

Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) in the Lower Great Lakes Region and a New Record for New York State

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Six populations of Great Plains Ladies'-tresses (*Spiranthes magnicamporum* Sheviak) have recently been discovered in three locations east of the lower Great Lakes region of Canada and the United States. The possible occurrence of *S. cernua* × *magnicamporum* hybrids was detected at one New York site. These discoveries are from both natural alvar and disturbed meadow and shore sites. The new records suggest that *S. magnicamporum* occurs more widely than was suspected previously, its presence perhaps masked by its similarity to the common *S. cernua* (L.) Richard. Eastern occurrences may represent a combination of post-glacial relict populations, responses to climate change, and the results of long-distance dispersal events. These range extensions constitute the most easterly known populations of *S. magnicamporum* in North America. They also represent new records for New York State (including Jefferson and St. Lawrence Counties) and for the City of Ottawa in Ontario.

Key Words: Great Plains Ladies'-tresses; *Spiranthes magnicamporum*; New York; Ontario; alvar; range extension; Ottawa; post-glacial relict

Introduction

As suggested by its common name, Great Plains Ladies'-tresses (*Spiranthes magnicamporum* Sheviak; Orchidaceae) is predominantly a western grasslands diploid species. The core distribution of this recently described taxon is central North America (Figure 1). Beyond there, *S. magnicamporum* is typically considered a rare disjunct, with isolated population clusters east to central Kentucky, western Virginia, southern Ohio, and southwestern Ontario (Sheviak and Brown 2002). Until recently, the most easterly occurrences were known only on the basis of 19th-century specimens from two presumed extirpated populations in southeastern Pennsylvania (Rhodes and Block 2000). It is a species of conservation concern in all or most jurisdictions beyond its core range. That is certainly true in Canada

where it was known from several populations in a small area of southern Manitoba (Ames *et al.* 2005; Brouillet *et al.* 2010+) and from scattered populations in southwestern Ontario (Oldham and Brinker 2009).

In September 2013, a large population of *Spiranthes magnicamporum* was discovered in relict prairie habitat on the Burnt Lands alvar, Lanark County, Ontario, by P. M. Catling (Reddoch *et al.* 2013). That discovery stimulated additional field investigations and the location of new populations. This article documents those new populations and reviews the distribution and habitat of the species east of the Great Lakes.

Additional Eastern Populations

The association between *Spiranthes magnicamporum* and the provincially rare and distinctive alvar grass Northern Dropseed (*Sporobolus heterolepis* (A. Gray) A. Gray) was noted during examinations of its preferred habitat in the Burnt Lands alvar and was used as a field aid for the discovery of additional populations. In September 2014, I conducted searches for this orchid in alvar habitat supporting *S. heterolepis* populations in the City of Ottawa portion of the Burnt Lands alvar and in similar sites between Belleville and Kingston in southern Hastings and Lennox & Addington Counties along the north shore of Lake Ontario. These searches were unsuccessful, perhaps because the sites examined were drier than the *S. magnicamporum* site on the Lanark County portion of the Burnt Lands alvar.

In 2014, however, I discovered a small population of *Spiranthes magnicamporum* in moist alvar habitat 5.1 km northeast of Chaumont in Jefferson County, New York, in the Chaumont Barren Reserve (Figures 2 and 3). *Spiranthes* specialists P. M. Catling and C. J. Sheviak verified the identification from photographs of the

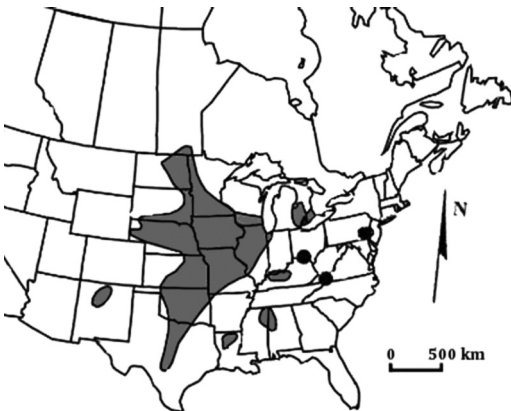


FIGURE 1. Distribution of Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) in North America (Sheviak and Brown 2002).

Chaumont Barren plants. This represents the first record of *S. magnicamporum* for the state of New York (Mitchell 1986; Weldy *et al.* 2015).

Twelve flowering plants of *Spiranthes magnicamporum* were initially found at the Chaumont Barren site, just coming into peak flower on 7 September 2014. The strong vanilla-like fragrance typical of this species was evident even in these mostly immature blooms. Later, 50 flowering plants were found there, including scattered individuals in a nearby *Sporobolus heterolepis* meadow, still flowering on 23 September 2014 (Holly Bickerton, personal communication).

On 13 September 2014, approximately 90 *Spiranthes magnicamporum* plants were found by Steven Daniel and Anne Johnson in a separate alvar population approximately 1 km from the first Chaumont Barren site. These plants had the leafless stems, late-flowering habit, and strong floral fragrance of *S. magnicamporum*. However, their flowers exhibited morphological features somewhat intermediate between those of *S. magnicamporum* and Nodding Ladies'-tresses (*S. cernua* (L.) Richard), the common, earlier-flowering, and typically odourless tetraploid species with which diploid *S. magnicamporum* can be confused. Although no *S. cernua* plants were noted in 2014 at the Chaumont Barren, the potential for this second population to represent hybrids warrants further investigation. Triploid hybrids between these species are known but are dif-

ficult to confirm without cytological analyses (Sheviak 1991).

Spiranthes magnicamporum was found at a second northern New York location shortly after the Chaumont discoveries. On 25 September 2014, Henry Steger located 76 plants in a calcareous roadside meadow at Hopson's Bay along the St. Lawrence River at Massena, St. Lawrence County. Another Massena population (approximately 20 plants) was found shortly thereafter (2 October 2014) by Anne Johnson and Steven Daniel in a similarly low, disturbed (possible landfill) site along the north side of the Wiley Dondero Canal in Robert Moses State Park, approximately 6 km east along the St. Lawrence River from Hopson's Bay (A. Johnson in Brunton 2015). The Massena populations are approximately 135 km east of the Chaumont Barren Reserve.

In addition to the New York populations, a second eastern Ontario population was discovered in 2014. On 19 September 2014, Henry Steger found 16 plants just coming into flower in the City of Ottawa portion of the Burnt Lands alvar in Burnt Lands Provincial Park. The plants were in a formerly treed but now graminoid-dominated alvar meadow that was burned in a wildfire in June 1999 (Catling 2009). This population is located approximately 4 km southeast of the much larger Lanark County Burnt Lands alvar population found in 2013 and is the first record for the City of Ottawa (Brunton 2005).



FIGURE 2. Site and habitat of Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) at the Chaumont Barren Reserve, Jefferson County, New York (7 September 2014). Photo: D. F. Brunton.



FIGURE 3. Flowering spike of Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) at the Chaumont Barren Reserve, Jefferson County, New York (7 September 2014). Photo: D. F. Brunton.

A voucher specimen from the initial Chaumont Barren population of *Spiranthes magnicamporum* (D. F. Brunton 18,833) has been deposited in the New York State (NYS) herbarium. Digital photographs of the second Chaumont Barren population, both St. Lawrence County populations, and plants from the City of Ottawa

site were obtained for documentation and verification purposes.

Figure 4 illustrates the known distribution of *Spiranthes magnicamporum* in Ontario and New York State. From an initial understanding of the species location close to the shores of Lakes Huron and Erie (Whiting and Catling 1986), its distribution in southwestern Ontario is now recognized to extend across virtually all of the Carolinian zone. (Note: Oldham and Brinker [2009] records shown in Figure 4 denote counties, not exact locations, where inland populations have been found since 1982.)

Spiranthes magnicamporum Habitats and Origins

The recently discovered populations of *Spiranthes magnicamporum* in the lower Great Lakes region occupy two quite different habitats, possibly reflecting dispersal at different time periods. Whiting and Catling (1986) describe the preferred habitat within the more or less continuous Ontario range (shaded area of Figure 4) as low prairies, littoral meadows, or even disturbed upland meadows over calcareous substrate. Similarly, Sheviak and Brown (2002) describe the plant as occurring across its North American range in "dry to wet prairies and fens," as do Rhodes and Block (2000) for Pennsylvania, Voss and Reznicek (2012) for Michigan, and Swink and Wilhelm (1994) for the Chicago region. A clear explanation for why two very different habitats appear to be used and what may have led to the occurrence of *S. magnicamporum* populations in this area will require additional research, including more field investigation in eastern Ontario, northern New York, and southwestern Quebec. There is sufficient evidence, however, to permit reasonable speculation on some likely possibilities.

The habitat of *Spiranthes magnicamporum* populations in the flooded section of the St. Lawrence River, also known as the St. Lawrence Seaway, is consistent with that of its core range, especially the more disturbed meadow habitats. It grows there in low, seasonally wet meadows in calcareous silty-sand and gravel substrate with Pringle's Aster (*Symphyotrichum pilosum* (Waldenow) G. L. Nesom ssp. *pringlei* (A. Gray) G. L. Nesom), White Flat-top Goldenrod (*Solidago ptarmicoides* (Nees) B. Boivin), and Greater Fringed Gentian (*Gentianopsis crinita* (Froelich) Ma) (H. Steger, personal communication) and at Robert Moses State Park, also with spikerushes, *Eleocharis elliptica* Kunth and the regionally rare *Eleocharis quinqueflora* (Hartman) O. Schwarz (Anne Johnson, personal communication; Eldblom and Johnson 2010)).

Contrary to that pattern, however, beyond the Carolinian zone in Ontario and the Chaumont Barren of New York, *Spiranthes magnicamporum* is found exclusively in alvar habitat. Plants at the Chaumont Barren, Burnt Lands, and Carden Plain (City of Kawartha, east of Lake Simcoe) alvars grow over limestone bedrock in the thin, seasonally moist turf of open meadows and glades in various combinations of *Sporobolus hetero-*

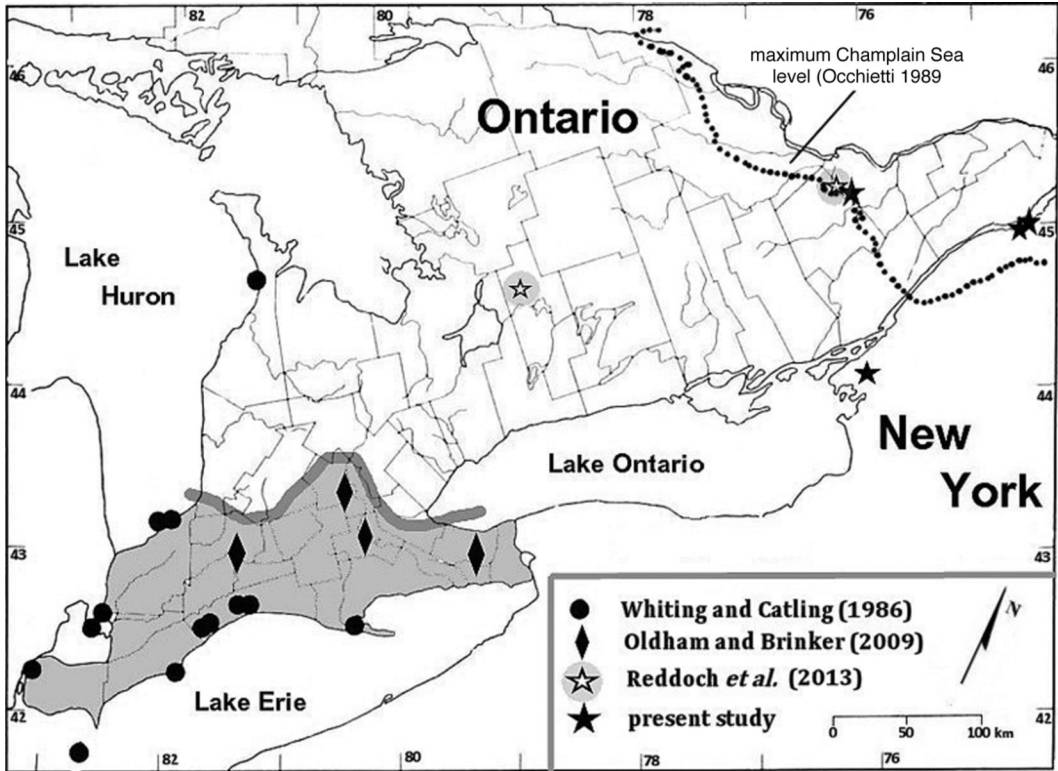


FIGURE 4. Distribution of Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) in Ontario and New York (shaded area indicates continuous range within Canada).

lepis, Ensheathed Dropseed (*Sporobolus vaginiflorus* (Torrey ex A. Gray) Alph. Wood var. *vaginiflorus*), *Solidago ptarmicoides*, Prairie Smoke (*Geum triflorum* Pursh), Canada Bluets (*Houstonia longifolia* Gaertner [syn. *Houstonia canadensis* (Willdenow) Fosberg]), Wiry Panicgrass (*Panicum flexile* (Gattinger) Scribner), and/or Poverty Grass (*Danthonia spicata* (L.) P. Beauvois ex Roemer & Schultes). Elsewhere in North America, "grassy limestone barrens" in Virginia (Weakley *et al.* 2012) appear similar to that of southern Ontario alvar sites. Charles Sheviak (personal communication) notes that "the species sometimes occurs in very shallow soils over limestone in the heart of its prairie range too."

It seems significant that the *Spiranthes magnicamporum* sites on the Carden Plain and Burnt Lands alvars are geographically situated within a complex of post-glacial Great Lakes drainage features such as stranded beaches, drainage outlet channels, and fossilized dunes (Chapman and Putnam 1984). The presence of these populations and their distinctive Great Lakes and western flora and faunal associates may be related to post-glacial landscape structure and to revegetation processes thought to have provided prehistoric migration opportunities (Catling and Brownell 1995; Reschke *et al.* 1999). These *S. magnicamporum* populations, then,

may represent relicts of the time when landscape forming processes were particularly active in the lower Great Lakes region (8000–12 000 years ago; Occhietti 1989). The optimum time for the migration of western and prairie species into the lower Great Lakes region including the currently known Ontario and New York range of *S. magnicamporum* would more likely have been during the hypsithermal period that prevailed approximately 8000–9000 years ago when conditions were warmer and drier than they are in contemporary times (Dadswell 1974; Mardis 2014).

Unlike those of other easternmost populations, however, *Spiranthes magnicamporum* sites along the St. Lawrence Seaway are distinctive by virtue of their prolonged, deep submergence in the post-glacial Atlantic Ocean embayment, the Champlain Sea (Figure 4). The Chaumont Barren alvar is situated beyond the reach of the sea and would have been available for revegetation shortly after deglaciation of the local landscape about 11 000 years ago (Karrow 1989). The Burnt Lands alvar (elevation 145–155 m above sea level) is situated at the western limit of the Champlain Sea (Russell and Cummings 2009). Current Burnt Lands *S. magnicamporum* sites are either at or only slightly beneath where the sea's maximum elevation (155 m above sea level) reached approximately 12 000 years

ago (Occhietti 1989) and thus were available for revegetation shortly thereafter (Brunton 1986). Accordingly, potential colonization of terrestrial habitats at both the Burnt Lands and the Chaumont Barren would have been possible during the warmer, drier hypsithermal period.

In contrast, the substantially lower elevation (approximately 64 m above sea level) St. Lawrence Seaway sites would have been available for colonization for a much shorter post-glacial period, having remained submerged beneath the waters of the Champlain Sea and its subsequent freshwater phase, Lake Lampsilis (Russell and Cummings 2009). This inundation extended to approximately 8000 years ago (Mardis 2014). Accordingly, occupation of the St. Lawrence Seaway sites would have occurred under at least close to contemporary climatic and vegetation conditions as they became established subsequent to the hypsithermal period.

Another possible explanation for the occurrence of *Spiranthes magnicamporum* at the apparently regionally atypical St. Lawrence Seaway sites may be long-distance wind transport of seed, as has been shown for numerous orchid species (Arditt and Ghani 2000). Were that the case here, however, a more frequent and random distribution across this commonly available, disturbed habitat would be expected.

Range expansion due to climate change has been used to explain recent discoveries of *Spiranthes cernua* in northern Ontario beyond its previously known range (Catling and Oldham 2011). That may apply to *Spiranthes magnicamporum* as well. Were that the explanation for these eastern *S. magnicamporum* populations, however, a more random distribution and a lower proportion of occurrences in rare habitat known for supporting relict western flora would be expected.

Spiranthes magnicamporum Status

Eastern Ontario and northern New York populations represent the easternmost extant *Spiranthes magnicamporum* in North America. Given the success of relatively limited 2014 field investigations, the discovery of additional populations in the lower Great Lakes region seems probable, particularly along the St. Lawrence Seaway shores of northern New York, in adjacent Stormont, Dundas and Glengarry County of southeastern Ontario and perhaps in extreme southwestern Quebec. Even if additional populations are discovered, however, it is expected that *S. magnicamporum* will remain a rare and biogeographically interesting element of the regional flora.

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My thanks to Paul M. Catling for sharing his Burnt Lands alvar discoveries, offering a wealth of ecological information, inspiring the initial Chaumont Barrens investigation, and providing verifications for later discoveries. Charles S. Sheviak also was quick to provide both specimen verification and valuable insights on *Spiranthes magnicamporum*. New York botanists Steven

Daniel and Anne Johnson immediately employed their expert field knowledge and shared the success of those efforts. Similarly, Ontario field botanists Henry Steger, Wasyl Bakowski, and Holly Bickerton shared their *S. magnicamporum* discoveries and experience from New York and Ontario. The manuscript benefitted significantly from input and comments by Paul Catling, Holly Bickerton, Charles Sheviak, and Joyce Reddoch.

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