

# The Genus *Astragalus* (Fabaceae) in Illinois

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## ABSTRACT

Herbarium and field searches were made to determine the former and current distribution of the five *Astragalus* species (milk vetch) known from Illinois. Of these, the adventive *A. agrestis* Dougl. has been reported once from the state. The native species *A. crassicaarpus* Nutt., *A. distortus* Torrey & Gray, *A. tennesseensis* Gray, and *A. canadensis* L. have experienced population declines due to habitat destruction. *Astragalus canadensis* is a widely distributed species of high quality prairie remnants, *A. crassicaarpus* is known primarily from glacial drift prairies in Macoupin County, *A. tennesseensis* is known from a single site in Tazewell County, while only six small colonies of *A. distortus* survive, all from wind blown sand and loess deposits in Cass, Mason and Scott counties. *Astragalus crassicaarpus* and *A. tennesseensis* are presently listed as endangered in Illinois, and endangered status is recommended for *A. distortus*.

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## INTRODUCTION

The genus *Astragalus* L., (milk vetch) is represented by more than 2,000 species in the Northern Hemisphere including 375 that occur in the United States (Isely 1998). Many are prairie and plains species of the western United States and Canada, but some occur in woodlands, barrens, and glades in the eastern United States (Gleason and Cronquist 1991). As members of the Fabaceae (Legume or Pulse Family), the genus belongs to the tribe *Galegeae*. Most species of *Astragalus* are perennials characterized by a stout taproot, odd-pinnately compound leaves, papilionaceous flowers held in spicate or racemose clusters, and turgid, several- to many-seeded fruits in which one or both sutures project into the locule to divide the cavity lengthwise into two parts (Fernald 1950).

While undertaking a study of glacial drift prairies in Macoupin County, Illinois, a few populations of *Astragalus crassicaarpus* Nutt. were encountered (McClain et al. 2002). Because little information is available concerning this endangered taxon in Illinois, which was, until recently considered extirpated from the state (Herkert and Ebinger 2002), we decided to examine the status of all species of *Astragalus* found in Illinois.

## METHODS

The distributions of the *Astragalus* species in Illinois were determined by examining specimens from herbaria (DEK, EIU, F, ILL, ILLS, ISU, ISM, KNOX, MO, MOR, MWI, SIU), consulting recent literature about the genus *Astragalus*, and by contacting many Natural Heritage Biologists of the Illinois Department of Natural Resources and botanists at the Illinois Natural History Survey, Champaign, Illinois. Except for *Astragalus canadensis* L., known locations for all milk vetch species, as recorded on herbarium labels or in the literature, were visited during the growing seasons of 1998-2002 and searches were made in all suitable habitats for *Astragalus* species. When plants were found, the predominant vegetation was noted and the number of milk vetch plants recorded. Localities were visited in successive years and new counts were made. Also, many potential sites having similar habitats and vegetation structure were examined to locate new populations. Nomenclature follows Mohlenbrock (1986), while all voucher specimens are deposited in the Stover-Ebinger Herbarium of Eastern Illinois University, Charleston, Illinois (EIU).

## RESULTS AND DISCUSSION

*Astragalus agrestis* Dougl. (field milk vetch) is a widespread and relatively common species associated with prairies, plains, montane meadows, and woodlands from western Washington east to northwestern Iowa and south to Utah and New Mexico (Isely 1998). It is adventive in Illinois (Jones and Fuller 1955). The single specimen reported is located at the Field Museum (F)(H.C.Benke 2456, 23 May 1918, Belvidere, Boone Co.; as *A. goniatus* by Jones and Fuller 1955). No other specimens of this species were located in other herbaria, and no living plants were found during the study.

*Astragalus canadensis* L. (Canadian milk vetch) is the most widespread species of milk vetch in the United States, occurring from northwestern Washington south through Utah, Texas and Louisiana to northern Alabama and South Carolina, north to Vermont, Minnesota, North Dakota and Montana (Isely 1998). The Canadian milk vetch is the most common *Astragalus* species in Illinois and was reported from 56 counties by Mohlenbrock and Ladd (1978). During the present study we located herbarium specimens from 58 counties (Figure 1). Though widely distributed, this taxon is not common. It usually is associated with black soil prairie remnants, hill prairies, sand prairies, or open woods having a grassy understory. It rarely occurs in disturbed habitat, being a very conservative species associated with areas of high natural quality (Taft et al. 1997).

*Astragalus crassicaarpus* Nutt. var. *trichocalyx* (Nutt.) Barneby (large ground plum) occurs in the southeastern part of the Great Plains from northeastern Texas, north through eastern Oklahoma, northwestern Arkansas, Missouri and western Illinois (McGregor 1986, Isely 1998). It is associated with prairie remnants and river bluffs in the eastern part of its range in western Illinois. In the southwestern part of the Great Plains this variety occurs in prairies, open oak woodlands, limestone hills, bluffs, creeks and river banks (McGregor 1986, Isely 1998).

The large ground plum was considered extirpated from Illinois until rediscovered in 1987 on a ledge of a limestone bluff along the Mississippi River in Jersey County (Herkert and

Ebinger 2002). The authors last observed this Jersey County population in 2000 and it consisted of a single plant with six stems. The large ground plum is presently known from six localities in the state, five in Macoupin County. This taxon has also been reported from Madison, St. Clair, and Will counties by Mohlenbrock and Ladd (1978), with Mohlenbrock (1986) considering the Will County population to be adventive. During the present study, herbarium specimens were located from Jersey, Macoupin, and St. Clair counties, but we were unable to locate the source of the records for Madison and Will counties (Figure 1).

The five populations of large ground plum in Macoupin County are all located on glacial drift prairie communities (McClain et al. 2002). These small prairie inclusions within forests are not common, having developed on glacial drift deposits of Illinoian age. Edaphic conditions are probably responsible for their existence as the soils are highly eroded with little of the original A horizon remaining, are moderately well drained, are low in nutrients and organic content, and are slightly acidic with a pH of 6.7-6.9 (Hodges et al. 1990). These prairies occur on level to gently sloping ground, are less than 1 ha in size and dominated by prairie grasses and forbs; *Andropogon gerardii* Vitman (big bluestem) and *Schizachyrium scoparium* (Michx.) Nash (little bluestem) being the dominant grasses.

The large ground plum is a common and very obvious component of these glacial drift prairies. In many years the plants are 40 cm tall with 1-25 basal stems per plant that produced numerous racemes of pale yellow flowers that develop into nearly globose fruits 15-30 mm across. Four of the five Macoupin County populations were studied for three growing seasons (Table 1). The number of ground plum plants present varied considerably throughout the study. The population at Beaver Dam State Park ranged from a low of 89 individuals in 1998 to a high of 214 in 1999. At the Roderick Prairie Nature Preserve the number of individuals varied slightly over the time of the study, while on the privately-owned Humphries Prairie, there was a continual increase during the time of the study (300 to 394). During the first year of the study Humphries Prairie was not grazed. Cattle were put on the site in the spring of 1999, and the area was grazed throughout the remainder of the study. The Bunker Hill population, located about 12 miles south of the other three populations, was in a small roadside prairie remnant that contained only a few plants. The small number of populations containing relatively few individuals suggest that large ground plum should remain on the endangered species list (Herkert and Ebinger 2002).

*Astragalus distortus* Torrey & Gray (Ozark or bent milk vetch) is infrequent to locally common in the southeastern Great Plains from eastern Texas and Louisiana north through eastern Oklahoma, eastern Kansas, Arkansas and Missouri, to southern Iowa and western Illinois (McGregor 1986, Isely 1998). Outliers occur in the Appalachian Mountains of Virginia and West Virginia in eastern United States where the species is restricted to shale-slopes (Gleason and Cronquist 1991). A species of prairie remnants, open woods, old fields and pastures, it is presently found on disturbed sand prairie remnants, and in sandy roadsides in Illinois. According to Isely (1998), bent milk vetch is infrequent and most populations have been extirpated from the northern part of its range. Bent milk vetch has been collected from nine Illinois counties, mostly from the west central part of the state (Figure 1). Of the more than 40 specimens located in the 12 herbaria visited, we

were able to determine 16 probable localities from which the species had been collected. Many herbarium specimens were collected in the late 1800s, and lack specific collecting information (Cook, Menard, and St. Clair counties), and we found no extant populations in these counties. In addition, all of the collections from Adams, Pike and Whiteside counties were from the early to mid 1900s, and though three had sufficient collecting data, we were not able to find extant populations.

Extant populations of bent milk vetch were found only in Cass, Mason, and Scott counties. Two localities in Cass County were examined, and one site near the railroad just south of Beadstown, Illinois had a few large populations of bent milk vetch in 1995. Presently most of the individuals have been eliminated by railroad maintenance or herbicides, as later attempts to relocate this population resulted in only a few plants finally being located (Table 2).

Of the two reported sites for bent milk vetch in Scott County, one contained an extant population, a loess hillside in the Sandy Creek Cemetery northwest of Glasgow. Here 45 clumps of bent milk vetch were observed in 2000 and 55 were found in 2002 (Table 2). The population was healthy and was flowering and setting seed despite frequently mowing. Mowing is probably an advantage at this site because it reduces competition from numerous non-native grasses and forbs.

Based on herbarium records, nine potential sites were located in the extensive sand and loess deposits of Mason County. All were visited at least twice and bent milk vetch populations were located at four sites. Populations were present on a loess ridge in Revis Hill Prairie Nature Preserve, on a sandy roadside adjacent to Sand Prairie Scrub Oak Nature Preserve, and along a sandy roadside on the west edge of the Barkhausen Woods Conservation Area (Table 2). In addition two plants were found on a sandy roadside 1 mile north of the Sand Prairie Scrub Oak Nature Preserve (NW1/4 S2 T20N R9W).

Based on information obtained from locations given on herbarium labels, the number of extant populations of bent milk vetch in Illinois has declined from 23 in the 1950s to only six at the present time. Of this total, four are located along the shoulder of roads or railroads, and one in a mowed cemetery. Only the population at Revis Hill Prairie Nature Preserve is relatively secure. Considering that there are only six known populations of this species in the state with few individuals, and the precarious position of most populations, we recommend the addition of this taxon to endangered species status for Illinois.

*Astragalus tennesseensis* Gray (Tennessee milk vetch) is an extremely rare species known from northern Illinois, central Tennessee, and northern Alabama (Isely 1998, Schwegman 1998). It occurs on limestone cedar glades in Alabama and Tennessee (Fernald 1950, Gleason and Cronquist 1991), and dolomite and gravel prairies of central and northern Illinois in DuPage, LaSalle, and Tazewell counties (Schwegman 1998). It has been extirpated from DuPage and LaSalle counties due to grazing, mining, and development, and is now known in Illinois from a single site in Tazewell County where it was discovered in 1947 (Schwegman 1998).

Herbarium searches revealed only 11 specimens, including one each from Grundy and Ogle counties; two from LaSalle County; four from Tazewell County; and three from

Will County. Jones and Fuller (1955) recorded this species from five counties in north-eastern Illinois (Grundy, Lake, LaSalle, Ogle, Will), while Jones (1963) added Lee County. Mohlenbrock and Ladd (1978) added Mason and Tazewell counties, while Herkert and Ebinger (2002) added DuPage, Kankakee, and Rock Island counties. Except for a few recent collections from Tazewell County, all specimens were collected from 1839 to 1907 (Figure 1).

The only known extant native population of the Tennessee milk vetch in Illinois occurs at Manito Prairie Nature Preserve in Tazewell County (McFall and Karnes 1995). This population consists of a series of sub-populations growing on a sloping terrace edge and ravine slopes of a gravel prairie. Population size and plant survival was monitored from 1984 to 1995 (Schwegman 1998). During that study the population ranged from 14 plants in 1989 to a high of 176 plants in 1990. The average number of plants present per year was 76.3, the average life span for 29 plants that survived their seedling year was 3.6 years, while maximum longevity was 7 years. In 2002 the authors found 125 plants of Tennessee milk vetch on Manito Prairie Nature Preserve. Some of the sub-populations of Tennessee milk vetch recorded by Schwegman (1998) have disappeared due to invasion by *Cornus drummondii* C. E. Mey. (rough-leaved dogwood), and *Coronilla varia* L. (crown vetch). Tennessee milk vetch is presently listed as endangered in Illinois (Herkert and Ebinger 2002).

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Figure 1. The distribution of the four native species of *Astragalus* in Illinois. (• = herbarium specimen seen; o = reported in literature but no herbarium specimen seen).



*Astragalus canadensis*



*Astragalus crassicaarpus*



*Astragalus distortus*



*Astragalus tennesseensis*

Table 1. Total number of flowering plants of *Astragalus crassicaarpus* var. *trichocalyx* observed at four gravel prairies in Macoupin County, Illinois.

Year	Beaver Dam State Park	Roderick Prairie Nature Preserve	Humphries Prairie	Bunker Hill Roadside
1998	89	55	300	9
1999	214	78	372	9
2000	173	68	394	12

Table 2. Total number of flowering plants of *Astragalus distortus* observed at five localities in Cass, Mason and Scott counties, Illinois.

Year	Sandy Creek Cemetery	Revis Hill Prairie	Sand Prairie Scrub Oak	Barkhausen Woods	Beardstown Railroad
2000	45	--	12	--	--
2001	--	117	17	2	--
2002	55	--	4	--	--
2003	35	171	8	42	45

-- years in which no counts were made.