

GERMAN IRIS – A NEW NATURALIZED PLANT SPECIES FOR SASKATCHEWAN

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Introduction

The genus *Iris* L. in the Iridaceae family includes about 260–300 species, many hybrids and cultivars.¹ The genus name is derived from the Latin and Greek word “iris” which is usually interpreted as “rainbow” but also as “a sweet smelling plant.” *Iris* species are naturally distributed in temperate regions of Northern Hemisphere. Their habitats mainly include open grasslands, woodlands, mountainsides, deserts and sandy coastal areas.² There are 34 species in the flora of North America³ and 17 in Canada,⁴ including both native and introduced.

German iris, bearded iris or flag (*Iris xgermanica* L.) probably originated in central southern Europe and the Balkan Peninsula.⁵ This species is considered to be a natural and fertile hybrid between sweet iris (*I. pallida* Lam.) and Hungarian

iris (*I. variegata* L.). It is believed that German iris is the ancestor of many, if not most, of the modern bearded irises that are so popular with gardeners throughout the world.⁶

German iris has become established all over the temperate biome and can be found growing on road shoulders, fields, old home sites and waste areas throughout much of Europe and North America. According to the PLANTS database,⁷ German iris naturalized in most parts of the U.S., except the Great

Plains, and from Eastern Canada to Manitoba (Figure 1). NatureServe⁸ delineates the species distribution range in North America that includes 20 states of the U.S. and three provinces of Canada (NB, ON, and MB).

German iris is a rhizomatous, perennial herb, growing to about 100 cm high, forming a large clump to 30 cm wide (Figure 2). Rhizomes are homogeneous, creeping on soil surface or to 10 cm depth, usually many-branched, light brown,



FIGURE 1. Distribution of German iris in North America (USDA, 2018).



FIGURE 2. German iris in full bloom. Photo credit: Vladimir Kricsfalusy

1.2-2 cm in diameter and smooth, with nodal rings; branches may arise in the fan or as many as 15-20 nodes are produced prior to active leaves. Stems are green, 2-3-branched, solid, 60-120 cm x 1–1.5 cm and glaucous. Leaves are purplish at base and folded midrib to base, glaucous, ensiform, to 45 cm x 3.5 cm. Inflorescences with terminal unit 2-3-flowered, branch units 1-2-flowered. Flowers are blue-violet, yellow, brown, or white with various patterns of pigment distribution. Seeds in two rows per locule, red-brown, oval, 3-4 mm, wrinkled.

The iris (no particular species) has been valued by humans since ancient times. In Greece, iris was the Greek goddess of the rainbow and a messenger of the gods. The iris was the symbol of royalty and priests in medieval Europe. The three-parted flower has been interpreted as reflecting the three virtues of faith, wisdom and courage.²

German iris has traditionally been used for making a blend of herbs and spices across the Middle East and North Africa, primarily associated with Moroccan cuisine.⁹ Peeled rhizomes of the plant (orris-roots) are used as flavouring in ice cream, confectionery and baked goods. Orris is also an ingredient in many brands of gin, including Bombay Sapphire and Magellan Gin.¹⁰ The aged rhizomes are steam-distilled, which produces a thick oily compound known in the perfume industry as "iris butter" or orris oil.¹¹

German iris was used in folk medicine and also as a magical plant (see comprehensive review by Lim⁹). The root is diuretic, emetic, expectorant and mildly purgative. Juice from the root is a powerful cathartic and used for the treatment of dropsy. Orris-root is also employed for complaints of the lungs, coughs and hoarseness, bronchitis

and chronic diarrhea. German iris contains notable amounts of terpenes, and organic acids⁹. Because of that, rhizomes can be toxic and may cause nausea, vomiting, diarrhea, and/or skin irritation.¹²

German iris includes hundreds of cultivars and is extensively grown as ornamental plant in home and botanical gardens all over the world. It is excellent for planting in borders, beds and foundation plantings. This species can easily escape from cultivation. For this reason, it is often very difficult to distinguish between native populations and those naturalized from garden escapes.

As mentioned earlier, German iris is not indicated for Saskatchewan in major databases.^{7,8} However, the first naturalized location of German iris in the province has recently been reported in literature.^{13,14} Nonetheless, existing data about habitat requirements of German iris are very scarce, and information about species ecology and population features is missing. The purpose of this study is to document a new location of German iris in Saskatchewan and assess its habitat and population ecology, verify existing information about the species distribution in the province, as well as evaluate species status based on exact data.

Methods

Studies on population biology of German iris and its habitat affinities were conducted in 2017 during the field surveys in Redberry Lake Biosphere Reserve. The site was revisited in 2018 to monitor the species flowering success. As the source of species' records we used our field studies and published information on flora of Saskatchewan.¹⁴ Herbarium specimens of German iris deposited at the SASK (W.P. Fraser Herbarium

at the University of Saskatchewan) were studied as well.

To develop a distribution map of German iris we followed the approach suggested for mapping species of Saskatchewan flora.¹⁵ The grid template was divided into quadrats of 50 km x 50 km. The information about habitat, vegetation cover, and site disturbances was collected during our field studies. Vegetation plot (10 m x 10 m) was placed in the woodland patch where the German iris occurs. We recorded total per cent cover for all vegetation layers, each plant species, and bare ground according to Daubenmire classes: 1 = 0 – 5%, 2 = 5 – 25%, 3 =

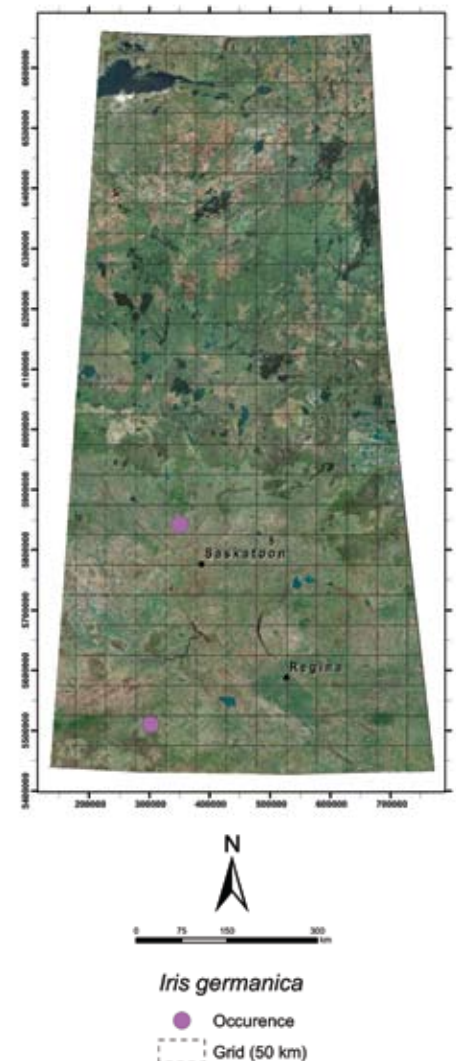


FIGURE 3. A distribution map of German iris in Saskatchewan. Species localities are shown in dots.

25 – 50%, 4 = 50 – 75%, 5 = 75 – 95%, 6 = 95 – 100%. Disturbances (litter, trampling, exotics, grazing, and burrowing) were estimated as follows: 0 – absent, 1 – light, 2 – moderate, 3 – severe. Taxonomy and nomenclature of vascular plants follow the VASCAN database.⁴ The average annual rate of species spread was calculated using distance based method. It was assessed by measuring the distance between the first and most recent observation of the species in the specific location.

Results and Discussion

Until recently, German iris has been recorded in Saskatchewan only from one site, south of Cadillac.¹⁴ It is situated in the Mixed Grassland ecoregion of the Prairie Ecozone. According to Dan L. Johnson, the author of this collection dating back to June 6, 2003, the population of German iris is located at Auvergne-Wise Creek PFRA Pasture and consists of about 25 individuals. It is established in well drained, rocky, dry, native mixed grassland hilltop near a rock circle possibly indicating an early homestead site. We visited this site to verify its current status on June 11, 2018, however despite intense search efforts no plants of German iris were found there.

During our field surveys in Redberry Lake Biosphere Reserve (RLBR) in 2017, we discovered the second site with German iris in Saskatchewan, southeast of Hafford. It is situated in the Aspen Parkland ecoregion of the Prairie Ecozone. This distribution area was found just across the road from the Education Center of RLBR. According to the information provided by the Education Center, two small groups of German iris were planted there in 2000. Initially they were maintained, but later have escaped and continue to grow and spread in the adjacent

woodland quite vigorously (Figure 4).

We assessed this distribution area of German iris during the field surveys (Table 1). Plants were found in open and semi-shaded microsites scattered across the aspen woodland, on fertile, dry to moist, and neutral sandy soil. The community canopy is composed by a pure balsam poplar dominated upper and middle canopy (*Populus balsamifera* L.). The shrub layer tends to be dense and diverse. The herbaceous layer is low and leaf litter covers much of the floor. Complete vegetation community notes are reported in Table 1.

The distribution area of German iris consists of two patches located about 15 m apart from each other. The extent of occurrence of the population is approximately 56 m². The size of the first, larger patch, is 12 m² and the second, smaller patch, is around 8 m². We calculated the demographic structure of German iris for the entire population and each patch separately (Table 2). The age spectrum of this population can be identified as of normal type (i.e. includes individuals of all life stages, following the classification suggested by Rabotnov¹⁶). Based on the

population age structure, dominance of medium sized vegetative plants and low intensity of vegetative spread (<1 m per year), German iris can be classified as a naturalized species.

We want to clarify that the term 'naturalized' is not a synonym for 'invasive'. Unfortunately, some scientific publications describing aspects of plant invasions have used the terminology loosely and their lack of rigour has led to confusion.¹⁷ To become invasive, introduced plants must overcome barriers to dispersal within the new region, i.e. sexual or asexual spread and the distance. There is a general agreement¹⁷ that for introduced plants spreading exclusively vegetatively, '6 m per 3 years' could be used as a criterion to classify it as an invasive species. Thus, German iris with self-sustaining populations but low intensity of vegetative spread should not be considered as an invasive species.

The obtained data show that the proportion of flowering plants in the study population of German iris substantially increased (from 15% to 26%) with a larger patch size (93 and 135 plants, respectively). A



FIGURE 4. A snapshot of German iris habitat (vicinity of Hafford, Saskatchewan). Photo credit: John Kindrachuk

TABLE 1. Vegetation community with German iris (Poplar Woodland ecosite).

Phytosociological relevé

Date & Observer: June 28, 2017; V. Kricsfalusy & S. Beever; Location: 11 km SE of Hafford, RM of Redberry No. 435; Ecoregion: Aspen Parkland (Hafford Plane ecodistrict); Soil: sand; Landform: recessional moraine; Elevation: cca 513 m; Area: 120 m²; Microtopography: S aspect, very gentle slope <3o; LSD: 8-14-37-5 W3; Coordinates: 52.71233 N 107.21527 W.

Vegetation cover: total – 4 (50-75%), upper canopy – 2 (5-25%), middle canopy – 2 (5-25%), understory – 4 (50-75%), ground – 3 (25-50%), bare ground – 2 (5-25%); Disturbances: litter – 2 (moderate), trampling – 1 (light), exotics – 1 (light), grazing – 0 (absent), burrowing – 0 (absent).

Balsam Poplar – Wolf-willow vegetation community

LAYER	SCIENTIFIC NAME	COMMON NAME	(% COVER)
Upper Canopy	Trees		
	<i>Populus balsamifera</i>	balsam poplar	20
Middle Canopy	Small Trees		
	<i>Populus balsamifera</i>	balsam poplar	10
Understory	Shrubs		
	<i>Amelanchier alnifolia</i>	Saskatoon	2
	<i>Cornus sericea</i>	red-osier dogwood	5
	<i>Elaeagnus commutata</i>	Wolf-willow	15
	<i>Cotoneaster laxiflorus</i>	black-fruit cotoneaster	10
	<i>Rosa woodsii</i>	Woods' rose	5
	<i>Salix bebbiana</i>	Bebb's willow	5
	<i>Shepherdia canadensis</i>	soapberry	10
Ground	Forbs		
	<i>Achillea millefolium</i>	common yarrow	3
	<i>Astragalus flexuosus</i>	flexible milk vetch	10
	<i>Galium boreale</i>	northern bedstraw	7
	<i>Iris xgermanica</i>	German iris	2
	<i>Maianthemum stellatum</i>	starry false Solomon's seal	2
	<i>Medicago sativa</i>	alfalfa	1
	<i>Solidago missouriensis</i>	Missouri goldenrod	1
	<i>Symphotrichum laeve</i>	smooth blue aster	1
	<i>Tanacetum vulgare</i>	common tansy	1
	<i>Taraxacum officinale</i>	common dandelion	1
	<i>Thermopsis rhombifolia</i>	golden bean	10
	<i>Vicia americana</i>	American vetch	1
	Graminoids		
	<i>Elymus canadensis</i>	Canada wildrye	1
<i>Poa pratensis subsp. pratensis</i>	Kentucky bluegrass	2	

TABLE 2. Population demography of German iris.

POPULATION PARAMETERS	SIZE (M ²)	NUMBER OF PLANTS	GENERATIVE PLANTS (G)	VIRGINILE PLANTS (V)	AGE RATIO (G : V)	SPREAD (M/YEAR)
Extent of occurrence	46	228	40	188	1 : 5	< 0.2
Patch 1	12	135	28	107	1 : 4	< 0.9
	(6 x 2)					
Patch 2	8	93	12	81	1 : 7	< 0.7
	(5 x 1.5)					
Between patch area	26					
	(15 x 1.7)					

Note: generative (g) – flowering plant; virginile (v) – vegetative plant.

large patch size may indicate more favourable conditions for German iris. The larger patch was found where vegetation is less dense and with a higher proportion of bare ground. A small patch size may have been negatively influenced by taller vegetation and much denser understory cover. This shows the importance of habitat conditions for establishment and survival of German iris. It may thrive in open (grassland) or semi-shade (light woodland) habitat but be unable to tolerate shady and humid habitat (dense woodland and forest).

To monitor the flowering success of German iris we revisited the study site in 2018. It turns out that the proportion of flowering plants in the population compared with the previous year substantially decreased: from 28 to nine plants (larger patch size) and from 12 to zero plants (smaller patch size). It's likely that this variation reflects environmental factors such as resource limitation. Many studies have demonstrated that flower number is subject to pollinator-mediated selection.¹⁸

Our research provides useful information about the habitat requirements of German iris in the Prairie Ecozone, particularly in the light of vegetation dynamics in response to climate change. According to the climate change scenario for Saskatchewan,¹⁹ the most significant impacts can be expected to occur at the interface of grassland with parkland and/or forest. In these ecotone areas, the drier open grassland ecosystem will expand at the expense of the more humid closed forest ecosystem. These processes will likely create opportunities for expansion of German iris due to more favourable light regime in open communities, as well as the prolonged warm season, increasing accumulation of heat

and milder winters. At this point, there is no concern with German iris becoming an invasive species in Saskatchewan. However, in some parts of the world it is listed under asset-based management category, which is a low priority for action, except in the protection of high value biodiversity or agricultural assets.²⁰

Thus, ecological monitoring of range extension in German iris can help to follow trends and developments in the numbers, spread and naturalization of this plant across the Saskatchewan. The current findings allow us to recognise the status of German iris as a naturalized species in the province. Thus far, no immediate negative impacts caused by this species to native flora and vegetation are known.

Given that the newly discovered population of German iris is located next to the Education Center at Redberry Lake Biosphere Reserve, it creates an excellent opportunity for establishing long-term ecological monitoring, particularly the species' flowering success and its speed of spread within the area. This may engage volunteer participants, e.g. students from the local school, in scientific research and increase efficiency of data collection. This in turn will contribute to further development of citizen science in the biosphere region. According to the recent studies,²¹ participatory approaches combined with professional support and coordination comprise a highly effective way for monitoring biodiversity and conservation interventions.

Conclusions

German iris is widely grown as a garden ornamental in Saskatchewan. This species has recently become naturalized in two locations within the Prairie Ecozone. Thus far, no immediate negative impacts caused

by German iris to native flora and vegetation are known. Monitoring known populations would help to determine whether this species is spreading or declining.

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