Aristida lanosa

Woolly Three-awn Grass

Poaceae

Aristida lanosa by Keith Bradley, 2015

***Aristida lanosa* Rare Plant Profile**

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

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Life History

Aristida lanosa (Woolly Three-awn Grass) is a perennial grass that produces solitary stems or forms small tufts. The culms are sturdy, erect, and unbranched; sometimes reaching 1.5 meters in height. The leaves are 3–6 mm wide and may be up to 50 cm in length but they are often shorter. The leaf blades are flat and smooth below, although they can be somewhat rough on the upper side and along the edges. The leaf sheaths are longer than the internodes and they are distinctly wooly—as suggested by the name—with tangled, cottony hairs that may be distributed uniformly or in patches. Tufts of hair are also present at the stem nodes. The inflorescence of *A. lanosa* is a loose panicle with appressed or ascending branches, each of which bears 4–12 single-flowered spikelets. The glumes have one vein and they are unequal in size: The lower one often has a slight outward curve. The lemmas are topped with three long awns: The middle one is usually longer than the other two and bent or curved at the base. (See Britton and Brown 1913, Henrad 1932, Hitchcock 1924 & 1950, Fernald 1950, Allred 1985, 1986 & 2021, Gleason and Cronquist 1991, Chamberlain 2018).

Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Center: Keith Bradley, 2015. Right: Larry Allain, U. S. Geological Survey.

Weakley et al. (2024) pointed out that *Aristida* awns are initially parallel and erect, so grasses in the genus are best identified when they are mature and dry. *A. lanosa* begins flowering in August and fruits may be present as late as November, although they may be released quickly upon drying. In New Jersey, *A. lanosa* has been observed fruiting during mid-September and early October (Stone 1911, Hough 1983, NJNHP 2024).

Aristida lanosa has sometimes been confused with *A. purpurascens* (Stone 1911) or *A. palustris* (Allred 2021), although the latter species does not occur in New Jersey. The cottony pubescence on the sheaths of *A. lanosa* can distinguish it from all of the other perennial *Aristida* species that occur in the United States (Allred and Valdés-Reyna). While the wooly appearance is a

reasonably reliable characteristic, *A. lanosa* plants with smooth sheaths may occasionally be encountered (Hitchcock 1950, Allred 2021).

Pollinator Dynamics

Wind is the primary means of pollination for plants in the Poaceae (Culley et al. 2002, Garcia-Mozo 2017). Some characteristics that facilitate wind pollination in the family include smooth, round pollen grains, a reduced perianth, and a limited number of ovules (Geisler 1945, Friedman and Barrett 2009). Even for grass species that also utilize insects as pollinators wind is the most important mechanism for cross-fertilization (Schulze-Albuquerque et al. 2019).

It is not clear whether *Aristida lanosa* is capable of self-fertilization. Self-incompatibility is frequent in the grass family, particularly in perennial species (Baumann et al. 2000, Friedman and Barrett 2009), although it may be partial—reducing but not eliminating the production of viable seeds (Connor 1979). Some *Aristida* species do not have spatial or temporal separation of male and female floral parts, making self-pollination possible (Ramirez 2006). Partial self-compatibility was recently documented in a southeastern member of the genus, *A. beyrichiana* (Burt and Brudvig 2019).

Seed Dispersal and Establishment

The fruit of a grass, known as a grain or caryopsis, is dry, indehiscent, and single-seeded. The lemmas of *Aristida* species have thick basal extensions (calluses) that become hard and pointy in fruit (Hitchcock 1950). The calluses of *A. lanosa* are 0.5–1 mm long (Allred 2021). Both the basal calluses and the awns at the top of *Aristida* caryopses aid in dispersal. The divergent awns on mature seeds enhance buoyancy, allowing the propagules to be carried by the wind, and the heavier calluses induce them to land in positions that are favorable for germination. Both the awns and the pointed calluses can also help the seeds cling to animal fur and be dispersed in that manner (Hitchcock 1924 & 1950, Allred 2021).

Soehren and Threlkeld (2003) indicated that *Aristida lanosa* was an important source of food for wildlife. *A. lanosa* seeds are occasionally consumed by birds or small mammals (Allred 2021), but browsing by larger mammals is unlikely to play a significant part in their distribution. The perennial *Aristida* species are generally avoided by grazers when alternate options are available: They are considered poor forage grasses because they typically have low palatability, relatively few leaves, and hard, dry fruits. Species in the genus are most likely to be browsed prior to flowering (Hitchcock 1924 & 1950, Hall et al. 2017, Allred 2021).

No information was found regarding the seed longevity or germination requirements of *Aristida lanosa*. Studies of other perennial *Aristida* species have reported that they are either short-lived in the seed bank or absent altogether (Kinuchan and Smeins 1992, Mulligan and Kirkman 2002, Coffey and Kirkman 2006, Andreu et al. 2009). Most grass seeds require a period of dormancy (Deno 1993), and species like *A. lanosa* that occur in fire-prone habitats often germinate readily

on bare ground (McAvoy 2014). A review of mycorrhizal studies indicated that some *Aristida* species form fungal associations but others do not (Wang and Qiu 2006).

Habitat

Aristida lanosa is usually associated with dry, sandy soils (Stone 1911, Hitchcock 1924, Steyermark 1958, Hough 1983, Allred 2021, Weakley et al. 2024), although it has occasionally been documented on more silty or loamy substrates (Boyle et al. 2007, Sorrie et al. 2006). Gillis (1971) cited *Aristida lanosa* as an example of a species that can be found in both sandhills and pine barrens, noting that plants adapted to those habitat types were often reliant on nutrients originating from surface decomposition because they were generally unable to produce roots that could reach beyond the sterile upper soils. The habitats occupied by *A. lanosa* are frequently subxeric to xeric (Burk 1959, Duke 1961, Rodgers and Provencher 1999, Payne 2010) but the grass may also be found in more mesic sites (Gilman 1957, Drew et al. 1998, Sorrie et al. 2006). Correll and Correll (1941) reported an occurrence on a seepage slope dominated by scrub oak.

Aristida lanosa was assigned a heliophily rank of 8 on a scale of 1 (shade-obligate) to 9 (sun obligate), indicating a strong preference for open conditions (Weakley et. al. 2024). In New Jersey, *A. lanosa* has been found growing in open areas within pine-oak woods and along woodland edges (NJNHP 2024), and it has been reported in similar habitats throughout the eastern portion of its range (Burk 1959, Conde et al 1983, Drew et al. 1998, Belden et al. 2003, Brudvig et al. 2013, Clewell 2013). Locations include barriers islands, dunes, riverine islands, and inland sites on the coastal plain (Sorrie 2014, Stalter and Lamont 2016, Nakahata et al. 2020). Southwestern habitats include Texas grasslands (Oberholser 1925), sandy prairies in Missouri (Steyermark 1958), glades on Ketona dolomite outcrops in Alabama (Allison and Stevens 2001), and upland forest gaps in Oklahoma (Buthod and Hoagland 2020). Brudvig and Samschen (2011) indicated that *A. lanosa* was more likely to be found in historically forested areas than in sites that had been used for pasture or agriculture in the past but it has occasionally been found growing on lawns or along roadsides (Soehren and Threlkeld 2003, Payne 2010).

Many of the pine-oak habitats utilized by *Aristida lanosa* in the eastern part of its range have historically been maintained by fire. Periodic burns limit the growth of woody plants and they generally benefit native grasses like *A. lanosa* that occur in the sites (Brockway and Lewis 1997, Belden et al. 2003, Clewell 2013, McAvoy 2014). *A. lanosa* was documented in 3 out of 8 sampling plots during a study of a pine-dominated woodland in Texas where prescribed burns had been implemented at varying times of year every 2–3 years for the previous 15 years (Phillips et al. 2008).

Wetland Indicator Status

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

USDA Plants Code (USDA, NRCS 2024b)

ARLA6

Coefficient of Conservancy (Walz et al. 2020)

CoC = 8. Criteria for a value of 6 to 8: Native with a narrow range of ecological tolerances and typically associated with a stable community (Faber-Langendoen 2018).

Distribution and Range

The global range of *Aristida lanosa* is restricted to the southeastern United States (POWO 2024). The map in Figure 1 depicts the extent of the species in North America.

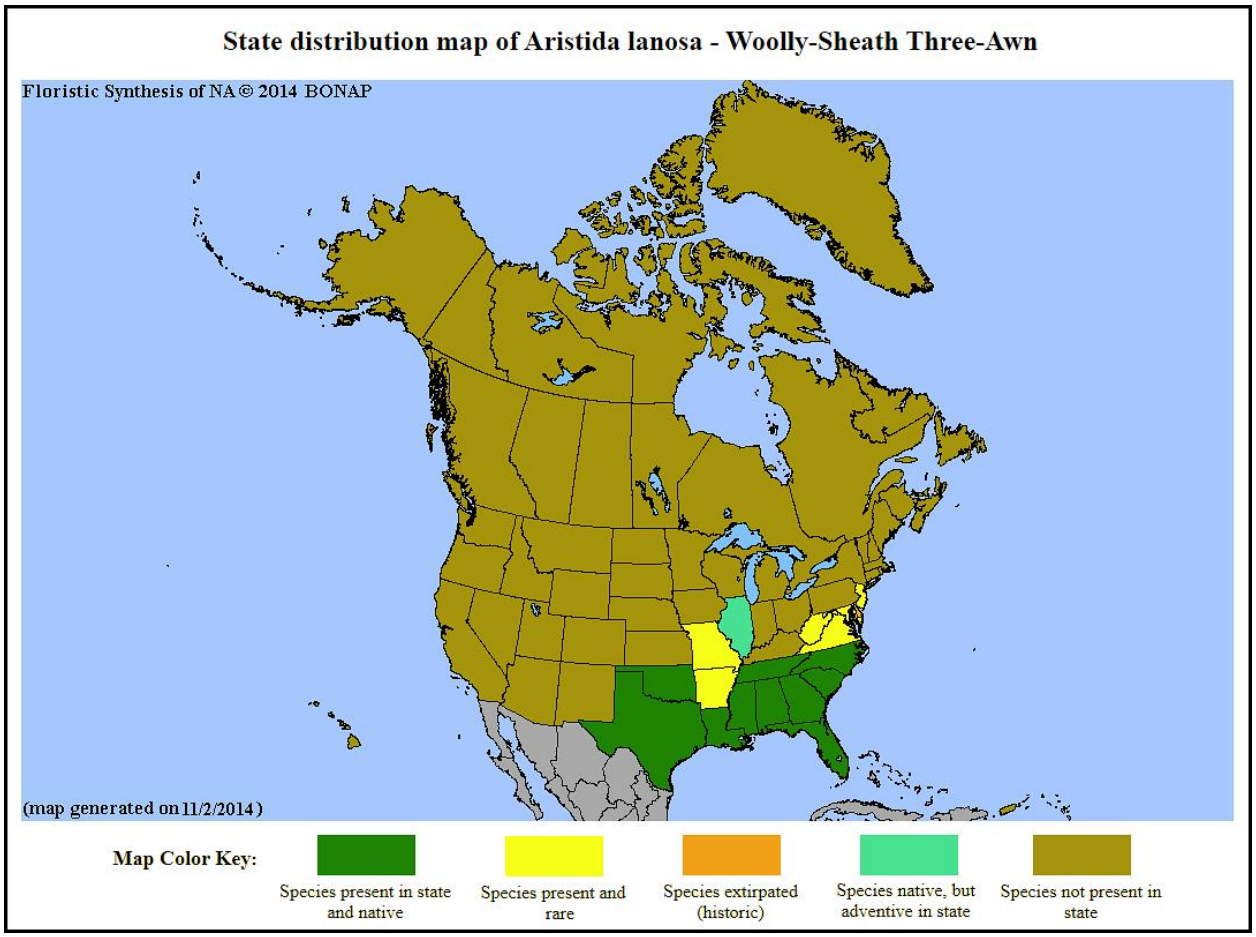

Figure 1. Distribution of A. lanosa in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2024b) shows records of *Aristida lanosa* in four New Jersey counties: Burlington, Camden, Cape May, and Salem (Figure 2 below). The data include historic observations and do not reflect the current distribution of the species.

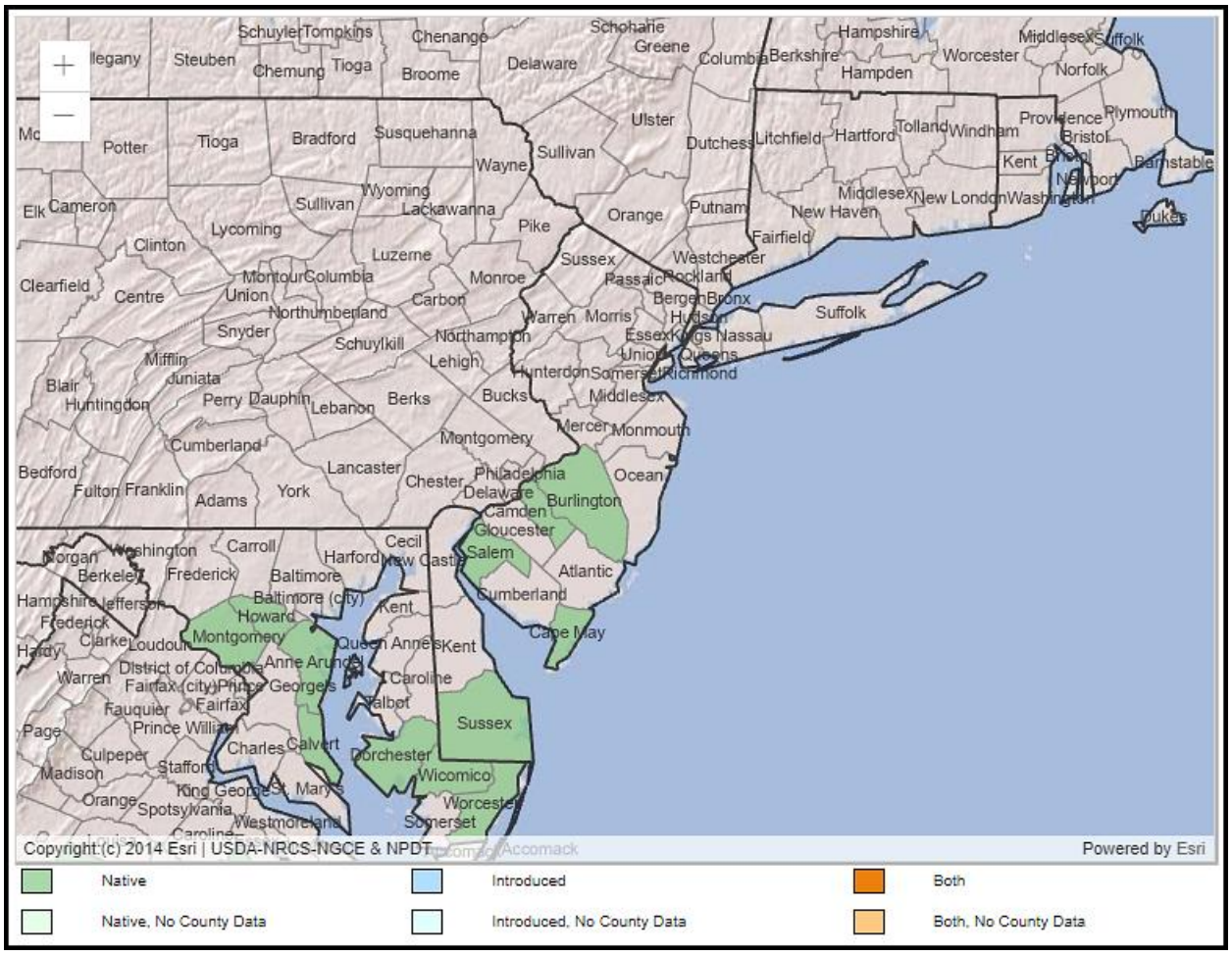

Figure 2. County records of A. lanosa in New Jersey and vicinity (USDA NRCS 2024b).

Conservation Status

Aristida lanosa is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *A. lanosa* throughout its range. Wooly Three-awn Grass is vulnerable (moderate risk of extinction) in four states, imperiled (high risk of extinction) in one state, critically imperiled (very high risk of extinction) in four states, and possibly extirpated in Delaware and West Virginia.

Aristida lanosa has also been identified as a plant species of highest conservation priority for the North Atlantic region, which includes four Canadian provinces and twelve U. S. states. The species was assigned a rank of R3 (vulnerable), signifying a moderate risk of regional extinction (Frances 2017).

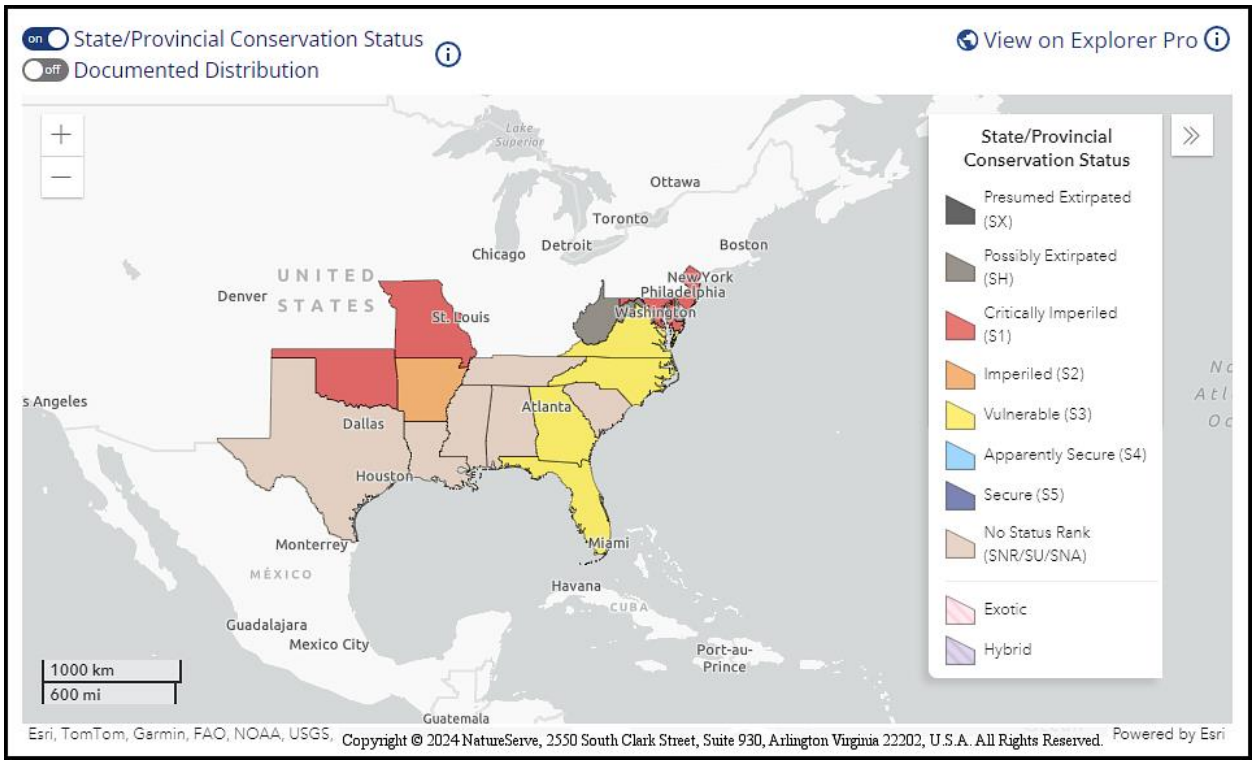

Figure 3. Conservation status of A. lanosa in North America (NatureServe 2024).

Aristida lanosa is critically imperiled (S1) in New Jersey (NJNHP 2024). The rank signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *A. lanosa* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities, being listed does not currently provide broad statewide protection for plants. Additional regional status codes assigned to the grass signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

Aristida lanosa has always been rare in New Jersey. The species was first reported at a site in Burlington County, where it was encountered by Witmer Stone and Stewardson Brown on September 15, 1901 (Stone 1907, 1908). *A. lanosa* was subsequently documented in Camden and Cape May counties (Stone 1911), and in 1934 it was collected in Salem County (NJNHP 2024). Hough (1983) indicated that the grass had not been seen in Burlington or Cape May in over 50 years, and site of the Camden County occurrence was developed at some point (NJNHP 2024). The Salem County population is the only one of the original occurrences that is still believed to be extant. A second extant population was discovered by David Snyder in 2000, approximately two miles away from where the species was first reported by Stone (Mid-Atlantic Herbaria 2024, NJNHP 2024).

Threats

No threats to New Jersey's extant populations of *Aristida lanosa* have been reported, although one former site was destroyed by development (NJNHP 2024). Some Florida occurrences met a similar fate (Clewell 2013). In addition to development, some upland habitats utilized by *A. lanosa* have been altered by grazing or lumber production. Brockway and Lewis (1997) found that light grazing by deer or cattle had no substantial impact on the vegetation in a Longleaf Pine (*Pinus palustris*) community. Perennial graminoids like *A. lanosa* are generally tolerant of herbivory because they can regrow from a basal meristem after they have been browsed (Begley-Miller et al. 2014), and since *Aristida* species are generally unpalatable to large herbivores the preferential grazing of other grasses may be advantageous to some populations (Hall et al. 2017).

Forest management activities often appear to benefit plants in the herbaceous layer. For example, Burk (1959) noted that episodic logging seemed to help maintain the fire-adapted vegetative community at a site in North Carolina. However, *Aristida lanosa* is an exception. Conde et al. (1986) noted an overall increase in herbaceous vegetation following the conversion of pine flatwoods to plantations but the cover of *A. lanosa* was reduced. A comparison of harvesting techniques in Alabama demonstrated that canopy thinning was more favorable than clearcutting in terms of species richness and diversity; however, the frequency of *A. lanosa* did not differ significantly between thinned and clearcut stands (Brockway and Lewis 2003).

Changes to eastern pine-oak woodlands resulting from fire suppression are a threat to *Aristida lanosa*. The grass, along with other characteristic herbaceous plants of pyrophilic habitats, can be eliminated by heavy accumulations of leaf litter, an extensive shrub layer, and canopy closure when natural successional processes are not disrupted (Brockway and Lewis 1997, Belden et al. 2003, Clewell 2013).

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Aristida lanosa* populations to climate change. The species was assigned a rank from NatureServe's Climate Change Vulnerability Index using the associated tool (Version 3.02) to estimate its exposure, sensitivity, and adaptive capacity to changing climactic conditions in accordance with the guidelines described by Young et al. (2016) and the state climactic computations by Ring et al. (2013). Based on available data *A. lanosa* was assessed as Less Vulnerable, meaning that climate change is not expected to have a notable detrimental impact on its extent in New Jersey by 2050. However, very little specific information was found regarding the ecological requirements of the grass—particularly during the establishment phase—so its vulnerability could have been underestimated.

Some of the effects of changing climactic conditions in New Jersey include higher temperatures, shifting precipitation patterns that increase the frequency and intensity of both droughts and floods, and rising sea levels along the coast (Hill et al. 2020). The state's extant populations of *Aristida lanosa* are situated on the inner coastal plain and do not face threats from coastal flooding in the near future, and the upland habitats will probably not have significant exposure to

inundation. As a southern species that reaches the northern end of its range in New Jersey *A. lanosa* is likely to tolerate warmer conditions, and as a plant of xeric habitats it may be expected to be reasonably drought-resistant. Potential secondary consequences of climate change (eg. shifts in wildfire frequency/intensity or the proliferation of more competitive invasive plants) are harder to predict, and the lack of information about *A. lanosa* makes it difficult to foresee how the species might respond to different scenarios.

Management Summary and Recommendations

The New Jersey populations of *Aristida lanosa* are in need of evaluation. The occurrences were last monitored during 1985 and 2007, respectively. Updated assessments of current population status, habitat conditions, and threats could determine whether management is required at either of the sites.

Fire may be an appropriate tool to maintain the communities that support *Aristida lanosa* in New Jersey and other parts of the eastern United States but more detailed information is needed. Brockway and Lewis (1997) indicated that biennial burns implemented during the dormant season were generally beneficial to grasses and forbs in pine-oak woodlands but studies of forestry management practices have shown that *A. lanosa* does not always respond in the same ways as typical herbs in those habitats. Experimental studies are needed to determine how *A. lanosa* is affected by different burning regimes. Additional areas where research could help to fill gaps in knowledge about *Aristida lanosa* include seed longevity, germination and establishment requirements, fungal associations, self-compatibility, and genetic diversity.

Synonyms

The accepted botanical name of the species is *Aristida lanosa* Muhl. ex Elliott. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b). When Fernald and Griscom (1935) described *Aristida lanosa* var. *macera* they viewed the plants as "very distinct" from typical *A. lanosa*. Most current sources do not recognize any varieties in *A. lanosa* but Weakley et al. (2024) suggested that var. *macera* is worthy of further consideration.

Botanical Synonyms	Common Names
Aristida lanosa Muhl. ex Elliott var. *macera* Fernald & Grisc.	Woolly Three-awn Grass
Aristida gossypina Bosc ex Roem. & Schult.	Woolysheath Threeawn
Aristida lanata Poir.	
Aristida lanuginosa Bosc ex Trin.	
Chaetaria gossypina Roem. & Schult.	
Moulinsia lanosa Raf.	

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