

***EUTHAMIA* (ASTERACEAE: ASTEREAE)
IN CUMBERLAND COUNTY, NEW JERSEY**

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ABSTRACT

Euthamia caroliniana, *E. lanceolata*, and *E. weakleyi* occur in Cumberland Co., New Jersey. *Euthamia weakleyi* is abundant and conspicuous, as it occurs at or near the edges of salt marsh, much of which is within conservation areas or in places unsuited for development. The other two species are now rare or uncommon, as much of their more inland or non-saline habitat has been lost to roadway, commercial, and residential development. The type collection of *E. floribunda* also was made from Cumberland County (Port Norris) — it and the similar *E. hirtipes* from southeastern Virginia have been hypothesized to be *E. caroliniana/lanceolata* hybrids or else an uncommonly occurring species. In a field survey of Cumberland County toward understanding the nature of *E. floribunda*, a population of *E. lanceolata* was encountered that comprises three morphs: (a) typical *E. lanceolata*, (b) nearly typical *E. lanceolata* (in habit) but with fewer florets per head and reduced vestiture, and (c) plants with the habit and head size in the range of *E. caroliniana* but with minutely hirtellous vestiture — the variation appears to reflect gene exchange between *E. lanceolata* and *E. caroliniana*, supporting the hypothesis of hybrid origin for *E. floribunda*. "Morph c" is closest to the morphology of *E. floribunda* and also is similar to plants identified in my *Euthamia* revision as variants of *E. floribunda*. Localities within Cumberland County are mapped for each of the three species, based on personal observations and previous collections, and variation is shown through representative collections. Localities for each of the three species in adjacent Cape May County also are mapped.

The identity of *Euthamia floribunda* Greene 1902 is problematic. The type (Cumberland Co., New Jersey) and the distantly-separated type of *Solidago hirtipes* Fernald 1946 (Sussex Co., Virginia) are closely similar in morphology. Fernald (1946) identified his new taxon as "x *Solidago* (§ *EUTHAMIA*) *hirtipes*, hybr. nov.," hypothesizing that it was a hybrid between *E. caroliniana* and *E. lanceolata*, both of which grow in the area of the type locality. He had earlier noted (1908, p. 13) that Greene's *E. floribunda* "seems to be a small-headed extreme nearest allied to [*E. lanceolata*]" but in 1946 did not make the connection between *E. floribunda* and *E. hirtipes*. Fernald apparently did not otherwise encounter plants closely similar to either type nor did I in a taxonomic revision of the genus (Nesom 2021a, 2021b).

In the *Euthamia* revision, however, I identified and mapped the two types as *E. floribunda* and included with them a number of collections of *E. caroliniana*-like plants from the same general area. The latter have sparsely hirtellous leaves or stem portions, seemingly outside the normal range of variation for *E. caroliniana* but approaching that of *E. floribunda* — but I noted that some might prove to belong with *E. caroliniana* sensu stricto.

Because of the rarity of the *Euthamia floribunda/hirtipes* morphology and its hypothesized hybrid origin, I sought to better understand its nature through field observations in Cumberland Co., New Jersey, especially in the area of Port Norris, where the type collection of *E. floribunda* was made, and through study of previous collections. I surveyed in the county on 3 and 7 October, 2021 (see Appendix for collection data), using previous collection localities for all three species as a guide. Many *Euthamia* collections were made earlier from Cumberland County, primarily reflecting intensive surveys by Bayard Long and associates, students of the Philadelphia area flora (including southern New Jersey). Most of their collections were made between 1909 and 1939 — all are housed at PH.

Collections from CHRB also contributed to the geographical picture. The maps in Figures 2-4 are primarily derived from PH collections seen first-hand by the author and those from a few other herbaria seen via images.

My observations are summarized here.

* *Euthamia weakleyi* (Figs. 2, 22-28) is scattered but conspicuous and relatively abundant in Cumberland County, usually growing at or near the edges of salt marsh, much of which is within conservation areas or in places unsuited for development. See habitat summary with Figure 2. Previous collectors in Cumberland County perhaps have selected smaller plants as specimens (e.g., Figs. 22-26) — with the exception of one population (*Nesom Cumb-4*, Fig. 28), plants of *E. weakleyi* encountered in my survey characteristically were 4–5 feet tall (e.g., Fig. 27) and difficult to prepare as a single specimen; I mostly collected side branches.

* *Euthamia caroliniana* (Figs. 3, 8-13) and *E. lanceolata* (Figs. 4, 14-15) apparently are now rare or uncommon compared to when earlier collections were made, as much of their characteristically more inland habitat has been lost to commercial and residential development and road broadening and maintenance (mowing, disturbance) or else is on private land and inaccessible. Both of these species grow over a range of moisture conditions but at least for the most part, they do not occur in the saline habitats of *E. weakleyi*. See Cumberland County habitat summaries with Figures 3 and 4.

* *Euthamia floribunda* (Figs. 16, 17) — I found plants matching this morphology only in one place and in a context supporting Fernald's hypothesis that it is of hybrid origin. At the southern end of the Bevan Wildlife Management Area, a population identified here as "*E. lanceolata* / aff. *lanceolata*" (*Nesom Cumb 8*; see Appendix for collection data) comprises three morphs.

(a) Typical *E. lanceolata* (Figs. 18, 19); stems of several plants appear to have slightly reduced vestiture compared to others, but it is impossible to say whether they are populational variants within typical *E. lanceolata* or whether they show genetic influence of *E. caroliniana*. 8a Florets per head — 17 ray, 7 disc.

(b) Nearly typical *E. lanceolata* (Fig. 20) (in habit) but with fewer florets per head, reduced vestiture on stems and leaves, and lateral leaf veins not so prominently raised as in typical *E. lanceolata*. 8b Florets per head — 9 ray, 5 disc.

(c) Plants with the habit (especially the numerous axillary shoots and branches) and small heads approaching *E. caroliniana* (Fig. 21) but with minutely hirtellous vestiture on leaves and stems. 8c Florets per head — 12 ray, 6 disc. This is closest to the morphology of typical *E. floribunda* (compare Fig. 16) and also is similar to plants identified in my *Euthamia* revision as caroliniana-like variants of *E. floribunda*.

The non-*Euthamia weakleyi* plants in Cumberland County are easily sorted into two morphological groups, *E. caroliniana* and *E. lanceolata*, suggesting that some kind of reproductive isolation separates them, perhaps post-zygotic in view of their close sympatry. Variants in *Cumb 8*, however, show a combination of features of *E. caroliniana* (numerous, closely arranged, and relatively small heads, axillary shoots) and *E. lanceolata* (hirtellous vestiture), and the proximity of populations of these species in typical form indicates that hybridization does occur. Variation in *Cumb 8* supports the hypothesis of hybrid origin for *E. floribunda*, and the scattered geography of the *floribunda* morph suggests that *E. hirtipes* (from southeastern Virginia, where both *E. caroliniana* and *E. lanceolata* occur) originated independently of *E. floribunda*.

Maps in Figs 5-7 show the distribution of the three species in Cape May County, also based primarily on collections from PH made in the early 1900's and from CHRB. The distribution of *Euthamia weakleyi* is analogous to that in Cumberland County, true to saline habitats. Collections of *E. caroliniana* were made from sites consistently closer to the coast than in Cumberland County but

from sandy, dry habitats at higher elevation than sites where *E. weakleyi* occurs. Nevertheless, *E. weakleyi* and *E. caroliniana* historically occurred in close sympatry, surely close enough that pollinators would have moved between populations of the two species.

Euthamia caroliniana and *E. lanceolata* both have been reported as diploid, *E. weakleyi* as hexaploid. And, in Cumberland and Cape May counties, *E. weakleyi* grows in saline habitats, a ecological distinction from the other two — perhaps contributing to a degree of reproductive isolation. On the other hand, some of the possible intermediates encountered in these two counties might be interpreted either as 'weakleyi-like' in leaf distribution and morphology or as narrow-leaved variants of *E. lanceolata*, and it probably would require evidence from molecular analysis or chromosomal/meiotic study to determine whether or not *E. weakleyi* hybridizes with the other two. It is assumed here that the hairiness of putative intermediates reflects genetic input from *E. lanceolata*. And it may be that introgression is more widespread than suspected, with subtle consequence of gene flow reflected in variation in head size/floret number, production of axillary shoots, and density of vestiture.

ACKNOWLEDGEMENTS

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APPENDIX. *Euthamia* collections in Cumberland Co., New Jersey, 2021 (set 1 to PH, set 2 to NCU, set 3 to TEX and others).

1. ***Euthamia weakleyi***. Moore's Beach Road, 0.5 mi S of jct with Hwy 47 in Delmont, roadside near residences, slightly raised area within marsh on all sides, scattered juniper and shrubs, with *Solidago sempervirens*; perhaps a single clone in area of 10 square feet, plants to 4 feet tall, 3 Oct 2021, *Nesom Cumb-1* [7 dups]
2. ***Euthamia weakleyi***. Glade Road (Co. Rd 616) at jct with Thompsons Beach Road in Heislerville, S side of road (across from Middle Street) along edge of low woods/thicket 150 ft N of marsh; large population, plants to 5 feet tall, 3 Oct 2021, *Nesom Cumb-2* [8 dups] Photo of population, Fig. 27.
3. ***Euthamia weakleyi***. SE of Port Norris, along Hansey Creek Road 1.4 mi SE of jct with Main Street (Co. Rd 553) on the E side of town of Dividing Creek, S of Owls Nest Field, W side of road in area of shrubs and scattered trees, immediately N of marsh; plants abundant, 3 Oct 2021, *Nesom Cumb-3* [2 dups]
4. ***Euthamia weakleyi***. SE of Port Norris, along Hansey Creek Road 2.1 mi SE of jct with Main Street (Co. Rd 553) on the E side of town of Dividing Creek, S of Owls Nest Field, 0.1 mi NE of crossing of Hansey Creek (end of road at the boat launch area), W side of road beside marsh; large population, plants up to 2 ft tall, shorter than those of other *Euthamia weakleyi* in the area, 3 Oct 2021, *Nesom Cumb-4* [3 dups] Photo of population, Fig. 28.
5. ***Euthamia weakleyi***. Gandy's Beach Road (Co. Rd 543) 2.0 mi W of jct with Fortescue Beach Road (Co. Rd 637), N side of road at edge of marsh; plants abundant here and in the area, 3 Oct 2021, *Nesom Cumb-5* [1 dups]

6. ***Euthamia weakleyi***. Gandy's Beach Road (Co. Rd 543) 1.0 mi W of jct with Fortescue Beach Road (Co. Rd 637), N side of road at edge of woods, marsh immediately to the north and south; plants scattered but abundant, 3 Oct 2021, *Nesom Cumb-6* [1 dups]
7. ***Euthamia weakleyi***. Ca. 4.5 air mi WSW of Fairton, Seabreeze Road, 0.8 road mi SW of jct with Back Neck Road, 0.15 mi N of jct with Durham Dr., slightly raised area with agriculture between areas of marsh, Dix Fish & Wildlife Mgmt Area, edge of thicket/low woods on W side of road, with *Solidago sempervirens*; large clone, plants 5 feet tall, leaning, scattered in this area 7 Oct 2021, *Nesom Cumb-7* [2 dups]
8. ***Euthamia lanceolata* /aff. *lanceolata*** 1.7 air mi NE of center of Newport, E.G. Bevan Fish & Wildlife Management Area, Shaws Mill Rd, at jct with unnamed road connecting to Ackley Rd, 1.6 mi NE of jct Shaws Mill Rd and Station Rd, edge of woods next to open field on N side of road, dry, sandy, woods of *Q. falcata*, *Q. phellos*, *Q. alba*, *Nyssa sylvatica*, *Prunus serotina*, *Acer saccharinum*, *Liquidambar*, *Sassafras*, *Juniperus*, *Juglans*; population in area of ca. 50 square ft, plants 4-5 feet tall, 7 Oct 2021.
Nesom Cumb-8a ***Euthamia lanceolata*** (typical) [5 dups]
Nesom Cumb-8b ***Euthamia lanceolata*** (overall aspect of *E. lanceolata* but with reduced vestiture and fewer florets, probably influenced by *E. caroliniana*) [2 dups]
Nesom Cumb-8c ***Euthamia lanceolata* × *E. caroliniana*** (aspect approaching *E. caroliniana* but with minutely hirtellous stems and leaves and slightly larger heads with more florets) [4 dups]
9. ***Euthamia caroliniana***. 3.6 air mi NE of center of Newport, E.G. Bevan Fish & Wildlife Management Area, Tom Bailey/Spring Garden Rd, 0.9 mi NW of jct with Shaws Mill Rd, N side of Joshua Branch (now dry) and low woods, edge of woods by large open field; large population, almost completely past flower, plants mostly 2 feet tall, 7 Oct 2021, *Nesom Cumb-9* [12 dups]
10. ***Euthamia caroliniana***. 5.3 air mi NE of center of Newport, E.G. Bevan Fish & Wildlife Management Area, Shaws Mill Rd, 0.25 mi SW of jct with Whitehead Rd, 0.9 mi SW of jct with Narrow Lane/Dividing Creek Rd, S side of road, wide grassy margin (unmowed) under power line, dry, sandy; large population, plants 2 ft tall, mostly past flower, 7 Oct 2021, *Nesom Cumb-10* [2 dups]



Figure 1. Location of Cumberland and Cape May cos., New Jersey.

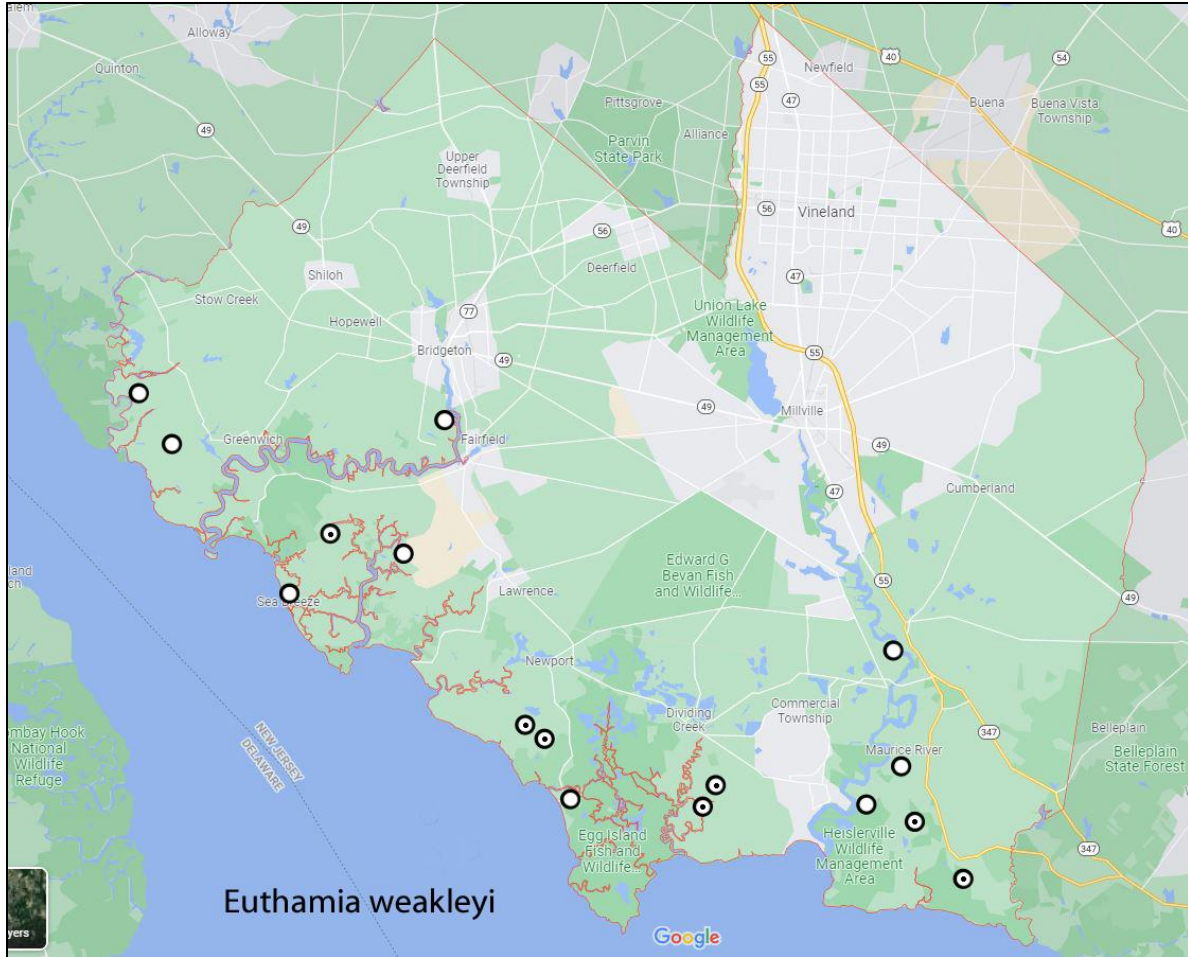


Figure 2. Distribution of *Euthamia weakleyi* in Cumberland County. Dotted symbols are vouchered by personal collections, open symbols by previous collections mostly at PH. Salt marsh edges, tidal river shores, thickets and woods edges in slightly raised areas closely adjacent to salt marshes (habitat descriptions from collection labels and personal observations).

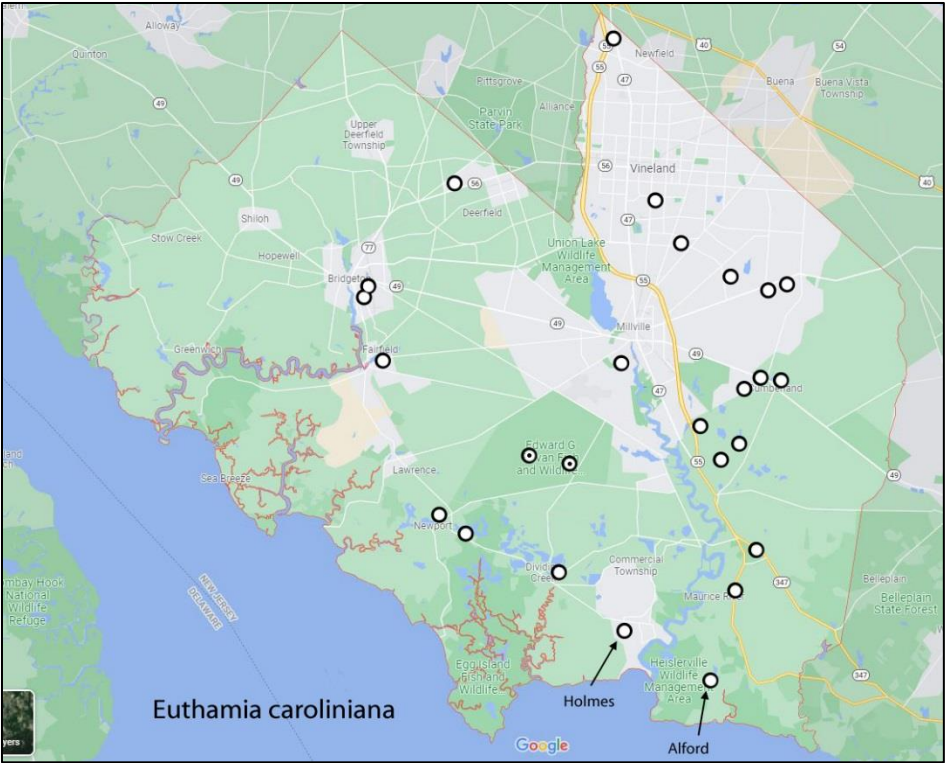


Figure 3. Distribution of *Euthamia caroliniana* in Cumberland County. Sandy or sandy-peaty pond and lake borders, boggy pond margins, peaty depressions along streamlets, moist to wet thickets, recently burned or cleared woodland, power line corridors, dry, sandy fields (from collection labels).

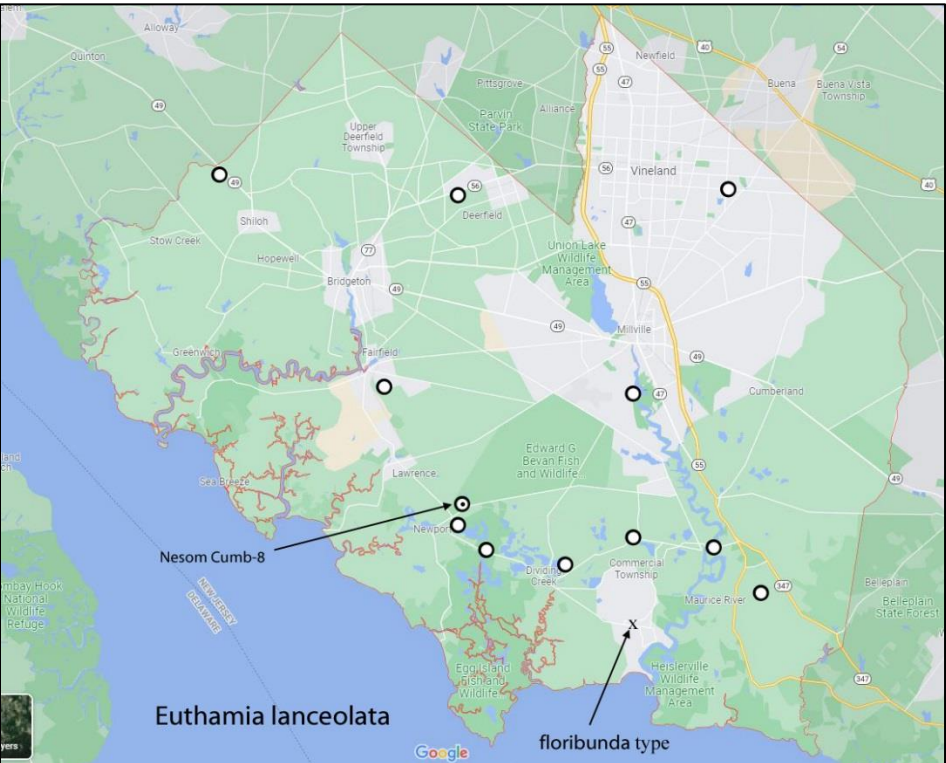


Figure 4. Distribution of *Euthamia lanceolata* in Cumberland County. Open fields, roadsides, pine-oak woods, swamp edges, peaty swales, sand, sandy loam, gravelly sand (from collection labels).

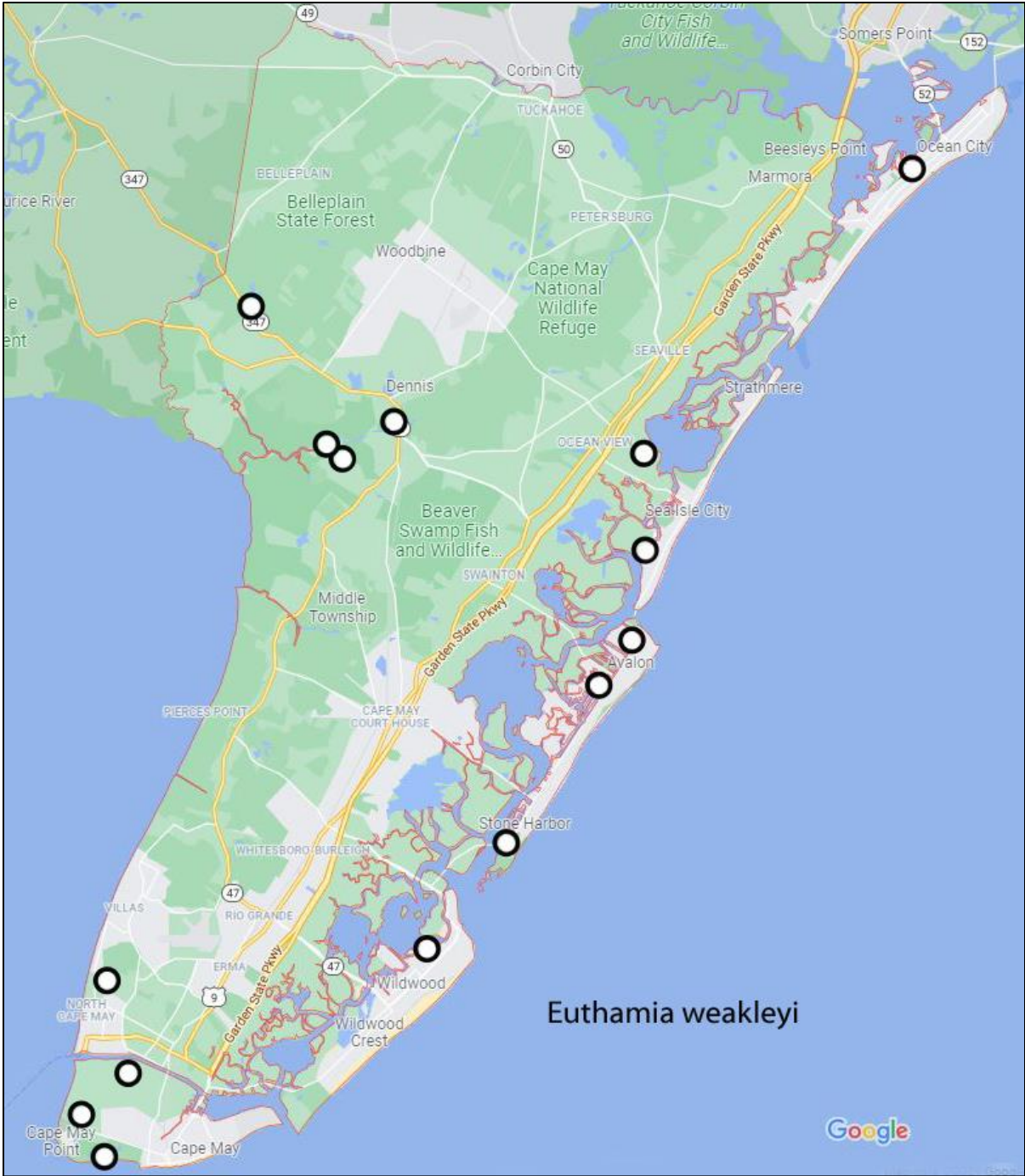


Figure 5. Distribution of *Euthamia weakleyi* in Cape May County. All collections are noted to be from saline habitats, mostly at marsh edges and tidal shores.

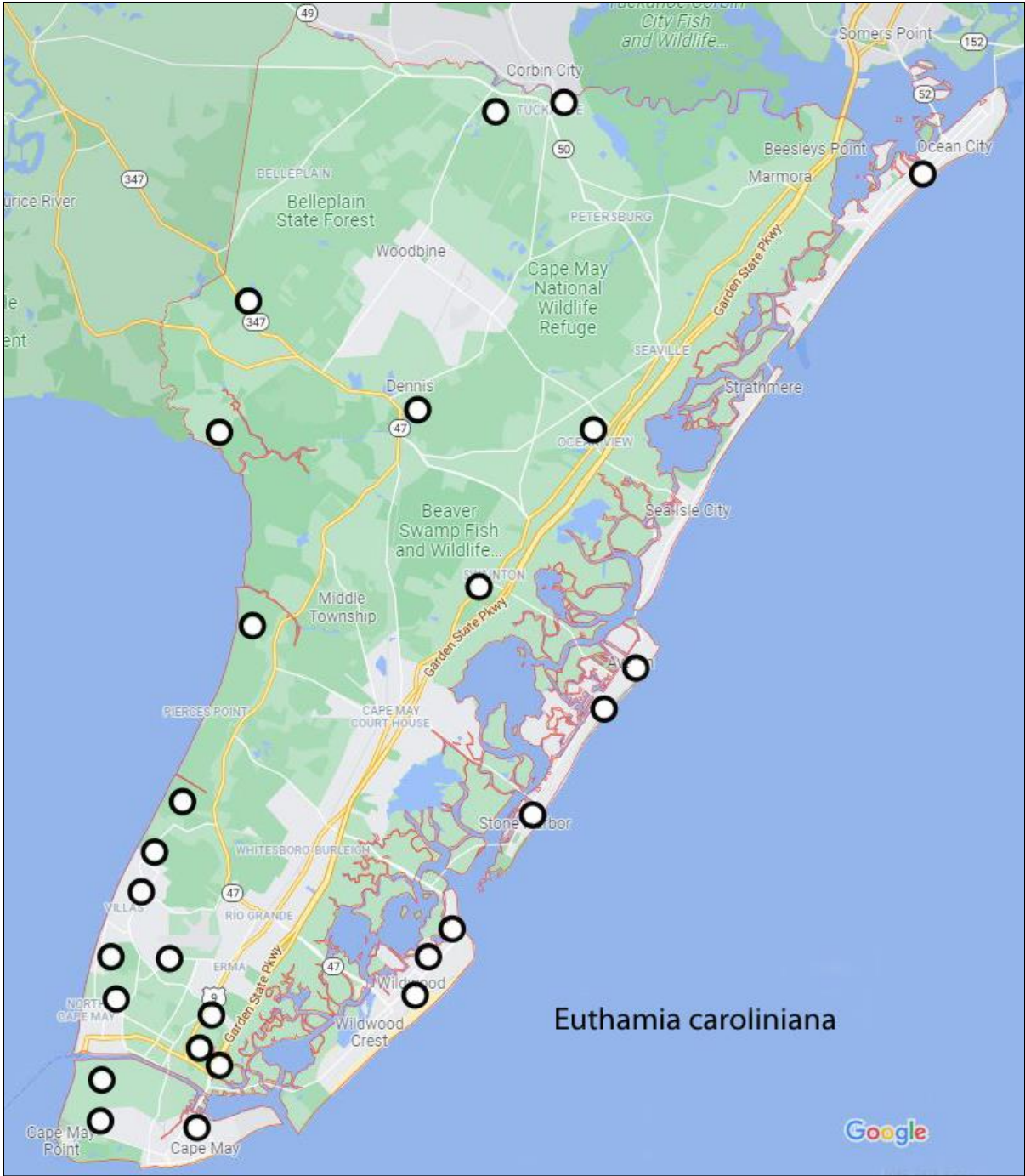


Figure 6. Distribution of *Euthamia caroliniana* in Cape May County. Most of the collections were made from coastal and near-coastal localities, but all apparently were made are from sandy, dry habitats at slightly higher elevation than sites where *E. weakleyi* occurs.

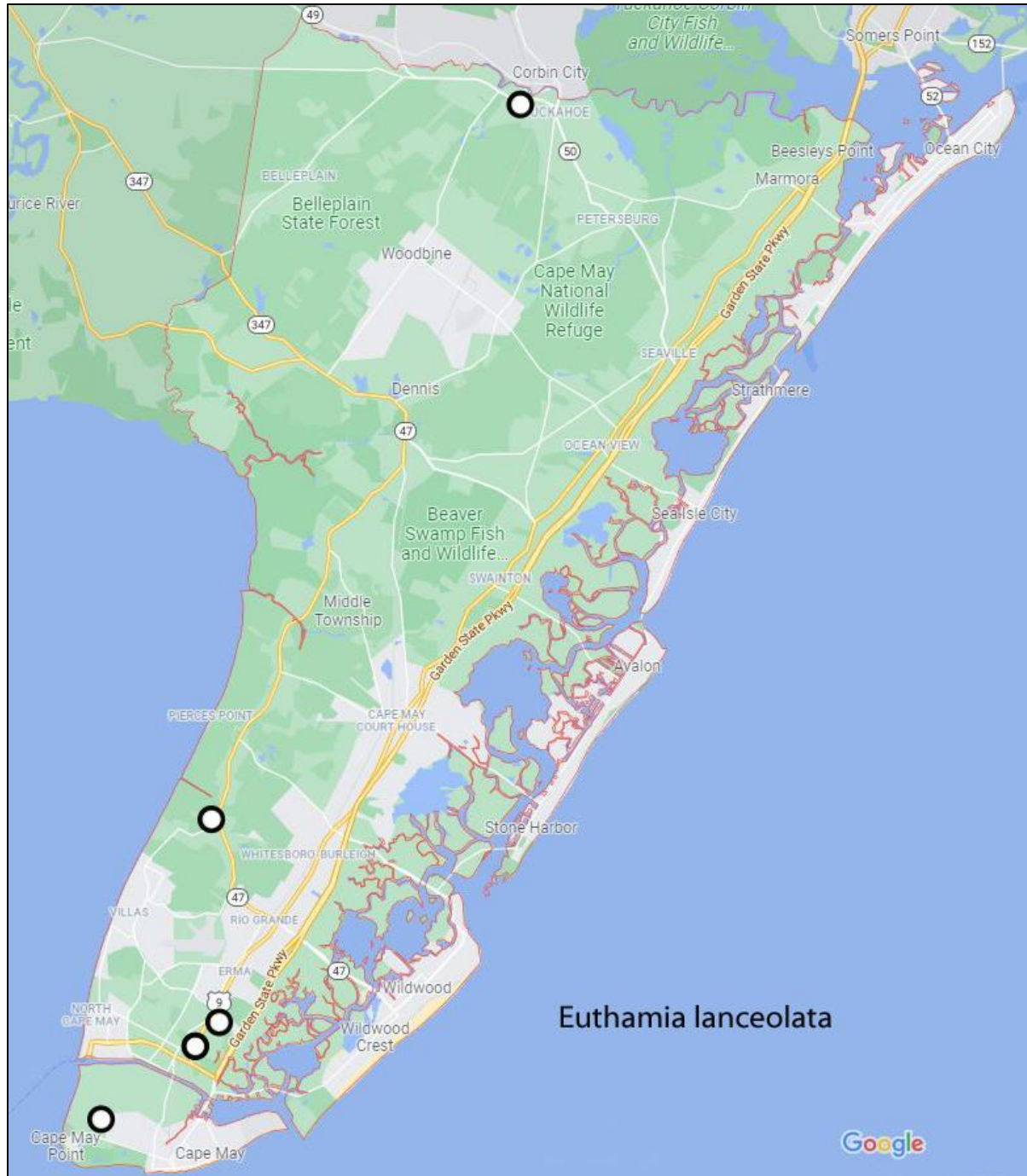


Figure 7. Distribution of *Euthamia lanceolata* in Cape May County. Collections were made from pine and pine-oak woods.



Figure 8. *Euthamia caroliniana*. Cumberland Co., Pennell 14774 (PH).



Figure 9. *Euthamia caroliniana*. Cumberland Co., Long 38968 (PH).



Figure 10. *Euthamia caroliniana*. Cumberland Co., Alford 2960 (DUKE). Unusual habitat for *E. caroliniana* ("sandy roadside near salt marsh"), in an area where *E. weakleyi* also occurs. See Figure 3 for mapped collection locality.



Figure 11. *Euthamia caroliniana*. Cumberland Co., Long 47525 (PH).



Figure 12. *Euthamia caroliniana*. Cumberland Co., Long 29589 (PH).



Figure 13. *Euthamia caroliniana*. Port Norris, Cumberland Co., Holmes 378 (CHRHB). See Figure 4 for mapped collection locality.



Figure 14. *Euthamia lanceolata*. Cumberland Co., Adams 1040 (PH). Densely fibrous-rooted rhizomes are characteristic of *E. lanceolata* and *E. graminifolia* sensu stricto.



Figure 15. *Euthamia lanceolata*. Cumberland Co., Long 19459 (PH).



Figure 16. *Euthamia floribunda*. Port Norris, Cumberland Co., Holmes 452 (holotype, US).



Figure 17. *Euthamia floribunda*. Cumberland Co., holotype (US). Detail from Figure 13.



Figure 18. Population variant "a" from *Nesom Cumb-8* (7 Oct 2021). Typical *Euthamia lanceolata* in overall aspect and vestiture.



Figure 19. Population variant "a" from *Nesom Cumb-8* (7 Oct 2021). Typical *Euthamia lanceolata* in overall aspect and vestiture.



Figure 20. Population variant "b" from *Nesom Cumb-8* (7 Oct 2021). *Euthamia lanceolata* in overall aspect but with stem and leaf vestiture of reduced density and without prominently raised lateral leaf veins.



Figure 21. Population variant "c" from *Nesom Cumb-8* (7 Oct 2021). Approaching *Euthamia caroliniana* in aspect (especially the axillary shoots and smaller, densely arranged heads) but with minutely hirtellous stems and leaf surfaces — this is essentially the morphology of *Euthamia floribunda*.



Figure 22. *Euthamia weakleyi*. Cumberland Co., Long 44643 (PH).



Figure 23. *Euthamia weakleyi*. Cumberland Co., Long 49371 (PH).



Figure 24. *Euthamia weakleyi*. Cumberland Co., Long 49249 (PH).

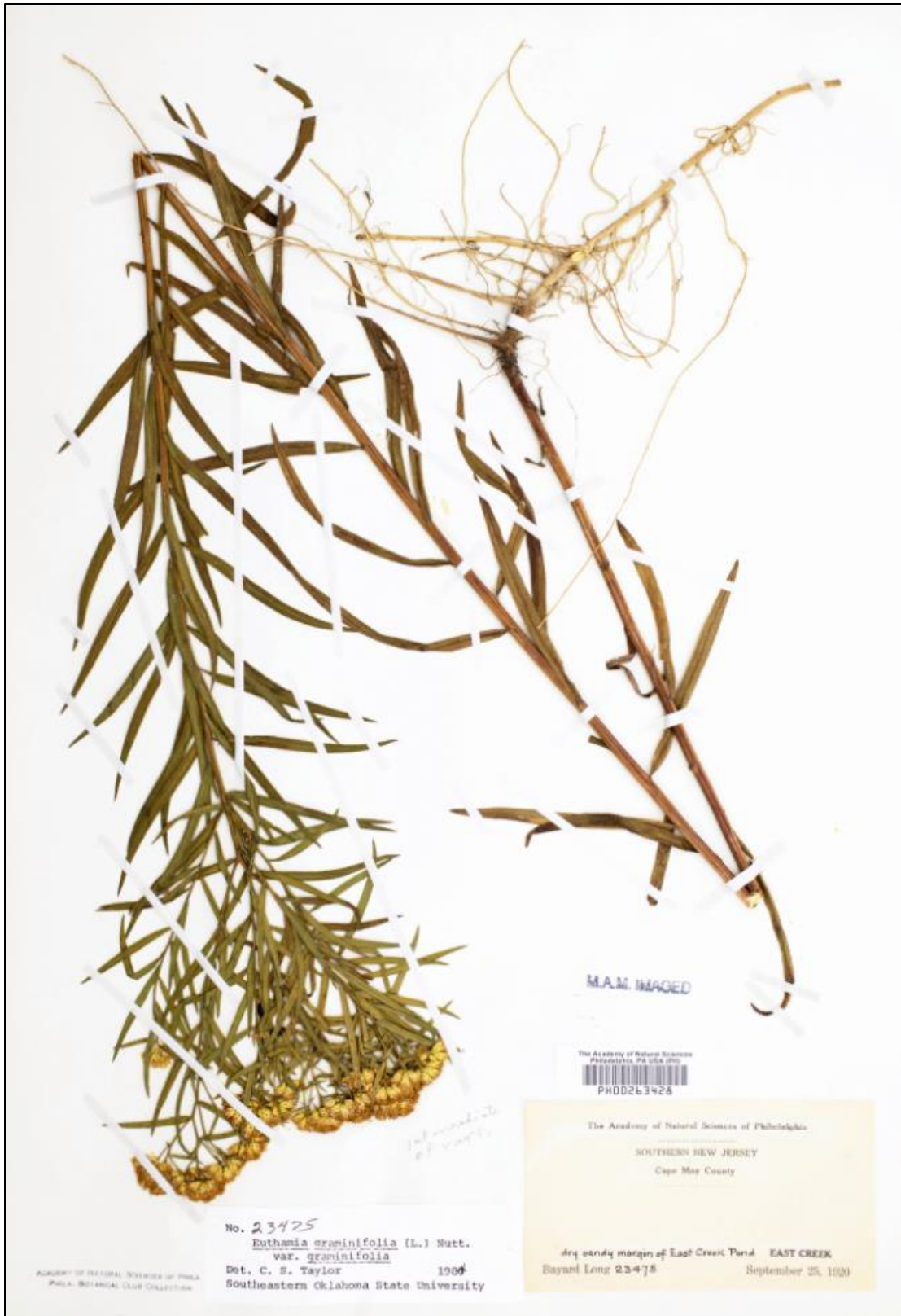


Figure 25. *Euthamia weakleyi*. Cape May Co., Long 23475 (PH). Cape May County is adjacent to Cumberland County — this collection (and in Fig. 23) is shown to illustrate the rhizome morphology, which is similar to *E. caroliniana* but different from *E. lanceolata*.



Figure 26. *Euthamia weakleyi*. Cape May Co., Allebach s.n. (PH).



Figure 27. *Euthamia weakleyi*. Cumberland Co., Glade Road (Co. Rd 616) at jct with Thompsons Beach Road in Heislerville, *Nesom Cumb-2*, 3 Oct 2021. Plants up to 5 feet tall. Photo by G. Nesom.



Figure 28. *Euthamia weakleyi*. Cumberland Co., SE of Port Norris, along Hansey Creek Road 2.1 mi SE of jct with Main Street (Co. Rd 553), *Nesom Cumb-4*, 3 Oct 2021. Plants mostly ca. 2 feet tall, shorter than characteristic for the species in Cumberland County, possibly reduced in height in response to mowing. Photo by G. Nesom.