inadequacy of Existing Regulatory Mechanisms**

The Endangered Species Act is the primary Federal law that provides protection for this species since its listing as endangered in 1998. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Therefore, we continue to believe that other laws and regulations have limited ability to protect the species in absence of the Endangered Species Act. Refer to the previous status review for a complete discussion of regulatory mechanisms (USFWS 2008b, pp. 7–8).

### **Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence**

At the time of listing, we identified the following **Factor E** threats to *Poa atropurpurea*: 1) trampling by livestock and humans; 2) indirect effects of grazing and browsing; 3) predation by livestock; 4) competition with other plant species; 5) habitat fragmentation; 6) hybridization with the nonnative *P. pratensis* (Kentucky bluegrass); and 7) limited numbers of *P. atropurpurea* individuals, and possible localized distribution of the different sexual forms of the species (USFWS 1998, pp. 49016–49017). Impacts associated with climate change, a threat that was not identified at the time of listing, are also discussed here. The information below updates our discussion of Factor E threats from the 2008 5-year review (USFWS 2008b, pp. 8–13).

#### ***Grazing***

In the listing rule, trampling by livestock and indirect effects of grazing and browsing were identified as threats to *Poa atropurpurea* (USFWS 1998, pp. 49016–49017). Predation of *P. atropurpurea* individuals from grazing by cattle, horses, and feral burros was identified as a threat at Bluff Meadow, Hitchcock Meadow, and Shay Meadow, and at grazing allotments on the CNF (USFWS 1998, pp. 49014, 49016–49017). The listing rule also noted that grazing could spread nonnative invasive plants, alter meadow nutrient cycling, directly trample plants, and compress soil (USFWS 1998, pp. 49016–49017).

In the 2008 5-year review, we continued to consider grazing as a threat to *Poa atropurpurea*, and we discussed it under **Factors A** (as a threat to habitat) and **Factor C** and **E** (as threats to individuals) (USFWS 2008b, pp. 6–9). We cited Painter (1995, entire), who discussed negative impacts to native plant populations by nonnative herbivores; Kimball and Schiffman (2003, pp. 1691–1692), who reported that cattle grazing harmed native species (including *Poa* species) and reduced native plant diversity at Carrizo Plains National Monument; and Belsky and Gelbard (2000, entire), who discussed numerous ways that livestock contribute to nonnative plant invasions. However, we also wrote that “grazing allotment policy provides the Forest Service with a tool to manage and maintain habitat conditions favorable to some species”, and that “[t]he effects of grazing have yet to be adequately monitored to ascertain if habitat conditions reflect the optimal level of maintenance of *P. atropurpurea*” (USFWS 2008b, p. 9).

Historically, widespread grazing impacted *Poa atropurpurea* habitat across the range of the species. The historical impacts of grazing very likely continues to alter meadow hydrology at some *P. atropurpurea* occurrences, but grazing is no longer widespread across the range of

*P. atropurpurea*, and is no longer a direct, ongoing threat to meadow habitat. In the San Bernardino Mountains, horse and burro grazing—on private and federal lands, respectively—remains a localized threat to *P. atropurpurea* individuals at five occurrences. Burros tend to congregate in wetter habitats, but the Forest Service plans and implements wild burro round-ups to minimize effects to listed plants (USFWS 2019, p. 37) At five more occurrences on USFS lands in the Peninsular Range, impacts from cattle grazing are avoided or minimized by the implementation of conservation measures (USFWS 2014, pp. 2–3).

Since cattle grazing is no longer widespread across the species' range, the threat of grazing to individual *Poa atropurpurea* is now localized. Although its effects are ongoing and will continue into the future, we consider the overall threat level to be low at this time. However, we need to continue surveys and monitoring at *P. atropurpurea* occurrences where grazing occurs. We also need more information about the species' response to different levels of grazing.

At some occurrences, grazing is a potentially beneficial management tool for *Poa atropurpurea*. While predation of *P. atropurpurea* individuals could reduce genetic diversity in small occurrences, and decrease recruitment [Krantz (USFS 1981), p. 36; USFS 1992, p. 10; Soreng 2000, pers. comm., unpaginated], some observations (Winter and Criley 2014, pers. comm., pp. 2–3) have suggested that grazing or related disturbances could benefit *P. atropurpurea*. Krantz (BBCSD 2008, p. 11) suggested seasonally-restricted, low-intensity grazing as a management tool at Pan Hot Springs Meadow in order to remove a nonnative *Elymus*.

### ***Dispersed Recreation***

We considered trampling a threat to *Poa atropurpurea* in the listing rule (USFWS 1998, p. 49012) and in the 2008 5-year review. Authorized dispersed recreation includes camping away from designated campsites, and horseback riding and hiking off designated trails, among other activities (USFWS 2019, p. 6). Dispersed recreation activities may trample, crush, or uproot individual plants, and compact and degrade habitat; however, the severity of effects is related to frequency and activity (USFWS 2019, p. 21). Ongoing dispersed hiking from Holcomb Valley Campground may result in the trampling of *P. atropurpurea* individuals within Belleville meadow. Ongoing use and maintenance of interpretive stops along the Gold Fever Trail may also result in trampling of individuals along the edge of these stops (USFWS 2019, p. 6). However, in 2019, we determined that due to the infrequent and dispersed nature of off-trail hiking, dispersed hiking and camping have a low potential to adversely impact *P. atropurpurea* critical habitat (USFWS 2019, p. 82). Some occurrences on private lands are also vulnerable to the effects of trampling; for example, The Nature Conservancy (TNC; Lot A) and Eagle Point (Lot K) properties are much more likely to be impacted by foot and bicycle traffic. However, we believe that overall, the magnitude of this threat is low at this time.

### ***Hybridization and introgression***

In the listing rule, hybridization with the nonnative grass *Poa pratensis* was identified as a threat to *P. atropurpurea* (USFWS 1998, pp. 49016–49017). As discussed under **Habitat**, *P. pratensis* subsp. *pratensis* is often present at *P. atropurpurea* occurrences. At the time of the 2008 5-year

review, we had no information about hybridization between *P. atropurpurea* and other *Poa* taxa (USFWS 2008b, p. 5). Since listing and the 2008 5-year review, we have not received any further information about this potential threat, and further study is needed to determine whether *P. atropurpurea* is hybridizing with other *Poa* taxa.

### ***Limited Numbers of Poa atropurpurea* Individuals, and Uneven Sex Ratios**

In the listing rule, we identified the limited number of *Poa atropurpurea* individuals, and possible localized distribution of the different sexual forms of the species, as a threat to *P. atropurpurea*. No specific meadow areas or population densities were identified (USFWS 1998, pp. 49016–49017). We also discussed small population size in the 2008 5-year review, noting that small and disjunct populations are more vulnerable to genetic and environmental stochasticity (USFWS 2008b, p. 12).

*Poa atropurpurea* occurrences in the Peninsular Ranges (San Diego County) could be threatened by loss of genetic diversity and skewed sex ratios. No observations of male plants have been recorded in San Diego County since 1994. In Laguna Meadow, Hirshberg (USFS 1994, pp. 1–2) reported 4 male plants out of approximately 1,140 total individuals during field surveys of the meadow, an overall 1:285 male to female ratio. There are three explanations for seed set in areas where no male plants have been observed: 1) the presence of undetected male plants in a population; 2) hybridization and introgression between *P. atropurpurea* and other *Poa* taxa, and 3) seed production without fertilization (asexual reproduction by apomixis) (Soreng 2013, pers. comm., unpaginated). Male plants have been observed at occurrences in the San Bernardino Mountains, and so the potential threat of uneven sex ratios is limited to occurrences in San Diego County. If *P. atropurpurea* is not reproducing sexually at occurrences in San Diego County, genetic diversity could be low at those occurrences (Soreng 2007b, *in litt.* p. 5). However, since the 2008 5-year review, no studies have examined *P. atropurpurea* genetics or reproduction in the Peninsular Ranges. Across the range of the species, many occurrences have not been observed for years, and we lack information about minimum effective population size for this species. Therefore, we are unable to determine the magnitude or immediacy of the potential threat of uneven sex ratios or small population size.

### ***Nonnative Invasive Plants***

In the 1998 listing rule, we discussed nonnative invasive plants in the context of grazing and alteration of hydrological conditions. We stated that “alteration of the direction of surface flow and rate of percolation may lead to changes in the species composition of the site (Neel and Barrows 1990), make the site unsuitable for one or more of the native taxa, and/or facilitate the encroachment of non-native species” (USFWS 1998, p. 49014). We also stated that “trampling may degrade habitat by soil compression and introduction of seeds of non-native species” (USFWS 1998, p. 49016). Then in the 2008 5-year review, we stated that “invasive plant species incursion has been exacerbated by the changing water regime, and the presence of non-native grazers such as sheep and cattle” (USFWS 2008b, p. 11).

Around 11 nonnative invasive plant species have been documented at *Poa atropurpurea* occurrences. Over 3 years of monitoring at North Baldwin Meadow, CDFW identified three

nonnative species: *Bromus tectorum* (cheatgrass), *Ranunculus testiculatus* (tuberled crowfoot), and *Lepidium perfoliatum* (clasping pepperweed). They recommended that the extent of nonnative plant invasion be further monitored and studied (CDFW 2018b, p. 5). At Pan Hot Springs Meadow, introduced ryegrass (*Elymus intermedia* x *elymoides*) forms a thick layer of thatch in the winter months; thatch and re-sprouting ryegrass may inhibit or outcompete endangered plant seedlings (BBCCSD 2008, p. 11). Other nonnative plants at *P. atropurpurea* occurrences include *Bromus japonicas*, *Agropyron* species, and *Bromus diandrus*.

Nonnative invasive plants could impact individual *Poa atropurpurea* by inhibiting seed germination, and reducing plant growth and reproductive output. These impacts to individuals could reduce population resiliency. Based on information in survey and monitoring reports, we believe that nonnative plants threaten *P. atropurpurea* plants at 4 occurrences and potentially threaten an additional 12 occurrences. The magnitude of impacts at each occurrence is not known, but these impacts have occurred historically, are ongoing, and will likely continue or increase in the future. Nonnative plant invasions may also be caused or exacerbated by activities discussed under Factor A, such as urbanization, alteration of hydrological conditions, unauthorized OHV use, use of roads and trails, and grazing. We believe that nonnative invasive plants present a moderate overall level of threat to *P. atropurpurea*. However, further monitoring is needed to characterize the level of threat at each occurrence.

### ***Climate Change***

Changes in temperature, precipitation, and snowpack, in the Southern California mountains may alter the hydrology of montane meadow habitats. These changes may impact individual *Poa atropurpurea* by reducing the resources available for germination, growth, and reproduction. These abiotic changes may also impact population resiliency by causing shifts in plant phenology or sex ratios at the population level. However, the effects of any precipitation changes to meadow hydrology will likely vary by meadow. While response to changing environmental conditions has been documented for other plant species, the response of *P. atropurpurea* to these changing conditions is uncertain.

The impacts of climate change will occur throughout the range of *Poa atropurpurea*. These impacts are ongoing and will continue to the future. Projected changes in temperature, precipitation, and snowpack may affect *P. atropurpurea* at all stages of the life cycle, but there is uncertainty about the magnitude of impacts at each meadow. *P. atropurpurea* occurs in different meadow habitats across its range, and so the species may have some ability to withstand or adapt to a range of environmental conditions (i.e., representation). However, we believe that the overall magnitude of this threat is high.

### ***Synthesis***

Since the 2008 5-year review, Federal, State, and private conservation partners have implemented measures to ameliorate impacts to *Poa atropurpurea* at some occurrences. The USFWS completed consultation on ongoing San Bernardino National Forest activities that may affect 12 listed plants (including *P. atropurpurea*) (USFWS 2019, entire). The Forest Service and the USFWS developed

Protective Measures and Management Directions to avoid and minimize effects to *P. atropurpurea* and critical habitat, and many actions are already being implemented (USFWS 2019, p. 9).

Due to the lack of consistent survey and monitoring data, and because many occurrences are on private land, we do not have data that would allow us to analyze whether *Poa atropurpurea* is stable or increasing across its range. However, the species remains threatened by land-use conversion and the alteration of hydrological conditions. Other threats under Factor A and Factor E also continue to impact *P. atropurpurea*. Threats vary in geographic scope, magnitude, and immediacy, and have not been well characterized at all occurrences.

We analyzed threats to *Poa atropurpurea* under the five factors considered at listing. Based on the best scientific and commercial data available, we find that *P. atropurpurea* remains in danger of extinction throughout its range. Due to ongoing threats and the lack of new information for many occurrences, we recommend no status change for *P. atropurpurea* at this time.

## RESULTS

### Recommended Classification:

**Downlist to Threatened**

**Uplist to Endangered**

**Delist** (*Indicate reasons for delisting per 50 CFR 424.11*):

*Extinction*

*Recovery*

*Original data for classification in error*

**No change is needed**

**NEW RECOVERY PRIORITY NUMBER: NO CHANGE**

## RECOMMENDATIONS FOR FUTURE ACTIONS

The actions listed below are recommendations to be completed over the next 5 years. These actions will help guide recovery of *Poa atropurpurea* by conserving *P. atropurpurea* habitat and occurrences, ameliorating threats to habitat and individuals, supporting research opportunities, and coordinating survey and monitoring efforts. The conservation of *P. atropurpurea* will require continued cooperation and coordination with partners—including Tribes, private landowners, and Federal, State, and local agencies—to minimize impacts from current threats and assist with species recovery. We will also work with USFWS programs, such as the USFWS’s Partners for Fish and Wildlife, to identify opportunities for conservation on private lands. Property easements or purchases of parcels could also be made through the Act’s section 6 funding, or other funding opportunities.

1. Conserve *Poa atropurpurea* occurrences and meadow habitat:
  - a. Continue to work with Forest Service, State, and conservation organizations to purchase *P. atropurpurea* occupied and suitable habitat from willing sellers.
  - b. Continue to work with local partners to identify an appropriate entity or entities to hold and manage conservation easements that protect *P. atropurpurea* habitat.
  - c. Provide private landowners with information about *P. atropurpurea* habitat, and explore opportunities for partnership and conservation.
  - d. Continue to work with the Big Bear City Community Services District to adopt and implement the draft Pan Hot Springs Habitat Management Plan.

2. Support research to resolve questions about *Poa atropurpurea* life history, ecology, and genetics:
  - a. Study meadow hydrology and better determine threats at *P. atropurpurea* occurrences.
  - b. Investigate reproductive life history characteristics such as seed germination requirements, mechanism of seed dispersal, and seed viability.
  - c. Investigate seedling establishment and time to reach maturity.
  - d. Conduct studies to resolve questions of: i) skewed sex ratios, ii) distribution of genetic diversity in the species, and iii) potential introgression/hybridization with other *Poa* taxa.
  - e. Determine the environmental needs and constraints of the species.
  - f. Conduct research to inform meadow restoration and reintroduction efforts.
3. Support efforts to survey *Poa atropurpurea* occurrences. Monitor population trends of *P. atropurpurea*. Soreng suggested that monitoring should map the spatial extent of the occurrence and include estimates of number of individuals or “clumps,” number of flowering individuals, sex ratios of pistillate to staminate plants, and seed production (Soreng 2007b, p. 4).
4. Identify potential areas for restoration and conduct studies of restoration techniques. Support partners in efforts to restore habitat and re-establish populations at historical locations.

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**U.S. FISH AND WILDLIFE SERVICE**

**5-YEAR REVIEW**

***Poa atropurpurea* (San Bernardino bluegrass)**

**Current Classification:**

**Recommendation resulting from the 5-Year Review:**

Downlist to Threatened

Uplist to Endangered

Delist (Indicate reasons for delisting per 50 CFR 424.11):

Extinction

Recovery

Original data for classification in error

No change needed

**Review Conducted By:** Carlsbad Fish and Wildlife Office

**New Recovery Priority Number:** No Change

**FIELD OFFICE APPROVAL:**

**Lead Field Supervisor, Fish and Wildlife Service**

Approve

Scott A. Sobiech  
Field Supervisor

APPENDIX A

Table A1: *Poa atropurpurea* Occurrence Table<sup>1</sup>

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
Alden Meadow (near), San Bernardino Mtns.	Extant	Presumed extant	14	NA	Private, water district (Redlands Mutual Water Company)	NA, likely seen in the 1970s or early 1980s	1982	NA	NA	Threats: 1, 2, 6 Potential: 9 Unknown: 5	Presumed extirpated where currently mapped, but possible in adjacent meadows	CDFW 2019; USFS 2002a; USFS 2002b
Arrastre Meadow, San Bernardino Mtns.	Not known at listing	Extant	35	NA	SBNF	NA	NA	"scarce"	2010	Threats: 4, 6, 8 Potential: 9		CDFW 2019, USFS 2002a, USFS 2019
Belleville Meadow (Holcomb Valley area), San Bernardino Mtns.	Extant	Extant	10	3	SBNF	NA	1997	210	2011	Threats: 1, 3, 4, 6, 8 Potential: 9		USFS and CBG 2013, CDFW 2019, USFS 2002a

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
Big Bear City Meadow fragments, San Bernardino Mtns.	Extirpated	Presumed extant	19	NA	Private	NA	1982	NA	NA	Threats: 2, Potential: 1, 9 Unknown: 4, 6	Extirpated from some areas; status unknown in others, but presumed extant where habitat is present	CDFW 2019
Bluff Meadow, San Bernardino Mtns.	Extant	Presumed extant	13	5	Private conservation organization, SBNF	NA	1984	NA	NA	Threats: 1, 3, 4, 5, 6 Potential: 9	Not observed since listing	USFS 2002a
China Gardens Meadows, San Bernardino Mtns.		Presumed extant	2	NA	Private	NA	NA	NA	NA	Threats: 1, 2, 3, 4, 6 Potential: 9	Extirpated from some areas; status unknown in others, but presumed extant where habitat is present	USFS 2002a
Cienega Seca Meadow, San Bernardino Mtns.	Extant	Extant	12	11	Private/deed restriction	1983	Less than 10,000	100	2011	Threats: 3, 5, 6 Potential: 1, 9		USFS and CBG 2013

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
Eagle Point Meadows Lot A, San Bernardino Mtns.	Extant	Extant	2	NA	Private conservation organization	1988	NA	50	2010	Threats: 1, 6, 9	Extirpated from some areas within historical meadow; extant within Lots K and A	CDFW 2019, Fraga 2010
Eagle Point Meadows Lot K, San Bernardino Mtns.	Extant	Extant	2	NA	Private/partial deed restriction	50	1986	250	2011	Threats: 1, 6, Potential: 5, 9	Extirpated from some areas within historical meadow; extant within Lots K and A	CDFW 2019, USFS 2019
East Baldwin Meadow, San Bernardino Mtns.	Not known at listing	Presumed extant	33	NA	Private	NA	NA	NA	NA	Threats: 2, 4, 7 Potential: 1, 3, 5, 6, 9		CDFW 2019, USFS 2002a
Erwin Meadows, San Bernardino Mtns.	Extant	Presumed extant	24	NA	Private	25	1981	NA	NA	Threats: 2, 7 Potential: 1, 6, 9 Unknown: 4, 5	Plants observed at the "east end of Erwin Lake"; this area is Erwin Lake according to USFS digital data	CDFW 2019, USFS 1981

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
Hitchcock Meadow (Holcomb Valley area), San Bernardino Mtns.	Extant	Presumed extant	11	4	Private, SBNF	NA	1981	NA	2008	Threats: 1, 2, 3, 4, 5, 6, 7, 8, Potential: 9		CDFW 2019, USFS 1981
Metcalf Meadow (East, SBLT), San Bernardino Mtns.	Extant	Extant	16	NA	Private conservation organization	NA	1984	NA	2016	Threats: 3, 4, 5 Potential: 1, 6, 9	Present in 2016, but count unknown	CDFW 2019, Hook 2016
North Baldwin Meadow, San Bernardino Mtns.	Extant	Extant	1	2	State, SBNF	0	1989	710	2018	Threats: 1, 3, 4, 5, 6, 7, 9	“Relatively large population” observed in 1987	CDFW 2019
Pan Hot Springs Meadow, San Bernardino Mtns.	Extant	Presumed extant	17	NA	Private, BBCCSD/covenant area (partial)	NA	1981	NA	2008	Threats: 9 Potential: 5 Unknown: 1, 2, 4, 6		USFS 2002a, BBCCSD 2008

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
Rathbun Meadow (Moonridge area), San Bernardino Mtns.	Extirpated	Possibly extirpated	21	NA	Private	NA	1981	NA	NA		Extirpated at listing	USFS 1981; Eliason 2019; Krantz 1993.
Shay Meadow (southeast), San Bernardino Mtns.	Extant	Presumed extant	23	NA	Private	NA	1982	NA	NA	Threats: 2, 7, Potential: 1, Unknown: 4, 5, 6, 9	Habitat is present but status is unknown	CDFW 2019
Shay Meadow, San Bernardino Mtns.	Extant	Presumed extant	34	NA	Private, private conservation	“relatively large numbers”	1981	NA	NA	Threats: 1, 2, 5, 7 Unknown: 4, 6, 9	Habitat is present but status is unknown	USFS 2000, USFS 2002a
Shay Meadow, San Bernardino Mtns.	Extant	Presumed extant	18	NA	Private, Private conservation, State, BBCCSD	NA	NA	NA	NA	Threats: 1, 2, 5, 7 Unknown: 4, 6, 9	Habitat is present but status is unknown	USFS 2002a
Wildhorse Meadows, San Bernardino Mtns.	Extant	Presumed extant	22	NA	SBNF	NA	1981	0	2000	Threats: 5, 6, 7 Potential: 1, 4 Unknown: 9	No plants seen in 2000	USFS 2000

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
Mendenhall Valley, Palomar Mtn.	Extant (not known to FWS)	Extant	4	13	CNF, Private (private lands under conservation easement)	100	1994	3	2017	Threats: 7, 9 Potential: 1 Unknown: 6		CDFW 2019, USFS 2019
Bear Valley, Laguna Mtns.	Extant (not known to FWS)	Extant	29	15	CNF	NA	1994	200	2010	Threats: 4, 7 Unknown: 1, 6, 9		USFS 2010
Filaree Flats (N of Laguna Meadow), Laguna Mtns.	Unknown	Vague	8	NA	CNF	NA	1992	0	2002	Unknown: 1, 4, 5, 7, 9		USFS 1992; USFS 2002b
Laguna Meadow (north occurrence), Laguna Mtns.	Extant	Extant	27	14	CNF	500	1994	222	2009	Threats: 1, 7 Potential: 6, Unknown: 9		USFS 1994; USFS 2009

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
Laguna Meadow (south occurrence), Laguna Mtns.	Extant	Extant	5	14	CNF					Threats: 7 Potential: 6 Unknown: 9		USFS 1994
North of Little Laguna Lake, Laguna Mtns.	Extant	Presumed extant	28	14	CNF	50–75	1994	0	2008	Threats: 7 Unknown: 1, 9		USFS 1994, USFS 2008b
Little Stonewall Creek, Cuyamaca Meadow Natural Preserve, Cuyamaca Mtns.	Extant (not known to FWS)	Presumed extant	31	NA	CDPR (Cuyamaca Rancho SP)	NA	NA	NA	NA	Potential: 1, 5, 6 Unknown: 9		J. Hirshberg collection (SD13515, CCH), Hirshberg 2019, pers. comm.
Cuyamaca Meadow Natural Preserve near fenceline, Cuyamaca Mtns.	Extant (not known to FWS)	Presumed extant	30	NA	CDPR (Cuyamaca Rancho SP)	NA	NA	NA	NA	Potential: 1, 5, 6 Unknown: 9		J. Hirshberg collection (SD13515, CCH), Hirshberg 2019, pers. comm.

Meadow or place name, mountain range	1998 Status (at listing)	2019 Status	CNDDDB Element Occurrence Number (EO)	Critical Habitat Unit	Ownership/conservation status	Estimated number of plants at most recent visit pre-listing	Year (pre-listing)	Estimated number of plants at most recent observation post-listing	Year (post-listing)	Threats code	Notes	Source (s)
N of Lake Cuyamaca (Northeast corner of intersection of Hwy 79 & Hwy S-1), Cuyamaca Mtns.	Extant (not known to FWS)	Presumed extant	32	NA	CDPR, Helix Water District, Lake Cuyamaca Park and Recreation District	NA	NA	NA	NA	Potential: 1, 5 Unknown: 6, 9		J. Hirshberg collection (SD15716, CCH), Hirshberg 2019, pers. comm.

<sup>1</sup> Threats have not been well-characterized at all meadows. We considered a threat “potential” if it is possible to likely that the threat alters meadow habitat or affects individuals, but has not been directly reported. We considered a threat “unknown” if we have no information about a threat at a particular meadow, or could not determine whether a threat was or was not likely present. The determination of “potential” versus “yes” was difficult in some cases; for example, OHV trespass might occur even in well-protected meadows. We need additional information about some Factor E threats such as hybridization, and limited numbers of individuals, the impacts of a changing climate, and so those threats are not included in this table. Threats codes: 1 = Alteration of hydrological conditions; 2 = Land-use conversion; 3 = Utilities and infrastructure; 4 = Unauthorized OHV use; 5 = Road and trail construction, use, and maintenance; 6 = recreational activities (other than authorized road and trail use); 7 = Grazing; 8 = Mining; and 9 = Nonnative plant species.