Pityopsis graminifolia var. *latifolia*

Wide-leaf Silkgrass

Asteraceae

Pityopsis graminifolia var. *latifolia* by Celeste Ray, 2021

***Pityopsis graminifolia* var. *latifolia* Rare Plant Profile**

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

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Life History

Pityopsis graminifolia var. *latifolia* (Wide-leaf Silkgrass) is a rhizomatous perennial herb in the aster family. The genus is taxonomically difficult (see Synonyms and Taxonomy section) because it includes a number of closely related species and varieties that have overlapping characteristics (Bowers 1972). Polyploidy is common in *Pityopsis*, and *P. graminifolia* var. *latifolia* is tetraploid or occasionally hexaploid (Semple and Bowers 1987, Semple and Jabbour 2019). There are five named varieties of *Pityopsis graminifolia* but var. *latifolia* is the most widespread and the only one of the five to occur in New Jersey. A number of the studies cited in this profile reported research results for *P. graminifolia* but did not identify the variety or varieties examined.

The basal leaves of *Pityopsis graminifolia* var. *latifolia* are soft, long (15–30 cm) and grasslike but the stem leaves are narrowly lance-shaped and become progressively smaller and more erect toward the top of the stems. The stems, leaves, and floral peduncles are covered with silky hairs that give them a silvery appearance. Each plant can produce 1–5 stems that are 20–80 cm in height and branched near the top. Like most species in the Asteraceae, the flowers of *P. graminifolia* var. *latifolia* are composite heads of both ray and disc florets. Each flower head is about 2.5 cm wide and has 10–16 pistillate ray florets and 30–40 disc florets with both pistils and stamens. Both ray and disc florets are yellow. (See Fernald 1897, Britton and Brown 1913, Fernald 1950, Gleason and Cronquist 1991, Semple 2020, LeGrand et al. 2023).

Left and Center: Flower and stem leaves by Celeste Ray, 2021. Right: Basal leaves by Alan Weakley, 2021.

Pityopsis graminifolia var. *latifolia* propagates vegetatively via branching rhizomes that can be 7–20 cm long. Each rhizome initially develops a shoot at the terminal end, but then additional shoots can develop from axillary buds. Clones can become fairly large but they eventually break up into individual plants (Bowers 1972, Brewer and Platt 1994b, Boggess 2013). In the eastern United States, *P. graminifolia* var. *latifolia* may flower from June to December, although it often blooms between July and October. In Florida the species occasionally flowers during the spring (Semple 2020, Weakley et al. 2022, LeGrand et al. 2023). New Jersey plants have been

observed in flower during October and November: During 2018 the plants were still in bud on the 14th of November (NJNHP 2022). Larger plants produce more numerous flower heads (Hartnett 1990). Seed set occurs from late fall through early winter, with dispersal beginning in December. The flowering stems senesce after seed set but one or more new shoot buds can first develop at the base of the plant. Nonflowering shoots do not die back during the winter, at least in southern locations. Observers in Florida noted that seeds began to germinate shortly after dispersal and continued into early spring while new ramets emerged from buds over a two-week period in February (Hartnett 1987, Brewer and Platt 1994a & 1994b). Populations of *P. graminifolia* that were monitored by Hartnett (1987) were primarily maintained by clonal growth rather than seeds.

Pollinator Dynamics

Pityopsis graminifolia var. *latifolia* is pollinated by insects. Bowers (1972) observed that *Pityopsis* species were fertilized by various types of bees, and Brewer and Platt (1994a) reported that the flowers of *P. graminifolia* were visited primarily by bumblebees (*Bombus* spp.) and a large assortment of Lepidopterans. There are 13 known species of bees that are specialist pollinators of *Pityopsis* and a few other closely related genera in the Asteraceae. Six of the bees occur in New Jersey: *Andrena fulyipennis, Colletes americanus, Melissodes dentiventris, Perdita bishoppi, P. boltoniae, and P. octomaculata*. The other seven species (*Dieunomia nevadensis, Melissodes fumosus, Perdita blatchleyi, P. consobrina, P. georgica, P. graenicheri,* and *Pseugopanurgus solidaginis*) are more southern in distribution (Fowler and Droege 2020).

Pityopsis graminifolia is not self-compatible. Pollinator exclusion experiments carried out by Bowers (1972) demonstrated that the flowers did not produce seed in the absence of insects. Although the study was completed before the five varieties of *P. graminifolia* were described in 1985, Moore (2014) subsequently examined Bowers' voucher specimens and determined that the *P. graminifolia* plants that had been used for the tests of self-compatibility belonged to var. *latifolia*.

Seed Dispersal and Establishment

Both disc and ray florets of *Pityopsis graminifolia* var. *latifolia* are fertile. The number of fruits per flower head is fairly uniform within a population so counting flower heads is a good way to estimate sexual reproduction at a given site (Hartnett 1987). Mature *P. graminifolia* fruits can be readily distinguished from those that failed to develop by their color and size (Brewer and Platt 1994a). The dry, single-seeded fruits are narrow and 2.5–4.5 mm long and terminate in bristles that are 5–9 mm in length (Semple 2020). The propagules are dispersed by wind (Brewer and Platt 1994a).

Pityopsis graminifolia seeds have no dormancy requirement and are capable of rapid germination. When grown in controlled conditions, the seeds begin to germinate a week after they have been planted (Kujawski and Englert 1999). Seeds in a Florida community germinated shortly after dispersal and continued for a period of several months (Brewer and Platt 1994a). A

seed bank study by Cohen et al. (2004) did not find any *P. graminifolia* propagules in the seed bank even when the species was present in the vegetation.

Pityopsis graminifolia is mycorrhizal (Wang and Qiu 2006) but fungal associates are probably not required for seedling establishment. Research by Anderson and Menges (1997) found that mycorrhizal colonization in *P. graminifolia* varied seasonally and between sites but was generally low. The authors observed that the highly branched root system in the species was consistent with limited formation of mycorrhizal associations.

Fire plays an important role in the maintenance of populations for a number of *Pityopsis* species and the process has been well-researched. However, most studies of response to fire in *Pityopsis graminifolia* did not identify the subject taxon at the varietal level which may account for some inconsistencies in results between studies and between populations. For example, regional differences were observed between paired populations in Florida (Brewer 1995) and in Mississippi (Brewer 2008). Nevertheless, many of the fire effects reported for *P. graminifolia* are common to multiple *Pityopsis* species and are likely to apply to var. *latifolia* (Gowe and Brewer 2005).

Hartnett (1987, 1990) determined that fire frequency affected the biomass allocation strategies of *Pityopsis graminifolia*—plants at sites that burned regularly made a heavier investment in roots than shoots in comparison to plants in unburned sites. Anderson and Menges (1997) observed that plants in burned areas had greater values for nearly every aboveground measure and that mycorrhizal colonization was unaffected by fire. Evidence that fire stimulates clonal reproduction in *P. graminifolia* was found during multiple studies (Hartnett 1987, Brewer and Platt 1994a & 1994b, Anderson and Menges 1997). An increase in flowering and establishment from seed can also be triggered by fire: Blooming in *P. graminifolia* is likely to be inhibited by competition from neighboring plants so the removal of both canopy and litter creates favorable conditions for seedling germination and development (Brewer and Platt 1994a, Gowe and Brewer 2005). Fires that occurred early in the growing season (May) were found to be more advantageous than later season (August) or winter (January) burns in terms of both sexual and asexual reproduction, and a secondary benefit of growing season fires was a reduction in bud herbivory by deer (Brewer and Platt 1994a, 1994b). In general, *Pityopsis graminifolia* is favored by frequent, low-intensity fires as opposed to infrequent intense fires (Gowe and Brewer 2005).

Habitat

Pityopsis graminifolia var. *latifolia* is most likely to be found in dry sandy soils at elevations of 0–600 meters above sea level (Semple 2020). The species thrives in full sun (Kujawski and Englert 1999) and favors well-drained woodland habitats with open canopies or limited tree cover including gaps, edges, and roadbanks (Weakley et al. 2022). It can also occur in more mesic or poorly-drained sites such as savannas and flatwoods (Cohen et al. 2004, LeGrand et al. 2023). New Jersey's occurrence is situated on the side of a road adjacent to a pine-oak forest (NJNHP 2022).

In the southeastern United States, *Pityopsis graminifolia* often grows in xeric sandhill communities with scattered trees, typically Longleaf Pine (*Pinus palustris*) and other *Pinus* or *Quercus* species. The understory vegetation can become dense, comprising a mixture of grasses, composites, and other herbaceous species, and the communities usually experience low-intensity fires every 1–5 years that inhibit succession by woody plants (Hartnett 1990, Brewer and Platt 1994a). *P. graminifolia* var. *latifolia* is sometimes dominant in the ground cover at those sites (Cohen et al. 2004, Davis 2022).

Wetland Indicator Status

Pityopsis graminifolia is an upland species, meaning that it almost never occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2023)

PIGRL

Coefficient of Conservatism (Walz et al. 2018)

CoC = 5. Criteria for a value of 3 to 5: Native with an intermediate range of ecological tolerances and may typify a stable native community, but may also persist under some anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The native range of *Pityopsis graminifolia* var. *latifolia* includes parts of the United States, Mexico, Central America, and the West Indies (Semple 2020). The map in Figure 1 depicts the extent of *P. graminifolia* var. *latifolia* in the United States and Canada, although New Jersey has been omitted.

Pityopsis graminifolia var. *latifolia* has only been recorded in one New Jersey county: Atlantic County. The map in Figure 2 reflects the current known distribution of the species in the state.

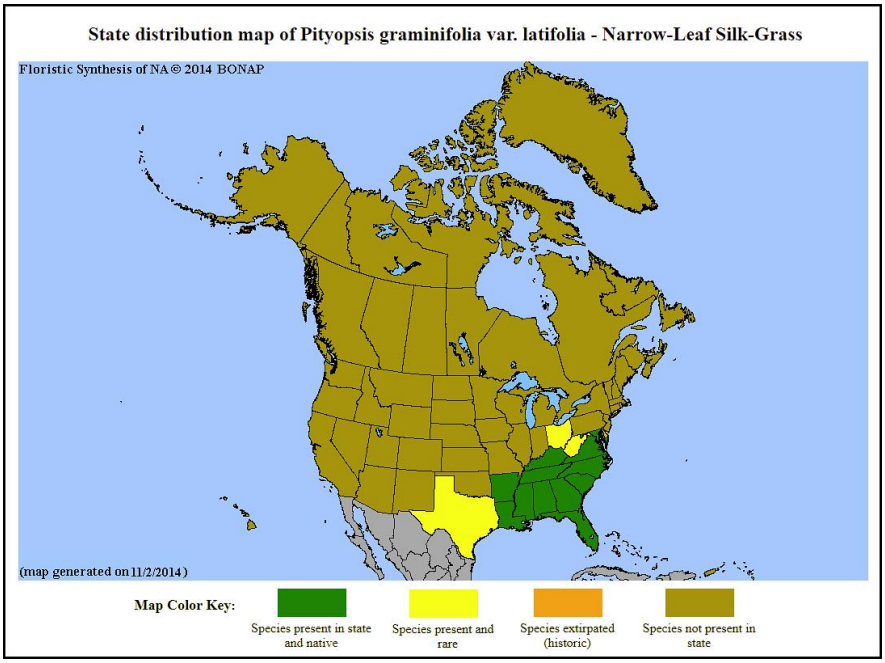

Figure 1. Distribution of P. graminifolia var. *latifolia in the United States, adapted from BONAP (Kartesz 2015).*

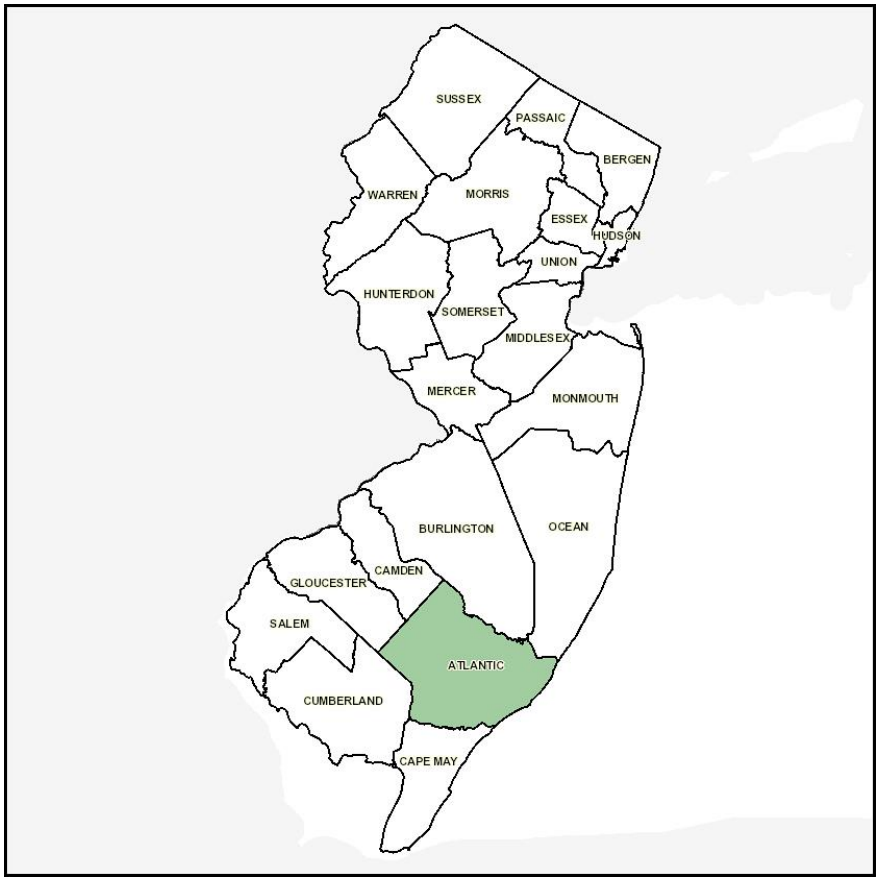

Figure 2. County records of P. graminifolia var. *latifolia in New Jersey (source data from NJNHP 2022).*

Conservation Status

Pityopsis graminifolia var. *latifolia* is considered globally secure. The G5T5? rank means the subspecies is currently thought to have 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, but the question mark indicates that the taxon is in need of a review (NatureServe 2023). The map below (Figure 3) illustrates the conservation status of *P. graminifolia* var. *latifolia* in the United States. Wide-leaf Silkgrass is unranked in most southeastern states but rare at the northern end of its range. The subspecies is critically imperiled (very high risk of extinction) in one state and possibly extirpated in Delaware and West Virginia.

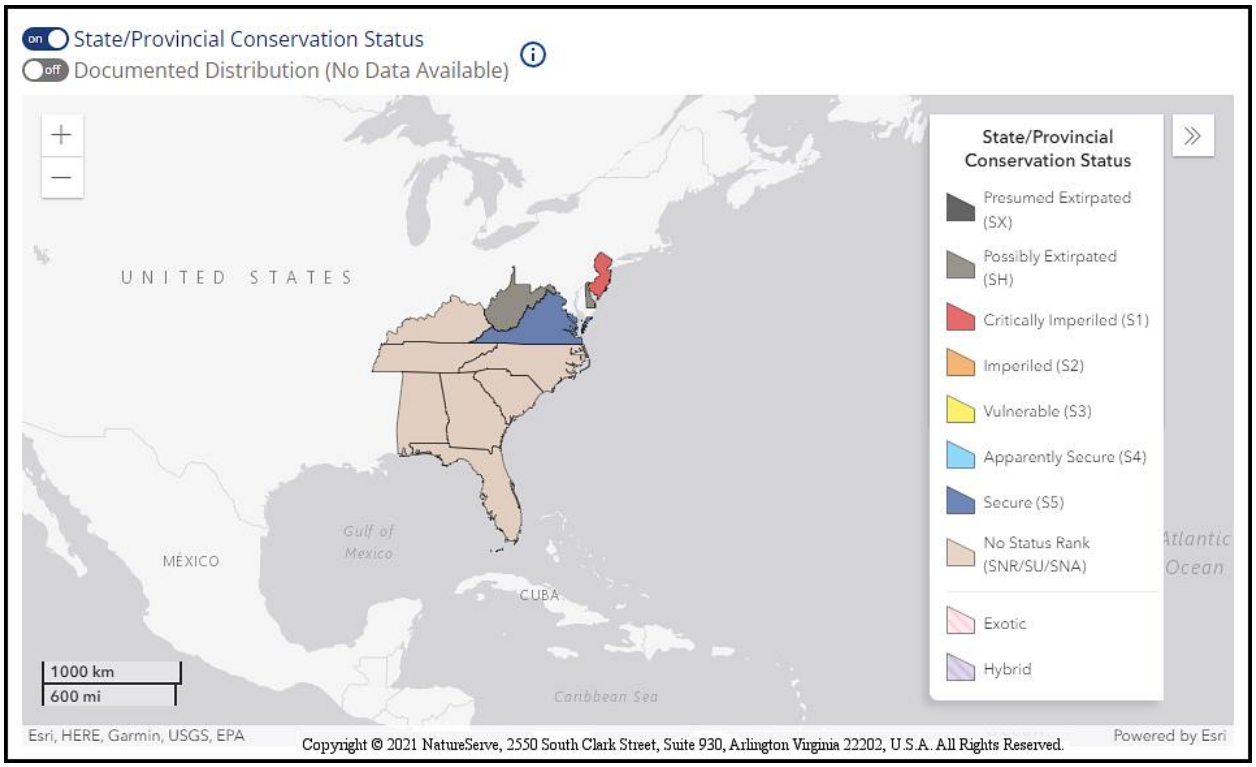

Figure 3. Conservation status of P. graminifolia var. *latifolia in the United States (NatureServe 2023).*

Pityopsis graminifolia var. *latifolia* is ranked S1.1 in New Jersey (NJNHP 2022), meaning that it is critically imperiled due to extreme rarity. A species with an S1.1 rank has only ever been documented at a single location in the state. *P. graminifolia* var. *latifolia* was first discovered in New Jersey in 2013 and the sole occurrence is limited to a single vigorous patch of plants. Wide-leaf Silkgrass has also been assigned a regional status code of HL, signifying that the species is eligible for protection under the jurisdiction of the Highlands Preservation Area (NJNHP 2010).

Threats

Pityopsis graminifolia var. *latifolia* requires an open habitat and reproduces best in the absence of competitors. Periodic disturbances are essential for the maintenance of communities occupied by the species, but not all disturbances are beneficial. For example, *P. graminifolia* var. *latifolia* thrived in *Pinus palustris* communities that regularly experienced fires but was absent from comparable sites that had been exposed to severe mechanical disturbances before they were converted to *Pinus taeda* plantations (Cohen et al. 2004).

Plants that are adapted to frequent fires can be threatened by fire suppression. In the absence of fire, *Pityopsis graminifolia* would probably be replaced by other more competitive species. Even a reduction in fire frequency could be harmful as it would be likely to increase the intensity of subsequent burns, and hotter burns which penetrate deeper into the soil can destroy buds and belowground organs that usually avoid damage when fires are less intense. Since *P. graminifolia* does not appear to maintain a seed bank some populations might fail to recover from a severe fire.

Other types of disturbance can also be helpful or harmful depending on the circumstances. New Jersey's population of *Pityopsis graminifolia* var. *latifolia* is adjacent to a road where it is subjected to periodic mowing (NJNHP 2022). The disturbance may help to maintain open habitat at the site, but it can also interfere with sexual reproduction if budding or flowering stems are mowed before the plants have set seed. In Florida, sandhill populations of *P. graminifolia* are sometimes disturbed by burrowing gopher tortoises. Although the plants on tortoise mounds are smaller and less abundant, the disturbances result in increased recruitment from seeds in the affected populations (Kaczor and Hartnett 1990).

Observed and anticipated impacts of climate change in New Jersey are not likely to significantly increase the vulnerability of *Pityopsis graminifolia* var. *latifolia* in the state. New Jersey is experiencing elevated temperatures and shifting precipitation patterns resulting in more frequent floods and longer, more intense droughts (Hill et al. 2020). Research has shown that populations of *P. graminifolia* var. *latifolia* have very low genetic diversity, which is often associated with a limited ability to adapt to change (Boggess 2013). However, as a southern species that reaches the northern end of its range in the state, *P. graminifolia* var. *latifolia* is already well-adapted to high temperatures. *P. graminifolia* is also known to be drought-tolerant (Kujawski and Englert 1999). Although there is no evidence that the plants can withstand prolonged periods of flooding, the extent of any potential threat from inundation is likely to vary considerably depending on local conditions at sites where populations occur.

Management Summary and Recommendations

New Jersey's single population of *Pityopsis graminifolia* var. *latifolia* is especially important because it is the northernmost documented occurrence of the species. Conservation of the population could be enhanced by the development of a mowing regime that balances the species' reproductive requirements with the need for roadside maintenance.

In many natural communities, fire appears to be the most effective management tool for Wide-leaf Silkgrass. Depending on the location, that may simply require the avoidance of fire suppression but at some sites controlled burns may be needed in order to maintain suitable habitat. Research results indicate that frequent, low intensity fires conducted early in the growing season are most beneficial to *P. graminifolia*.

Much of the knowledge regarding the life history of *Pityopsis graminifolia* var. *latifolia* results from studies that were carried out in Florida so it would be useful to know if seasonal cycles differ in northern populations. *P. graminifolia* var. *latifolia* appears to be a species that could expand its range in a northerly direction in response to climate change, and its relatively recent appearance in New Jersey suggests that searches for new occurrences in other locations close to its northern boundary could be fruitful. As noted below, additional work is also needed to resolve the taxonomic status of the *P. graminifolia* complex.

Synonyms and Taxonomy

The accepted botanical name of the species is *Pityopsis graminifolia* var. *latifolia* (Fern.) Semple & Bowers. Some orthographic variants, synonyms, and common names are listed below (ITIS 2023, USDA NRCS 2023).

Botanical Synonyms	**Common Names**
Chrysopsis graminifolia var. *latifolia* Fernald	Wide-leaf Silkgrass
Chrysopsis nervosa (Willd.) Fernald	Narrow-leaf Silk-grass
Heterotheca correllii (Fernald) H. E. Ahles	Common Silk-grass
Heterotheca nervosa (Willd.) Shinners	
Pityopsis nervosa (Willdenow) Dress.	

The taxonomy of *Pityopsis graminifolia* and its nearest relatives has a long, rocky history and it is still under debate. The genus *Pityopsis* has alternately been included in and distinguished from other genera such as *Chrysopsis* and *Heterotheca*. Fernald (1897, 1950) consistently included in *Chrysopsis* as did Small (1903), but when Small later moved a section of *Chrysopsis* to *Pityopsis* Fernald (1942) expressed the sentiment that *Pityopsis* was a "hardly worthwhile genus." Shinners (1951) rolled both *Chrysopsis* and *Pityopsis* into *Heterotheca* and Harms (1969)—who followed his lead—recognized that section *Pityopsis* was a clearly distinct group but also noted that botanists had been reluctant to elevate it to species level following Fernald's remark.

New Jersey presently follows the system established by Semple and Bowers in 1985 which divided the genus *Pityopsis* into two sections (Pityopsis and Graminifoliae), placed *Pityopsis graminifolia* in the latter section, and described five varieties of the species. Although the original monograph is out of print, a comparable system is applied in Flora of North America (Semple 2020). A phylogenetic analysis by Gowe and Brewer (2005) concluded that the five named varieties of *P. graminifolia* formed a clade but that the group might be more closely related to Section Pityopsis than to Section Graminifoliae. More recently, genetic studies that evaluated all previously described *Pityopsis* species suggested that *P. graminifolia* with its five

varieties did not hang together as a clade (Hatmaker 2016, Hatmaker et al. 2020). The latest trend has been to elevate the five varieties to species level, but that has resulted in further disagreements. The *Pityopsis latifolia* described by Bridges and Orzell in 2018 is not equivalent to *P. graminifolia* var. *latifolia*: *P. latifolia* is endemic to Florida so the taxon which is the topic of this profile was consequently identified as *Pityopsis nervosa* (Weakley et al. 2018, 2022). A different view was taken by Nesom (2019), who also elevated all previous *P. graminifolia* varieties to species level but included the subject species in *Pityopsis graminifolia*. A review of these changes by Semple and Jabbour (2019) concluded that a much larger study is needed in order to resolve outstanding questions regarding the group.

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