

## Note

### Confirmation of Shining Firmoss (*Huperzia lucidula*; Lycopodiaceae) in Manitoba

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#### Abstract

The occurrence of Shining Firmoss (*Huperzia lucidula*; Lycopodiaceae) in Manitoba has been suspected since 1943 but unconfirmed. The discovery at the herbarium of the University of Manitoba of a non-accessioned specimen, collected in Riding Mountain National Park (RMNP), Manitoba, confirmed that the species occurred in the province. At about the same time, a thriving colony of Shining Firmoss was discovered at Gunisao Lake, ~380 km to the northeast of the RMNP site. Shining Firmoss is now established as a rare, widely dispersed element in Manitoba's flora.

Key words: Shining Firmoss; *Huperzia lucidula*; Manitoba; new distribution records

Shining Firmoss, *Huperzia lucidula* (Michaux) Trevisan (synonym: *Lycopodium lucidulum* Michaux), so named because of the glossiness of its leaves, is one of about 25 species of *Huperzia* found worldwide (PGI 2016) and one of three species recorded from Manitoba in VASCAN (Brouillet *et al.* 2010+). It is a perennial, forest-floor, evergreen plant (Figure 1) of hardwood and mixed forests. According to Wagner and Beitel (1993), it is found in Canada from Manitoba east to Newfoundland and in the eastern United States from the Canadian border south to Alabama and Georgia. However, the reports from Manitoba in these sources, as well as in Cody and Britton (1989), are unsupported by specimen citations.

In 2012, D. Sawatsky discovered a previously unknown 1958 herbarium specimen of Shining Firmoss in the University of Manitoba Herbarium (WIN). (Herbarium acronyms follow Thiers [2020].) That specimen (*J.M. Walker* [later, Shay] 213, WIN 82392) from Riding Mountain National Park (RMNP), Manitoba (Figure 2) confirmed the occurrence of the species in the province. The specimen was unaccessioned and, thus, likely had been overlooked until the time of Sawatsky's discovery.

The collection label reads: "*Lycopodium lucidulum*. Coll. #213. Date: July 19, 1958. Habitat: Damp, shaded hollow beneath woods. Coll. J.M. Walker"

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FIGURE 1. Part of a colony of Shining Firmoss (*Huperzia lucidula*) found near Gunisao Lake, Manitoba (R.J. Staniforth 849, RS), in 2013. Photo: R.J. Staniforth.

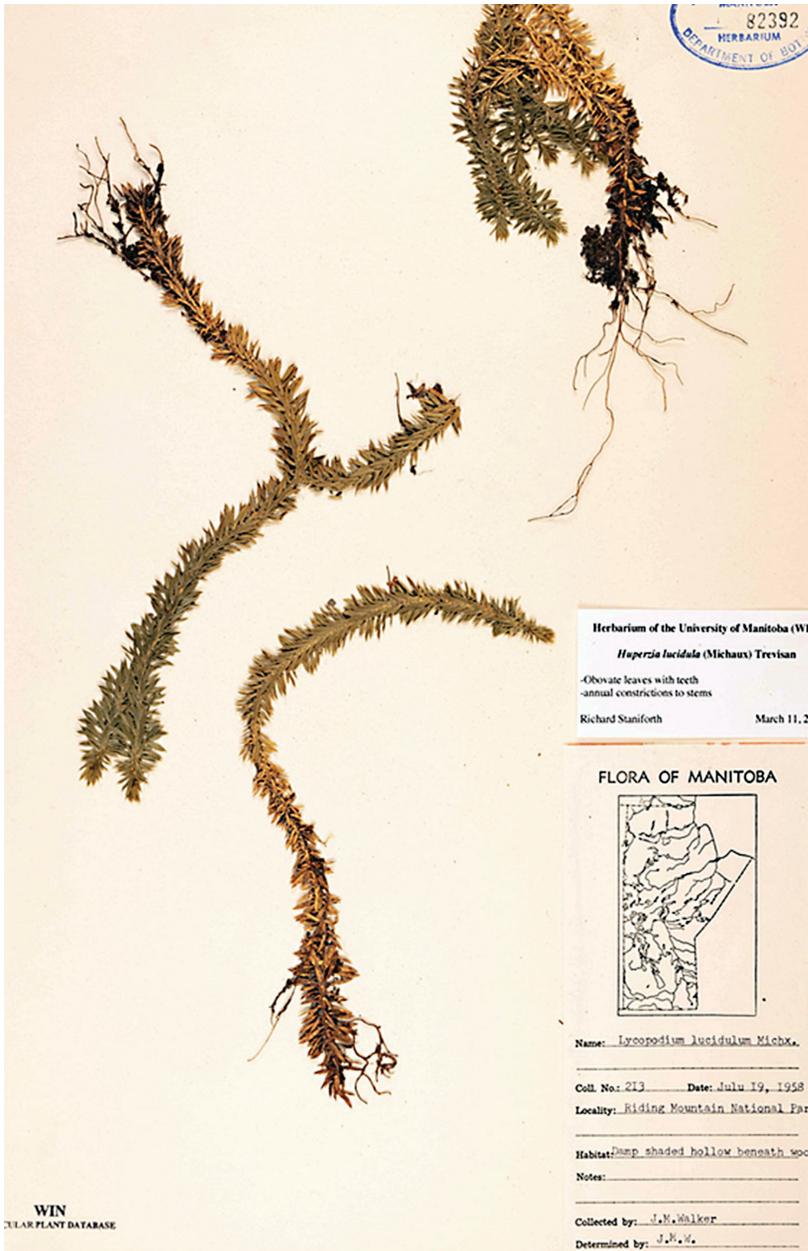


FIGURE 2. Herbarium specimen of Shining Firmoss (*Huperzia lucidula*) recently discovered at the University of Manitoba (WIN). Note the annual constrictions in the stem, the stem width, the long oblanceolate leaves, and the spreading leaf posture. Photo: R.J. Staniforth.

(Figure 2). I revised it to *Huperzia lucidula* (Michaux) Trevisan, a homotypic synonym of the name *L. lucidulum*, based on the attributes noted in Table 1. Further, on 24 June 2013, I discovered a small (1 m × 3 m) colony of the species at Gunisao Lake in central Manitoba (Figure 1) growing along the edge of

a granite outcrop in pine–spruce–birch forest (*R.J. Staniforth 849*, RS, the personal collection of R.J.S. to be deposited in a public Manitoba herbarium). This colony consisted of mature trailing plants and numerous immature plants that had clearly developed from gemmae. The RMNP and the Gunisao Lake sites are

**TABLE 1.** Comparison of morphological features of Shining Firmoss (*Huperzia lucidula*), Northern Firmoss (*Huperzia selago*), and their hybrid Butters' Firmoss (*Huperzia ×buttersii*).

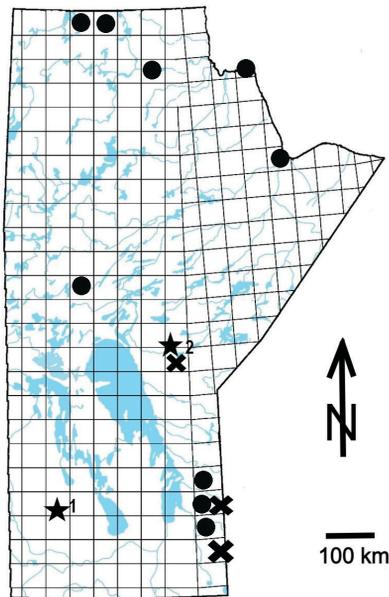
Morphological characteristic	Shining Firmoss	Butters' Firmoss	Northern Firmoss
Annual stem constrictions	Conspicuous	Indistinct	Obscure
Stem thickness	10–20 mm	Intermediate	7–14 mm
Leaf posture	Spreading to reflexed	Intermediate	Spreading-ascending
Leaf shape	Oblanceolate (widest above middle)	Intermediate	Tapered, triangular (widest below middle)
Leaf length	7–11 mm	Intermediate	3.5–7.5 mm
Leaf margin	1–8 teeth per side	Teeth inconspicuous or (rarely) absent	Entire (teeth absent)
Leaf stomata	Undersurface only	A few on upper surface, many below	Both surfaces
Gemma shape	Rounded	Intermediate	Acute
Spore viability	Viable (regular shape and size)	Aborted (irregular shape and variable size)	Viable (regular shape and size)

Sources: modified from Wagner and Beitel (1993), Haines (2003), and Palmer (2018).

~380 km apart (Figure 3). In 2015, firmoss expert W. Testo confirmed vouchers from the 2013 Gunisao Lake collection as *H. lucidula*. On the basis of its irregular gemmae shape and the presence of aborted spores, however, a replicate of *R.J. Staniforth 849* in Daniel Brunton Private Herbarium (DFB; now renumbered *R.J. Staniforth 849b*, for clarification)

was determined by D.F. Brunton and confirmed by W. Testo to be the sterile hybrid Butters' Firmoss (*Huperzia ×buttersii* (Abbe) Kartez and Gandhi [*H. lucidula* × *Huperzia selago* (L.) Bernhardt]; D. Brunton pers. comm. 13 May 2015). I conclude that all other specimens collected at Gunisao Lake represent *H. lucidula* based on the distinctions of diagnostic characteristics noted for *H. lucidula*, *H. ×buttersii*, and *H. selago* (including *Huperzia appressa* (Desvaux) Löve and Löve, *p.p.* [*pro parte*, in part]) in Table 1.

Earlier reports of *H. lucidula* in Manitoba are vague and unsubstantiated. The species was not mentioned in the first provincial floras (Burman 1909; Jackson *et al.* 1922). Lowe (1943: 9) was the first botanist to include the species on a provincial list: "Moist woods. Occasional. Riding Mt. Nat. Park, Victoria Beach and Kenora, Ont.", but no supporting specimens with a collection date prior to 1943 have been located. Scoggan (1957: 51) decided that "in the absence of supporting specimens... it seems best to exclude this species for the present from the flora of Manitoba". However, he later wrote that the species did occur in "SE Man. (Bissett)" (Scoggan 1978: 135), but offered no further explanation. Shortly thereafter, White and Johnson (1980: 29) included *H. lucidula* in their enumeration of the rare vascular flora of Manitoba on the basis of an RMNP collection (perhaps the unaccessioned *J.M. Walker 213* collection found by Sawatsky in 2012), but with no mention of southeastern Manitoba records. My critical examination of all eastern Manitoba specimens of *L. lucidulum* (Appendix S1) found that all of these had been misidentified and either represented the hybrid



**FIGURE 3.** Manitoba locations (50 × 50 km grid) of Shining Firmoss (*Huperzia lucidula* ★: 1. Riding Mountain National Park, 2. Gunisao Lake), Butters' Firmoss (*Huperzia ×buttersii* ×), and Northern Firmoss (*Huperzia selago* ●).

Butters' Firmoss (*Huperzia ×buttersii*) or Northern Firmoss (*Huperzia selago*).

Before the discovery of the *J.M. Walker 213* RMNP specimen and the colony at Gunisao Lake, recent Manitoba reports of this species appear to originate from the inclusion of *H. lucidula* in *Plants of Riding Mountain National Park* (Cody 1988). Cody (1988: 19) reported that the species is "Rare on moss-covered shale under birch near the East Gate", but a thorough field exploration by D. Staniforth and R.J.S. (19–21 September 2010) failed to find any plants at that location. A subsequent extensive search in Manitoba herbaria (the Manitoba Museum [MMMN], WIN, the University of Winnipeg [UWPG], and the small plant collection at RMNP [W. Vanderschuit pers. comm. ~ June 2009]) for a voucher specimen to confirm the Cody report was unsuccessful. A voucher was also searched for by G. Mitrow and M. Anions in the National Collection of Vascular Plants – Agriculture and Agri-food Canada (DAO), where Cody had been the curator. Although one was not found, a

fuzzy photograph (Figure 4) of the apparently missing collection which had been accessioned in 1982 as DAO 337594, "Ex herb. Manitoba", was discovered (M. Anions pers. comm. 10 November 2010). There are two herbarium labels on this specimen, one in the photograph and the other on the newer sheet (Figure 5). The photograph gives the following information:

Flora of Manitoba. *Lycopodium lucidulum* Michx. Coll: #3325. Date: 10-7-58. Locality: Riding Mtn. National Park near E. Gate. Habitat: N.-facing slope near birch on wet moss-covered shale. (Apparently the first authentic record for Manitoba.) Coll: J.C. Ritchie. Det: J.C.R. Stet! [let it stand as written] W.J. Cody 1982.

The photograph of the firmoss lacks fine definition. The possibility that the specimen is incorrectly identified cannot be excluded using the photographic evidence alone. However, given the 1982 W.J. Cody and 1989 D.W. White annotations on the herbarium sheet in support of the original identification by Ritchie, the identification is considered likely to be accurate.

*Huperzia lucidula* is a widely dispersed and rare taxon in Manitoba (Figure 3). It has not been recorded to the north, west, or southwest of Manitoba; i.e., Saskatchewan (Harms and Leighton 2011) and North Dakota (Shipunov 2019). It is known eastward, where it is considered to be regularly occurring both in adjacent northwest Ontario (Walshe 1980; Cody and Britton 1989) and northeastern Minnesota (Tryon 1954; Chayka and Dziuk 2020). It is possible that additional occurrences will be found in Manitoba, especially beside granite outcroppings within the boreal forests of mid-Manitoba.

The dispersal potential of hybrid *Huperzia ×buttersii* is presumably more limited than that of putative parents *H. lucidula* and *H. selago*, because of its dependence on relatively large dispersal units (the gemmae). This hybrid is known only from several sites in southeastern Manitoba, usually in direct or close association with plants of one or both parents (Figure 3; Staniforth 2012; Staniforth and Brunton 2022).

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**FIGURE 4.** A photograph of the missing herbarium voucher of Shining Firmoss (*Huperzia lucidula*) at the National Collection of Vascular Plants (DAO), Agriculture and Agri-food Canada, Ottawa, Ontario; *J.C. Ritchie 3325* specimen (DAO 337594). The original specimen was missing, but a photograph of it remained and was made into a herbarium specimen with its own label and accession number. See Figure 5 for the detailed label data. Photo: R.J. Staniforth.

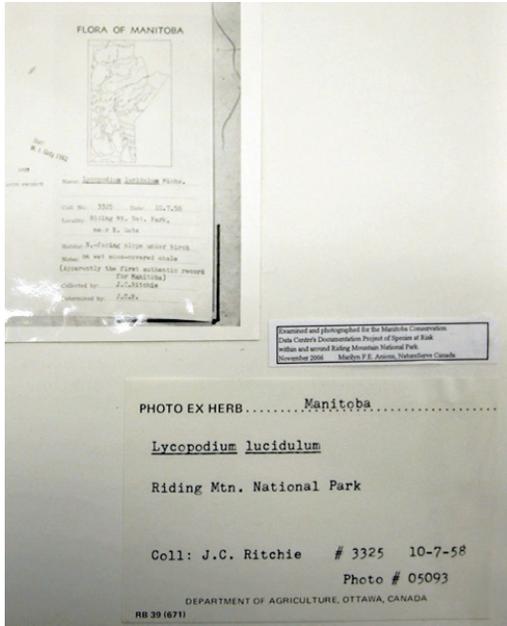


FIGURE 5. Herbarium label of *J.C. Ritchie* 3325 specimen (DAO 337594) of Shining Firmoss (*Huperzia lucidula*). Photo: R.J. Staniforth.

tant, Winnipeg, Manitoba), W. Testo (University of Gothenburg, Sweden), and W. Vanderschuit (Parks Canada, Riding Mountain National Park, Manitoba). I also thank two anonymous reviewers and *The Canadian Field-Naturalist* editorial staff who spent a substantial amount of time on enhancements to the original manuscript.

*Note:* The author died as the manuscript neared completion. Daniel F. Brunton of Ottawa, Ontario, was invited by Diana Staniforth to complete the final review and publication process and was honoured to do so.

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#### **SUPPLEMENTARY MATERIAL:**

**APPENDIX S1.** Specimens of Shining Firmoss (*Huperzia lucidula*), Butters' Firmoss (*Huperzia ×buttersii*), and Northern Firmoss (*Huperzia selago*) known from Manitoba herbaria.