

Oryzopsis asperifolia

White-grained Mountain-rice Grass

Poaceae



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Oryzopsis asperifolia by Peter M. Dziuk, 2012

***Oryzopsis asperifolia* 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

Oryzopsis asperifolia (White-grained Mountain-rice Grass) is a perennial grass that forms dense tufts. Basal leaves are present year-round: Their blades are 3–9 dm long and 4–9 mm wide and they are deep green on one surface but lighter and somewhat waxy (glaucous) on the other. The lower leaf sheaths are bright red-purple or white, although they are usually concealed by the substrate. The leaf bases are nearly round in cross-section and they are twisted so that the glaucous upper surfaces of the blades face downward. The leaves are slightly rough to the touch and their edges are often rolled inward toward the upper surfaces. Stem leaves are much smaller or absent altogether and when present they seldom exceed 1 cm in length. The culms may be erect, spreading, or prostrate: They are 25–65 cm long and the inflorescence is a contracted panicle 3.5–13 cm long. The single-flowered spikelets are 5–7.5 mm in length with two slightly unequal glumes. The firm, pale lemmas have a dense tuft of hairs at the base and they are tipped with awns that are 7–15 mm long and typically slightly wavy. (See Britton and Brown 1913, Johnson 1945, Fernald 1950, Hitchcock 1950, Voss 1961, Dore and McNeill 1980, Gleason and Cronquist 1991, Chamberlain 2018, Mittelhauser et al. 2019, Barkworth 2021). Detailed descriptions of the floral development, leaf surface structure, and embryology of *O. asperifolia* were provided by Kam (1973), Barkworth (1981) and Barkworth (1982), respectively.



Hitchcock 1950, courtesy USDA NRCS 2024a.



Peter M. Dziuk, 2014.

McEwen (1962) observed that *Oryzopsis asperifolia* began the production of new leaves and flower stalks simultaneously in the spring. Throughout its range the species usually flowers in late April or May and mature fruits may be present by the beginning of June (Stevens 1921, Rhoads and Block 2007, Foster and Biligetu 2018, Kelloff and Kass 2018, Weakley et al. 2024). The flower stalks tend to lean over after the fruits have matured (McEwen 1962). In some New Jersey populations observers noted that the plants had dispersed most of their fruit by early June (NJNHP 2024) although Hough (1983) indicated that fruits were occasionally retained until September or October. New *O. asperifolia* leaves continue to grow throughout the season, attaining their maximum size in August and remaining fully or partially green throughout the winter. Like the culms, the leaves are initially upright but become more prostrate with age. Older leaves senesce from the tips downward. Individually leaves generally persist until the

appearance of new leaves in the spring and some live through a second growing season. The lowest parts typically remain green for 11–17 months and a maximum leaf life of 25 months has been recorded (McEwen 1962, Dore and McNeill 1980, Foster and Biligetu 2018, Barkworth 2021).



Peter M. Dziuk, 2005.



Erik Danielsen, 2023.

Oryzopsis asperifolia is relatively easy to identify (Mittelhauser et al. 2019). There is only one species of *Oryzopsis* in North America (Kartesz 2015). Several morphologically similar grasses from the same tribe (see Synonyms and Taxonomy section) have been documented in New Jersey but they all have more prominent stem leaves (Chamberlain 2018).

Pollinator Dynamics

Wind pollination is prevalent in the grass family (Culley et al. 2002, Garcia-Mozo 2017). Some characteristics that facilitate wind pollination in the Poaceae include smooth, round pollen grains, a reduced perianth, and a limited number of ovules (Geisler 1945, Friedman and Barrett 2009). Self-incompatibility is common in wind-pollinated plants (Friedman and Barrett 2009). It is particularly frequent in perennial grasses and has been documented in the tribe (Stipeae) which includes *Oryzopsis* (Baumann et al 2000). However, no specific information was found regarding the potential for self-fertilization in *O. asperifolia*.

Seed Dispersal and Establishment

The fruit of *Oryzopsis asperifolia* is a dry, one-seeded grain. At maturity, the florets separate above the glumes (Barkworth 2021). The majority of grass seeds fall near the parent plants but both wind and post-ingestion dispersal are also common (Collins and Uno 1985, Cheplick 1998). Grass seeds are an important food source for numerous birds and they are also frequently consumed by other animals, including both seed predators and grazers (Fassett 1957, Cheplick 1998). Rodents may either consume the seeds or cache them in new locations and a related grass (*Achnatherum hymenoides*) was noted as a species that is frequently hoarded (Vander Wall 2010, Lucero and Callaway 2018). *O. asperifolia* is said to be highly palatable and it is commonly

eaten by mammals like rabbits or deer (McEwen 1962, Foster and Biligetu 2018). The defecation of viable seeds is a particularly effective form of dispersal for many grasses (Janzen 1984, Milotić and Hoffmann 2016, Orłowski et al. 2016). The long awns of *Oryzopsis asperifolia* also increase the likelihood of seed attachment to mammal fur and subsequent transport (Hovstad et al. 2009, Peterson and Kellogg 2022).

Little is known about the germination and establishment requirements of *Oryzopsis asperifolia*. Most grass seeds require a period of dormancy (Deno 1993, Baskin and Baskin 1998). Dore and McNeill (1980) noted that *O. asperifolia* was weakly rooted and difficult to grow in the absence of a surface mulch. The species appears to be facultatively mycorrhizal: Endomycorrhizae were present in 13 of the 29 *O. asperifolia* plants examined by Malloch and Malloch (1981).

Habitat

Throughout its range, *Oryzopsis asperifolia* is most likely to be found in dry woodland habitats (Smyth 1912, Knowlton 1919, Breitung 1957, Hough 1983). It often grows at high elevations (Sharples 2017, Weakley et al. 2024): Altitudes between 600 and 1500 meters have been recorded (Harper 1900, McEwan 1962, Charboneau et al. 2013). In Ontario *O. asperifolia* was noted as one of the most abundant herbs on ridge tops but it was also a significant component of the herbaceous vegetation on both south and north facing slopes (MacHattie and McCormack 1961). The majority of *Oryzopsis asperifolia* populations in New Jersey have been associated with limestone ridges (NJNHP 2024). However, the ground where the grass occurs may be rocky, sandy, or gravelly—it has been collected on talus slopes, dry eskers, and muddy reservoir banks (Bannan 1940, Nekola 1990, Mitchell and Tucker 1994, Forman et al. 2003, Wagner and Robinson 2006, Rhoads and Block 2007, Foster 2015, Kelloff and Kass 2018, Barkworth 2021). *O. asperifolia* appears to require a well-developed layer of duff or loose soil (Dore and McNeill 1980, Barkworth 2021). Host (1996) observed that the species declined following even moderate amounts of soil compaction and Corio et al. (2009) found that the grass was more frequent in soils that had high earthworm densities.

Barkworth (2021) indicated that *Oryzopsis asperifolia* can occur in both deciduous and coniferous woods. The grass is often found in sites where the canopy is dominated by aspens (*Populus tremuloides*, *P. grandidentata*) or conifers including *Abies*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga*, and *Tsuga* (Scribner and Tweedy 1886, Stevens 1921, Bannan 1940, McEwen 1962, Mitchell and Tucker 1994, Walford and Baker 1995, Host 1996, Krestov et al. 2000, Charboneau et al. 2013, Sharples 2017, Hogan 2019). *O. asperifolia* can also occur in mixed conifer/hardwood forests (Chapman and Crow 1981a, Dister 2017, NJNHP 2024) and it was reported at one site where the canopy was dominated by maple (*Acer*) and beech (*Fagus*) trees (May 2015). When *O. asperifolia* is growing in forest gaps there is often a well-developed shrub layer consisting of *Myrica* or assorted ericaceous species (Bannan 1940, Levy 1970, Weakley et al. 2024).

Oryzopsis asperifolia often establishes in young aspen or pine woods but then persists as the canopy continues to develop (Bradley 1947, Mueggler 1985, Uresk and Severson 1998). However, the grass grows faster and flowers more abundantly in places with higher light

availability and populations can become vegetative in shadier sites (Good 1963, Uresk and Severson 1998). Assessments of shade tolerance have indicated that *O. asperifolia* is able to withstand moderate shading but it benefits from sunnier conditions (Humbert et al. 2007, Weakley et al. 2024). Sporadic disturbances may help to maintain the vigor of established populations. Bradley (1947) observed that *O. asperifolia* was a characteristic species of aspen forests that had experienced periodic fires. The grass is tolerant of occasional burning although it recovers slowly rather than responding with vigor (Chapman and Crow 1981a & 1981b, Abrams and Dickman 1982). *O. asperifolia* can sometimes take advantage of openings created by the removal of canopy trees, but only after the woody vegetation begins to recover (Roberts and Gilliam 1995, Lamb et al. 2003, Wagner and Robinson 2006, Riege 2020). On the other hand, clearcutting activities sometimes initiate a shift in community composition and in those cases *O. asperifolia* is likely to be at a disadvantage (Zenner and Berger 2008).

Wetland Indicator Status

Oryzopsis asperifolia 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)

ORAS

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 *Oryzopsis asperifolia* is restricted to the United States and Canada (POWO 2024). The map in Figure 1 depicts the extent of the species in North America.

The USDA PLANTS Database (2024b) shows records of *Oryzopsis asperifolia* in four New Jersey counties: Passaic, Sussex, Union, and Warren (Figure 2). The data include historic observations and do not reflect the current distribution of the species.

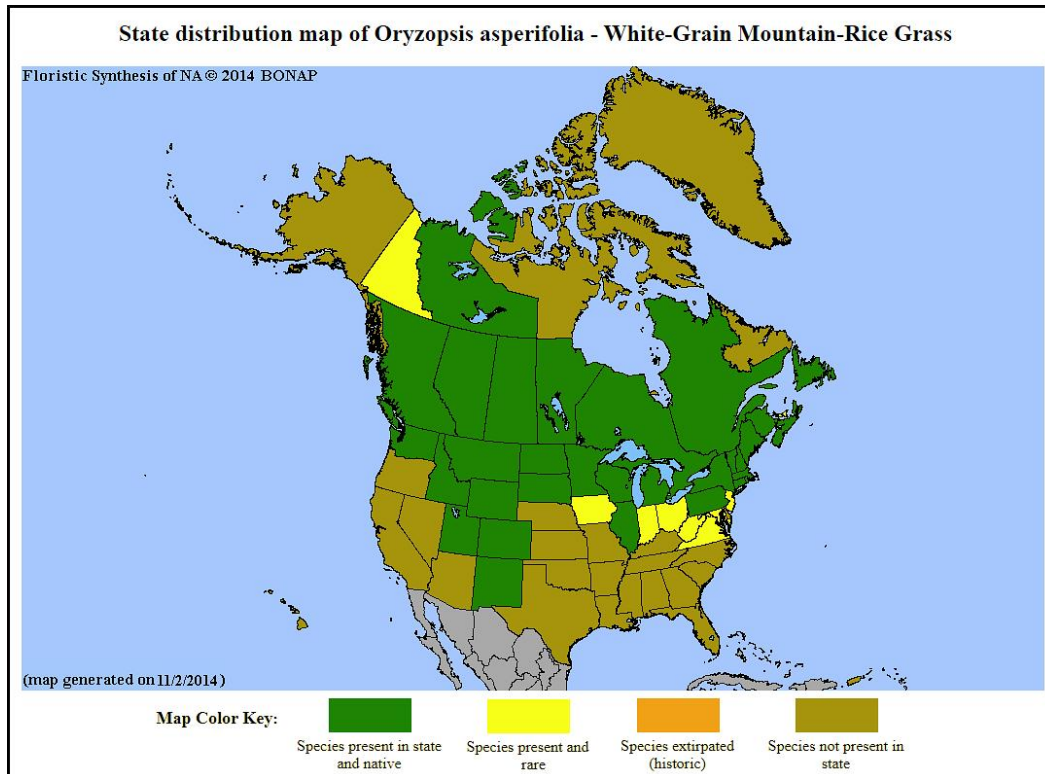


Figure 1. Distribution of *O. asperifolia* in North America, adapted from BONAP (Kartesz 2015).

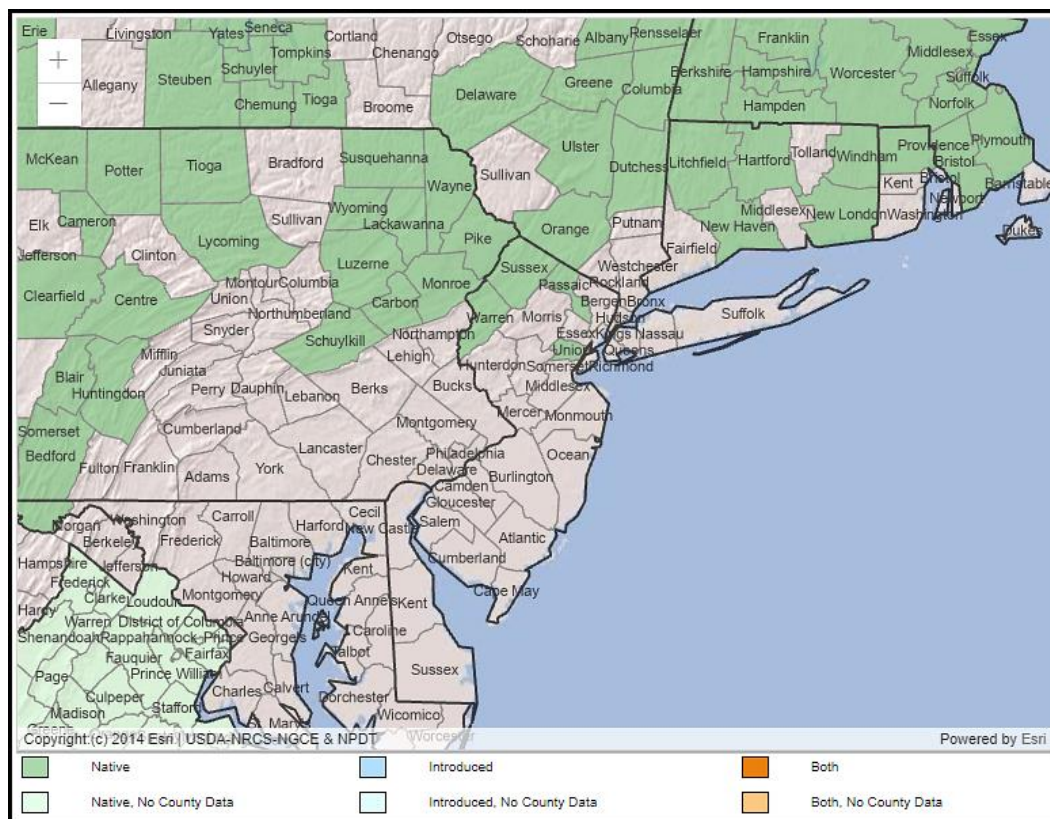


Figure 2. County records of *O. asperifolia* in New Jersey and vicinity (USDA NRCS 2024b).

Conservation Status

Oryzopsis asperifolia 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 *O. asperifolia* throughout its range. The species is critically imperiled (very high risk of extinction) in five states, imperiled (high risk of extinction) in three states and one province, and vulnerable (moderate risk of extinction) in one state and one province. Throughout most of its range *O. asperifolia* is secure, apparently secure, or unranked.

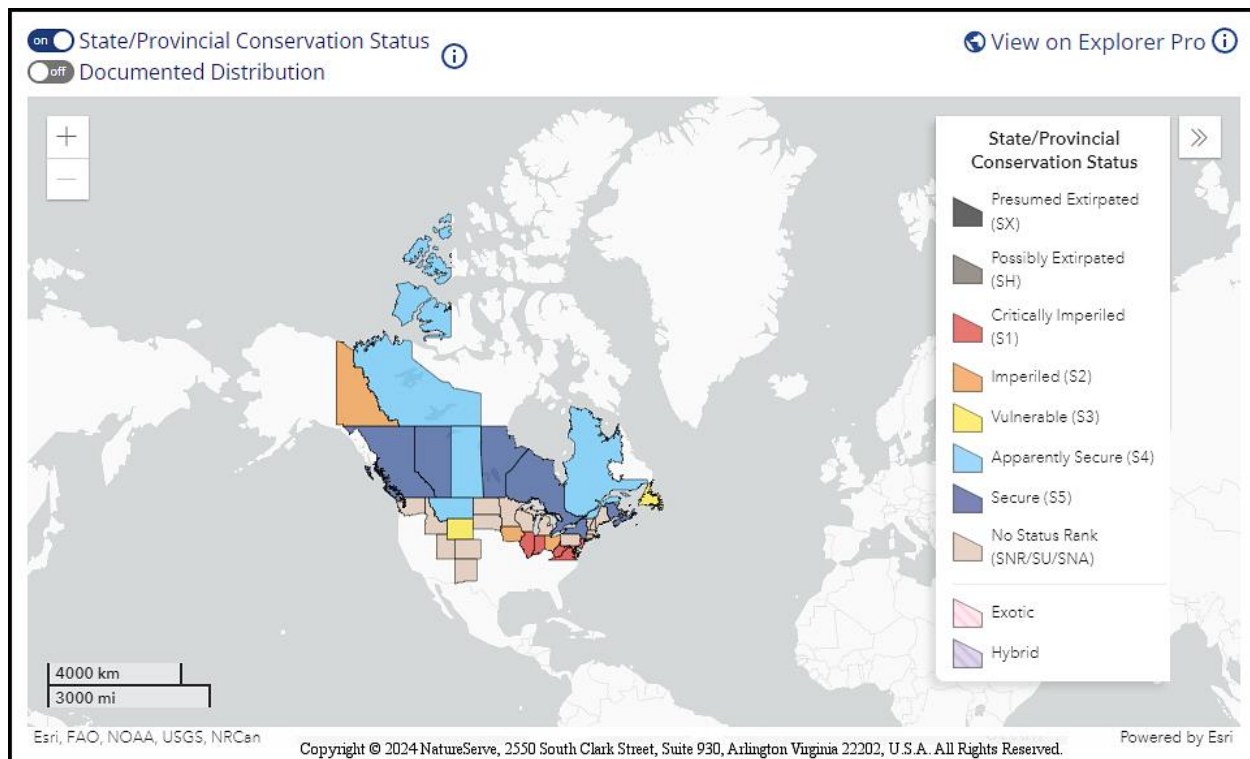


Figure 3. Conservation status of *O. asperifolia* in North America (NatureServe 2024).

Oryzopsis asperifolia 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. *O. asperifolia* 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).

The earliest report of *Oryzopsis asperifolia* in New Jersey was from Union County (Britton 1881, Taylor 1915) but by the mid-1900s it was only known from a few locations in the northern

part of the state (Hough 1983). Five extant occurrences were reported by Breden et al. (2006). All of the seven sites tracked by the Natural Heritage Program are located in Sussex or Warren County. One is ranked as historical and six are still characterized as extant but one of those may have been destroyed by development, another has only supported one or two *O. asperifolia* plants in recent years, and three others have not been monitored for several decades (NJNHP 2024).

Threats

Oryzopsis asperifolia is relatively secure throughout its range but some decline could result from habitat loss or fragmentation (NatureServe 2024). The proposed expansion of a housing development was identified as a threat to one New Jersey population about 25 years ago although it is not clear whether the project was completed or what impact it may have had on the grass. A concern raised regarding another New Jersey occurrence was the proliferation of invasive plants (*Alliaria petiolata* and *Berberis thunbergii*) that had established in the vicinity (NJNHP 2024). While the effects of competition on *Oryzopsis asperifolia* have not been specifically studied, Zenner and Berger (2008) observed that the grass experienced a decline after more competitive species established in gaps created by logging. Certain types of habitat alteration that result from beaver activity can also threaten populations of *Oryzopsis asperifolia*. A Michigan study found that the grass was able to persist in areas where trees had been cut down by beavers but disappeared from sites that had been flooded (Riege 2020).

Oryzopsis asperifolia is notably palatable and its winter-green leaves are likely to increase its vulnerability to herbivores. However, the results of both a long-term abundance study and an exclosure evaluation indicated that *O. asperifolia* had a high tolerance for browsing (Wiegmann and Waller 2006, Rooney 2009). Many perennial grasses can minimize the consequences of herbivory by regrowing from a basal meristem after they have been browsed (Begley-Miller et al. 2014). A clipping experiment to simulate grazing effects found that repeated browsing could take a toll on *O. asperifolia* but occasional herbivory—particularly during the winter months—did not have a significant detrimental effect (Foster and Biligetu 2018). The consumption of fruiting stems by deer could hamper reproductive efforts but might also result in the dispersal of viable propagules (Myers et al. 2004). *Oryzopsis asperifolia* seeds can be utilized as a food source for humans (Morton 1963), although that does not promote dispersal because the propagules are typically ground up to make flour.

A number of fungal diseases have been documented on *Oryzopsis asperifolia* including *Phyllachora graminis*, *P. oryzopsidis*, and species of *Mycosphaerella* and *Puccinia* (Orton 1899, Davis 1914, Greene 1952). Greene additionally reported an unidentified *Physalospora*, noting that it was "of questionable parasitism but appearing to have developed on the current season's leaves." *Mycosphaerella* was formerly a huge genus that included more than 10,000 taxa so it is not clear which species may have been associated with *O. asperifolia* (Crous et al. 2009). *Phyllachora* fungi form tar-like spots on the foliage of their hosts but seldom cause significant damage to the plants (Broders et al. 2022). Rust fungi in the genus *Puccinia* are likely to be a more serious threat to their host plants: Severe infections can inhibit fruit production and cause premature wilt or senescence (Avasthi et al. 2023).

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Oryzopsis asperifolia* 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 climatic conditions in accordance with the guidelines described by Young et al. (2016) and the state climatic computations by Ring et al. (2013). Based on available data *O. asperifolia* was assessed as Moderately Vulnerable, meaning that it is likely to show some decrease in abundance or range extent in New Jersey by 2050. However, threats to the species may have been overestimated due to uncertainty regarding the species' ecological requirements and competitive abilities.

As the global climate warms, temperatures are rising faster in New Jersey than elsewhere in the northeast and the weather patterns are also changing. A net increase in annual precipitation is likely due to greater storm intensity but longer, more frequent droughts are also occurring in the state (Hill et al. 2020). The current vulnerability assessment was based on the presumption that *Oryzopsis asperifolia* will be moderately or highly sensitive to rising temperatures since New Jersey is close to the southern end of the species' range and it primarily grows at high elevations; however, no data was found to either support or contradict that supposition. Redmann (1985) noted that *O. asperifolia* has some adaptations that can minimize heat stress—for example 90% of its stomata are located on the upper (downward-facing) side of the leaves and its leaves can roll inward to further minimize water loss. Nevertheless, the extent of the species' drought tolerance has not been evaluated.

Invasive plant species are likely to become an even greater threat in New Jersey as the climate continues to warm. Some of the exotic species which have already gained a foothold in the northeast are expected to become more abundant (Dukes et al. 2009, Coville et al. 2021, O'Uhuru 2022), and both the northeastern and mid-Atlantic regions are predicted to become hotspots for the establishment of additional nonnative plants (Bellard et al. 2013, Salva and Bradley 2023). While some observations have indicated that invasive plants are detrimental to *Oryzopsis asperifolia* populations there is currently insufficient information to accurately assess the extent of the threat they may pose to the grass.

Management Summary and Recommendations

An updated status assessment is needed for *Oryzopsis asperifolia* in New Jersey. Most of the occurrences have not been visited for many years so their current management needs are not known. Depending on the outcome of monitoring visits, some sites may require efforts to control the spread of invasive species. At sites where *O. asperifolia* is primarily vegetative some minor canopy thinning might stimulate reproduction. One location where the plant was collected during the 1940s has not been searched but suitable habitat is still thought to be present.

Additional research is needed to provide a basis for effective management of this species, particularly in the southern end of its range where it may be more vulnerable to climate change.

Information about self-compatibility, seed banking, germination, and establishment requirements would be useful, as would additional knowledge regarding the climactic requirements and competitive abilities of *O. asperifolia*.

Synonyms and Taxonomy

The accepted botanical name of the species is *Oryzopsis asperifolia* Michx. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024). Within the Poaceae *Oryzopsis* has been placed in the Tribe Stipeae. A number of closely related and morphologically similar plant species were formerly included in *Oryzopsis* but the circumscription of that genus was frequently questioned and over time they have all been transferred to other genera (Johnson 1945, Kam and Maze 1974, Barkworth 1983 & 1993, Romaschenko et al. 2011). *O. asperifolia*, the type species for *Oryzopsis*, is now the only species retained in the genus by most current sources (eg. Peterson et al. 2019, Barkworth 2021, Weakley et al. 2024) although POWO (2024) also includes one Asian species (*O. chinensis*).

Botanical Synonyms

Oryzopsis aspera Muhl.
Oryzopsis leucosperma Walp.
Oryzopsis mutica Link
Urachne asperifolia (Michx.) Trin.
Urachne leucosperma Link
Urachne mutica (Link) Steud.

Common Names

White-grained Mountain-rice Grass
Roughleaf Ricegrass
Whiteseed Mountain-Ricegrass
Spreading Ricegrass
Rough Mountain Ricegrass
Aspen Ricegrass

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