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THE NATIVE ORCHID CONFERENCE JOURNAL

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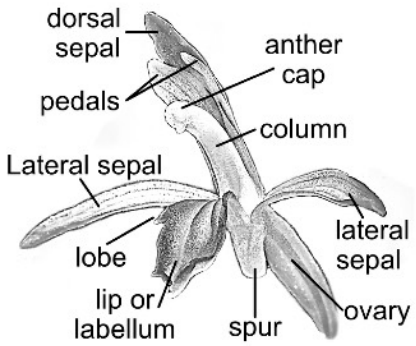
COLOR VARIATIONS OF *CORALLORHIZA MERTENSIANA*

By Bill Kress, wckress@gmail.com

We found our first *Corallorhiza mertensiana*, or Pacific Coralroot, in the coastal mountains of California, about 120 miles north of San Francisco. There were thousands of single plants and clusters within a half mile of the Pacific Ocean, about 150 feet above sea level. For those not familiar with this orchid, the drawing to the right illustrates the anatomy.



Corallorhiza mertensiana

On June 27, 2022, a group of NOC Symposium attendees visited a wooded area east of Port Angeles, WA. This area was in the rain shadow of the Olympic Mountains and, therefore, drier than areas to the west, and the environment similar to that of the *C. mertensiana* seen in California.

While we saw several different wildflowers in the area, including *Hemitomes congestum* and *Monotropa uniflora*, the most common flowering plant was the leafless terrestrial orchid *Corallorhiza mertensiana*. Because of the dark understory, spotting them was challenging, but there were orchid-finding experts in the group. In many instances, we heard, “Here’s a different one…”

That day we found about a dozen sepal and petal color variations, as shown below. There is so much intergradation of color variants in this species that experts have found it best not to try to name them all but it is delightful to see them. They are best described with photographs.

We thank our hiking companions, Brenda Kostiuk and Paul Catling, for their amazing ability to spot and identify native orchids in a dark forest, some at a significant distance.

THE WHITE-LIPPED FORM OF STRIPED CORALROOT

By Paul M. Catling and Brenda Kostiuk, brenda.kostiuk@gmail.com
Photos by Jean-Luc Roux and Elisabeth Roux, elisaroux@orange.fr, and D.R. Gunn

Although Brown (2006: 44, and 1995) refers to f. *eburnea* of *Corallorhiza striata*, as having "flowers yellow to white," his accompanying photo labelled f. *eburnea* (2006: 45) has flowers with dark red-striped lips (on close examination). It is not therefore the pure white, or pale yellow-white-flowered form of *C. striata*. More importantly Brown's original description of f. *eburnea* does not refer to the location of a type specimen or photo. Thus *Corallorhiza striata* f. *eburnea* P.M. Brown in N. Amer. Native Orchid J. 1: 9 (1995) was published in contravention of Art. 40.7 ICN (Turland *et al.* 2018, https://www.iapt-taxon.org/nomen/pages/intro/title_page.html): "For the name of a new species or infraspecific taxon published on or after 1 January 1990 of which the type is a specimen or unpublished illustration, the single herbarium, collection, or institution in which the type is conserved must be specified."

If f. *flavida* applies to var. *striata*, as listed in the Kew catalogue, we may already have a name for a white-lipped form making *eburnea* superfluous, but this is not the case. We accept J.V. Freudenstein's annotation of the type specimen of var. *flavida* at the Smithsonian (NMNH) as *Corallorhiza striata* var. *vreelandii* (https://collections.nmnh.si.edu/search/botany/?ti=3, see barcode 00026794, catalog no. 2607640). Consequently, the white-lipped form of *Corallorhiza striata* var. *striata* is without a name (since f. *eburnea* is invalid – see above).

Interestingly, Luer's illustration (1975: 324, Plate 92, Figure 4) labelled: "*Corallorhiza striata* var. *striata* … is an albino form of the flowers enlarged about ½ times; Otero Co., N.M., June 1969. A photograph by Thomas K. Todsen", may be a photo of the type of *C. striata* var. *flavida* before it was pressed. It has the right location, date and photographer as on the pressed specimen (barcode 00026794, catalog no. 2607640) at the Smithsonian. It is also clearly var. *vreelandii* based on its small flowers.

The pale plant that we are discussing here is not *C. striata* var. *striata* f. *fulva*. This form was described from Gaspé (Fernald 1946: 197), and the name applies to plants with stems, sheaths, and perianth yellow-brown or orange-brown. The type specimen is now considered to be referable to *C. striata* var. *vreelandii* (e.g., Beauséjour 2008; Species Status Advisory Committee 2009). The form considered here is neither brown, nor has the small flowers of var. *vreelandii.*

We would like to propose a name for the form with the white to yellowish-white, non-striped, or obscurely pale, yellow-striped lip, but Article 40.4 of the code of nomenclature (Turland *et al.* 2018, https://www.iapt-taxon.org/nomen/pages/intro/title_page.html) requires that the type be a specimen. Of course we prefer not to collect rare orchids, but the specimen could be a few flowers in a packet with photos, but without that (at least), it cannot be named.

Some time ago (Catling *et al.* 2013), we had the same difficulty of not being able to provide an official Latin name, but we did provide an English name. Here we could call this simply the "White-lipped form" of Striped Coralroot.

Corallorhiza striata Lindley, Gen. Sp. Orchid. Pl.: 534 (1840) var. ***striata,*** White-lipped Form of Striped Coralroot. Lip white to yellowish-white, with obscure, pale-yellow stripes. Floral parts very pale yellow and white, unstriped, or with pale yellowish stripes. Stem, rachis, bracts, and ovaries, very pale yellow. Plants with white to pale yellowish-white non-striped lips or obscurely pale-yellow striped lips are very rare. We have seen photos of such plants from Kananaskis in Alberta (Figure 1) and the Bruce Peninsula, and Manitoulin Island (Figure 2) in Ontario.

Figure 1. *Corallorhiza striata* var. *striata,* with pale yellowish-white lip**.** Kananaskis Village, Alberta, 23 June 2014. Photos by Jean-Luc Roux and Elisabeth Roux. a, plant; b, flower from front.

Figure 2. *Corallorhiza striata* var. *striata,* with pale yellowish-white lip. Providence Bay, Manitoulin Island, Ontario, 16 June 1983. Photo by D.R. Gunn.

We have examined a few thousand photos of *C. striata* var. *striata* on iNaturalist, and seen living plants across North America, as well as many hundreds of herbarium specimens. The plants are most often reddish-purple to pale pinkish-purple, or purplish-brown, or pale yellowish-brown, but all these variations have pale pinkish to yellowish flowers with purple stripes. The lips are usually the most boldly marked floral parts, especially in pale plants. In dark reddish-purple plants, the lips may be dark reddish-purple throughout. In pale plants, the lips may be striped with reddish-purple, this being the only reddish-purple on the plant. A form that is entirely bright yellow with bright yellow, non- striped perianth parts (including a bright yellow unstriped lip) is very rare (3 observations). Some equally rare, pale yellow plants have yellow lips with portions of purple stripes only at the tip of the lip (4 observations).

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KEY TO WHITE-LIPPED CORALROOTS IN WESTERN NORTH AMERICA

By Paul M. Catling and Brenda Kostiuk, brenda.kostiuk@gmail.com

The fact that the relatively new Ozette Coralroot (*Corallorhiza maculata* var. *ozettensis* Tisch) is principally identified by its white, unspotted lip, has resulted in some difficulty distinguishing it from other Coralroots which have forms with white flowers. In fact, all of the western Coralroots have named white-flowered forms. They are generally rare and of great interest to those who enjoy photographing orchid flowers. One very enthusiastic flower photographer, and an active member of NOC, the late Lorne Heshka, would travel hundreds of miles to photograph a rare colour variant, and members very much enjoyed seeing his photos (and kidding him about whether the drive was worth it).

In his very comprehensive work on *Corallorhiza*, Freudenstein (1997: 6) did not recognize colour variants as taxonomic entities "because of the sporadic nature of the variation." He did go on to raise some doubt about potential taxonomic significance. The situation with Ozette Coralroot makes colour variants seem more relevant taxonomically now than they were in the past (but even in the past, there may be a few skeletons in the closet such as *C. trifida* f. *verna*).

The following key is based on characters that are generally easy to use. Characters were also selected on the basis of their reliability. Although this key does not answer all the questions, we expect that it will be of some help, especially in providing a basis for future study. A section on nomenclature follows the key.

Key to the western white-lipped Coralroots

1a. Lip without a prominent mid-lateral lobe on each side (Figures 5, 6) … **2**
1b. Lip with a prominent mid-lateral lobe on each side (Figure 1, 2, 3, 5) … **4**

2a. Lip abruptly narrowed into a long basal claw; sepals and petals converging over lip, or not (Figures 5, 6) … ***Corallorhiza wisteriana*** f. ***albolabia*** P.M. Brown
2b. Lip not basally clawed; not all sepals and petals converging over the lip … **3**

3a. Lip 10-18 mm long … ***Corallorhiza striata*** var. ***striata*** white-lipped form, see preceding article
3b. Lip 6-8 mm long … ***Corallorhiza striata*** var. ***vreelandii*** f. ***flavida*** (T.K. Todsen and T.A. Todsen) P.M. Brown

4a. Sepals and lateral petals long and narrow, the lateral sepals horizontal or directed downward from the base but not strongly decurved along their length (Figure 3); basal third of lip gradually narrowed to the base; lateral lobes of the lip relatively short (Figure 3) … ***Corallorhiza mertensiana*** f. ***albolabia*** P.M. Brown
4b. Sepals and lateral petals not long and narrow, the lateral sepals often strongly decurved near the middle of their length (Figure 4b); lip relatively broad throughout with an abrupt cordate, truncate, or cuneate base; lateral lobes of the lip long or short … **5**

5a. Lip 3-5 mm long; lateral lobes of the lip short; adnate spur at base of lip not well developed (Figure 4) … ***Corallorhiza trifida*** f. ***verna*** (Nutt.) P.M. Brown
5b. Lip 5-9 mm long; lateral lobes of the lip long; adnate spur at base of lip prominent … **6**

6a. Middle lobe of lip distinctly expanded toward the tip (Figure 2a), ratio of width of widest part to base (of middle lobe where lateral lobes join) more than 1.5; floral bracts averaging 1-2.8 mm; often early blooming … ***Corallorhiza maculata*** var. ***occidentalis*** f. ***immaculata*** (Peck) Howell
6b. Middle lobe of lip expanded slightly, or not at all, toward the tip (Figures 1a, b); ratio of width of widest part to base (of middle lobe where lateral lobes join) less than 1.5; floral bracts averaging 0.5-1 mm; often late blooming … **7**

7a. Plant mostly yellow … ***Corallorhiza maculata*** var. ***maculata*** f. ***flavida*** (Peck) Farwell
7b. Plant mostly reddish-purple or brownish … ***Corallorhiza maculata*** var. ***ozettensis*** Tisch

Nomenclature:

Corallorhiza maculata var. ***maculata*** f. ***flavida*** (M. Peck) Farwell, **WHITE-LIPPED EASTERN SPOTTED CORALROOT**, Amer. Midl. Naturalist 10: 208 (1927).
Corallorhiza maculata f. *flavida* (M. Peck) Farw. in Amer. Midl. Naturalist 10: 208 (1927).
Corallorhiza maculata var. *flavida* (M. Peck) Cockerell in Torreya 16: 232 (1916).
Corallorhiza multiflora var. *flavida* M. Peck in New York State Bot. Rep. 15(501): 126 (1897), Type from New York State, woods at Menands, Albany County (probably at New York State Museum, NYSM, Albany).

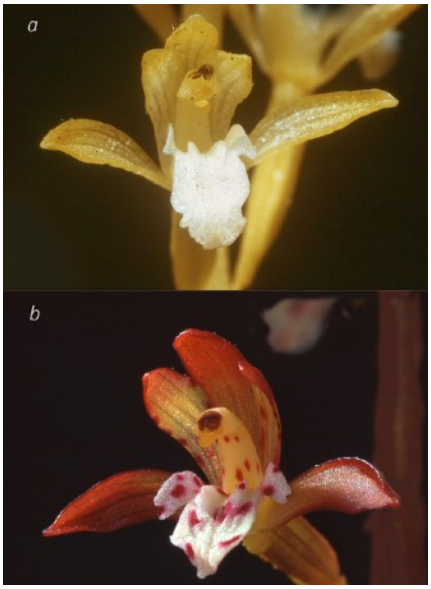

Figure 1. (left) *Corallorhiza maculata* var. *maculata* with a characteristically terminally narrow lip. **a,** f. *flavida,* Flowerpot Island, Ontario, 30 June 1963, photo by D.R. Gunn; **b,** f. *maculata*, Gatineau Park, Québec, 10 July 1975, photo by D.R. Gunn.

Figure 2. (right) Yellow coralroot plants. **a,** *C. maculata* var. *occidentalis* f. *immaculata*, a yellow plant with a characteristic terminally expanded lip. These may bloom earlier than most other infra-taxa of *C. maculata* on the Pacific coast. Capital, southern Vancouver Island, British Columbia, 19 May 2020, iNat. photo 57028738, by Ian Cruickshank, CC BY-NC 4.0; **b,** The flowers on this plant have a lip that is relatively narrow at the tip. It may be called *C. maculata* var. *maculata* f. *maculata* based on the very pale lavender blotches on the lip, but it is also close to *C. maculata* var. *maculata* f. *flavida* based on the yellow colour of the plant and the almost white lips. Capital, southern Vancouver Island, British Columbia, 21 June 2013, iNat. photo 70177393, by James Miskelly, CC BY-NC 4.0.

Corallorhiza maculata var. ***occidentalis*** f. ***immaculata*** (M. Peck) Howell, **WHITE-LIPPED WESTERN SPOTTED CORALOROOT**, Marin Fl., ed. 2: 363 (1970).
Corallorhiza maculata var. *immaculata* M. Peck in Leafl. W. Bot. 7: 177 (1950), https://www.biodiversitylibrary.org/item/47013#page/212/mode/1up, Type: Oregon, Mosby Creek near Cottage Grove in Lane County, collected on 22 June 1947 by Howard B. Taylor 10478 (WILLU collection at OSU).

The listing of this form under var. *maculata* in the Kew catalogue is an error if J.V. Freudenstein's 1992 annotation of the type as var. *occidentalis* is accepted.

Corallorhiza maculata var. ***ozettensis*** Tisch, **OZETTE CORALROOT**, Madroño 48: 40 (2001). Type: Clallam County, Washington on Cape Alava collected on 28 June 1967 by E.L. Tisch 689A & 689B (holotype, UC; isotype, OSU).

Corallorhiza mertensiana f. ***albolabia*** P.M. Brown, **MERTEN'S WHITE-LIPPED WESTERN CORALROOT**, N. Amer. Native Orchid J. 1: 9 (1995). Type: Coos Co., Oregon, photo in Luer 1975: 321, t.90, Figure 3.

Figure 3. Merten's Coralroot. **a**, an older inflorescence of f. *albolabia*. Fort Townsend, Olympic Peninsula, Washington, 25 June 2022, P.M. Catling. **b**, Portion of an almost white-lipped form, but with a flush of lavender at the base of the lip. Most would accept this as f. *albolabia.* Ancient Grove, Olympic Peninsula, 27 July 2022, P.M. Catling.

Corallorhiza striata var. ***striata***, **WHITE-LIPPED STRIPED CORALROOT**, see this issue of Native Orchid Conference Journal for information on this form, which awaits naming until a specimen is available to serve as the type.

Corallorhiza striata var. *striata* f. *fulva* Fernald is not described as having a white lip and is usually considered a synonym of *C. vreelandii* (details below).

Corallorhiza striata var. ***vreelandii*** f. ***flavida*** (T.K. Todsen and T.A. Todsen) P.M. Brown, **YELLOW VREELAND'S STRIPED CORALROOT**, North American Native Orchid Journal 1(1): 14. 1995.
Corallorhiza striata var. *flavida* T.K. Todsen & T.A. Todsen in S. W. Naturalist 16: 122 (1971). Type: Otero County, New Mexico, collected on 8 June 1969, by T.K. and T.A. Todsen. Annotated as var. *vreelandii* by J.V. Freudenstein in 1992 (US).

Corallorhiza striata var. *striata* f. *fulva* Fernald, from Québec, is not described as having a white lip; the stems, sheaths, and perianths are yellow- or orange-brown instead of warm madder-purple, and the description implies that the plant has a purple-striped lip (Correll 1959: 333). Fernald's f. *fulva* was considered a synonym of var. *vreelandii* by Freudenstein (1997: 13) and is so treated by recent authors (Beauséjour 2008: 162) .

Corallorhiza trifida f. ***verna*** (Nutt.) P.M. Brown, **EARLY CORALROOT**, Wild Orchids Canad. Marit. & N. Gr. Lakes: 284 (2006).
Corallorhiza trifida var. *verna* (Nutt.) Fernald in Rhodora 48: 196 (1946).
Corallorhiza verna Nutt. in J. Acad. Nat. Sci. Philadelphia 3: 136 (1823). Nuttall noted material from Pennsylvania, Vermont and New Ipswich in Massachusetts (probably at PH).

Fernald (1946: 198) provides other synonyms of this, our oldest white-lipped form, dating back to 1823, with the species *C. trifida* dating back to 1753 (as *Ophrys corallorhiza* L.). The white-lipped form occurs in the temperate region of North America, whereas the nominate *forma trifida,* with a purple-marked lip, occurs in Eurasia, and in more northern regions of North America (extending to the true Arctic). On the cool shore of Lake Superior, plants with a few tiny madder-purple spots at the base of the lip occur (Case 1987: 226) where intermediates might be expected. Fernald (1946: 195) thought that the northern plants with a spotted lip were "well separated" from the more southern plants with a pure white lip, and he provided other differentiating characters. The f. *verna* is a good example of a white-flowered colour variant that deserves more study (Catling 2023).

Corallorhiza wisteriana f. ***albolabia*** P.M. Brown, **WISTER'S WHITE-LIPPED CORALROOT**, N. Amer. Native Orchid J. 1: 9 (1995). Type from Levy Co., Florida, photo in Luer 1975: 329, t.93, Figure 3. Some believe that the eastern and western plants of Wister's Coralroot should be recognized as different species (Freudenstein and Barrett 2014). See Coleman (2016) for information on variability in western plants.

Although it is not quite in the west, Horner (2016: 5, Fig. 7C) reported *Corallorhiza odontorhiza* plants that were bright lime-green with pure white, unspotted lips, in Door County, Wisconsin, observed in 2015.

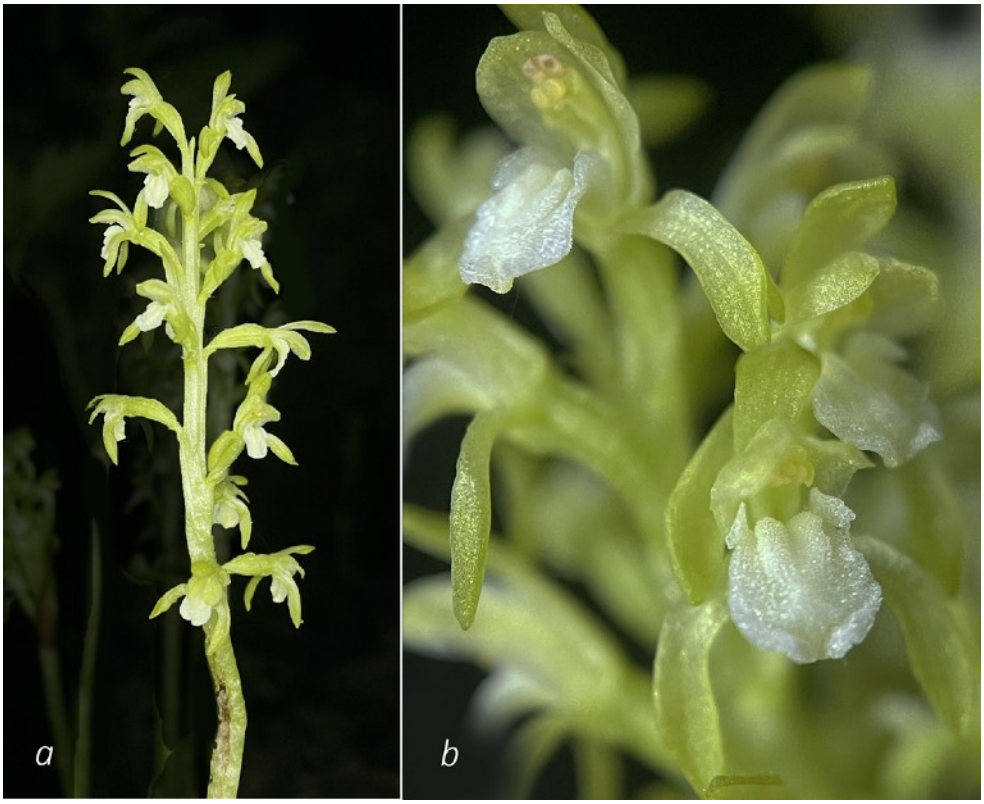

Figure 4. Early Coralroot. **a,** inflorescence; **b,** flowers enlarged. Utah, July 2002, iNat. photos 211079000, 211078987 (modified), by odinbriem0, CC BY-NC 4.0.

Figure 5. (left) Wister's Coralroot has sepals and petals often converging over the lip. a-c, an almost white-lipped plant. The spots here are very pale. We have not seen a pure white lip in this taxon, but this very pale-spotted form is common in parts of the west. Montana, June 2021, iNat. photos 202813507, 202813532, 202813549 (modified), by Scott Mincemoyer. CC BY-NC 4.0.

Figure 6 (right) Wister's Coralroot. Idaho, June 2021. iNat. photo 138435124 (modified), by sacjackson, CC BY-NC 4.0.

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A HIGHWAY CORNUCOPIA FOR NATIVE ORCHID CONSERVATION: CLOVERLEAF INTERCHANGES AS EXCLUSION ISLANDS

By Laura Juszczak, PhD, laurajust54@gmail.com

Introduction

At a Long Island Botanical Society walk along Big Reed Pond in Montauk, N.Y., in September of 2022, I had the opportunity to chat with Clara Holmes, a field ecologist at the New York City Dept. of Parks and Recreation, about wild orchid populations in New York City. One would think that all are fairly accessible to anyone who took the time to look, but intriguingly, there is at least one population that is off-limits. Within the confines of a highway cloverleaf interchange segment on Staten Island, a population of *Platanthera lacera* flourishes. The orchid habitat is embedded in a heavily developed suburb (Figure 1). Yet the general public would decidedly have problems gaining access even if it knew about it.

This became the seed of an idea. Acres of cloverleaf interchange islands of unused, federally owned and protected land--in no danger of housing construction--- stretch from coast to coast, as do median strips and off-shoulder land bracketing the highways. These "no man's lands"—— some 12 MILLION ACRES (Barringer 2007)---serve only as the negative space defining the surrounding highway. They are an immense horticultural opportunity just waiting to be developed.

Figure 1. Highway cloverleaf exchange embedded in a developed area.

Where Have we Heard this Before?

Those of us of a certain vintage will remember Lady Bird Johnson's 1965 Highway Beautification project, an outgrowth of President Lyndon Johnson's Highway Beautification Act, which was nicknamed "Lady Bird's Bill." (LBJ Presidential Library, 2023) The intention was to make the nation's highways more scenic by limiting billboards and planting wildflowers along the roadside and median strips.

More recently---in the early 2000s----horticulturalists in Delaware wanted to naturalize the greenspace along the Interstate-95 federal highway corridor with native grasses (Barringer 2007). However, the public was still wedded to the look of the clipped lawn. A poll in Delaware showed that "neatness over nativeness" was preferred. The public objected to the unkempt look of tall, native grasses and opined that the surrounding roadsides should look like a mowed lawn.

How Climate Change is Changing Minds

After some 15 years, however, priorities have changed as climate change issues with water availability and species decline cause us to rethink the preference for a manicured green lawn. Homeowners are now encouraged to turn their lawns into wildflower meadows or at least refrain from mowing at the beginning of the growing season, called "No Mow May," to allow insects to take advantage of insect-friendly blossoms like that of clover (Roach 2020). The reality of limited water resources is shifting opinion and action toward native sustainable flora even in people's yards.

Capitalizing on Momentum

A number of forces have come together in this moment with respect to native orchid conservation. The American Orchid Society supports conservation through its Philip E. Keenan award. In a report in The American Orchid Society Bulletin, "Orchids," Scott Weber, 2022 recipient of the award, reveals several findings resulting from 25 years of studying native orchid populations on his southern Wisconsin farm that suggest establishing populations of various species in cloverleaf interchanges is feasible (Weber 2023). He has found that many native terrestrials defy the "rules" of orchid germination and propagation. Among the rules relevant to this discussion are:

- Growth in an atypical habitat
- Short-lived and unpredictable population location. For species with a short life cycle and shifting populations, "Spreading seed is the easiest and cheapest method for introduction or restoration" (Weber 2023).
- Appearance of populations on sites disturbed by mowing, bulldozing or fire. Weber states that "If I want more Spiranthes, I just need to mow a new path through the brush or tall grass" (Weber 2023).
- Long distance seed dispersal and germination in a wide range of soil types.
- Years-long delays in seed germination.

- Populations opportunistically self-perpetuating in greenhouse pots of soilless potting mix, defying the common wisdom of an obligate symbiotic fungi. Weber reports that one landowner, who happened to live near a population of *Triphora trianthophoros*, found one growing in the pot of a houseplant (Weber 2023).

Who will Do the Work?

Weber is working with the Wisconsin Department of Natural Resources and a nonprofit organization to increase the genetic diversity of local populations of yellow lady's slippers (Weber 2023). The North American Orchid Conservation Center at the Smithsonian Environmental Research Center has been working to reestablish orchid populations in the Arizona Canelo Hills Cienega Preserve in collaboration with the Desert Botanical Garden, local landowners and conservationists. The project is supported by a grant from the Biophilia Foundation, and consists of building rock detention structures, an Indigenous peoples' method, to retain water in support of both native orchids and their mycorrhizal fungi (Whigham, Salywon, and McCormick 2022). Local and national conservation groups, botanical societies and gardens, and universities are all potential partners (Sprague 2023).

How Much Land are We Talking About?

The reason for focusing exclusively on highway cloverleaf interchanges are two-fold. The highway that encompasses them functions as an exclosure for human poaching and animal (mainly deer) foraging. First, although stopping on roadside shoulders is possible, it is not feasible along cloverleaf interchanges. Second, foraging deer along highway roadsides is a common site, but high-speed traffic around a cloverleaf is a deterrent. Median strips are a secondary site possibility because of their narrow width.

The land area encompassed by cloverleaf interchanges is a fraction of the estimated 12 million acres surrounding federal highways, but how large is this fraction? The U.S. Dept. of Transportation Reference Service was not able to supply me with a rough estimate of the total acres of cloverleaf interchanges, due to their size variability, nor a number of interchanges (U.S. Dept. of Transportation, 2023). To get some rough estimate of the potentially available acreage, the number of interchanges on the major East-West (Interstate - x0 where currently, x = 1-4, 7 – 9. Example: I-80) and North-South (Interstate – y5 where currently, y = 0 - 9. Example: I-95) U.S. federal interstates on the lower 48 states was tallied, excluding auxiliary interchanges (Wikepedia.org, 2023). The total number of such interchanges is currently listed as 1,619. Using an area of 82.8 acres/cloverleaf interchange (not excluding road area; Jovanovic & Atelšek, 2021), a back-of-the-envelope calculation gives us total of 0.134 M acres or 1.2% of the aforementioned 12 M total for federal cloverleaf interchanges. Because this count does not include the cloverleaf interchange acreage for non-federal highways, we may assume that 0.134 M acres is a rough lower limit. Regardless, 0.134 M acres is significant because it is land that is in the public domain and therefore does not require purchase. Surely this is the time to revisit the idea of locating and establishing suitable habitats for native endangered species, including orchids, in these vast areas of available and isolated acreage.

An Idea whose Time has Come and Why It can Work

- Orchid seed has long viability; it can germinate years after sowing (Weber 2023).
- It has been demonstrated that some species will grow on disturbed land and populations have been found established in atypical habitats (Weber 2023).
- Mowing has been shown to enhance orchid population growth in some species (Weber 2023).
- Restricted mowing, while catalyzing orchid growth on one hand, reduces highway upkeep cost that can become a source of funds (win/win).
- As gas powered vehicles disappear, the effects of their pollution diminish.
- As climatic heating continues, the effect of road salting is diminished.
- Cloverleaf interchanges are foraging animal exclosures.
- Cloverleaf interchanges are not accessible to public, reducing the opportunity for poaching.
- Public awareness can be more generally raised to these "wildflower" habitats, reducing the potential of inducing "orchid allure."
- No need to purchase land as it is already in the public domain.
- Public objections to visual unsightliness are diminished because orchids are small in stature and are not visually unsightly like "raggy" grasses.
- Establishing highway wildflower sanctuaries becomes an opportunity for citizen involvement. (Sprague 2023).
- Convincing state participation should not be difficult as roughly a score—from Vermont to Texas---already have highway wildflower projects.

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MAINTENANCE OF MOUNTAIN LADY'S-SLIPPER (*CYPRIPEDIUM MONTANUM*) BY BRUSHING

By Paul M. Catling and Brenda Kostiuk, brenda.kostiuk@gmail.com

Abstract

Evidence for the beneficial effects of regular brushing (cutting of woody vegetation) along a highway verge is presented for Mountain Lady's-slipper (*Cypripedium montanum*) in east-central British Columbia. A post-brushing trend in high orchid population densities is followed by decline as woody vegetation regrows. The cycle is repeated by orchid population recovery and recruitment after the next cut. The regular cycle appears to recur over 5 - 11 year intervals depending on site conditions and timing of cutting events. The presence of large populations in a continuity of different patches at different times is similar to other high biodiversity communities such as coral reefs and tropical rain forests. The development of high orchid population density as a result of brushing may also be viewed as a current plant trait anachronism that is a result of loss of certain Pleistocene megafauna.

Introduction

A section of the Trans Canada Highway between Tête Jaune Cache and McBride is not only scenic with snowy mountain peaks on all sides, it is also an interesting place for wild orchids. There are hiking trails, parks, and rest stops, but a notable aspect is the effect of roadside maintenance leading to large populations of Mountain Lady's-slipper (*Cypripedium montanum* Douglas *ex* Lindley). For more information on this species, see Coleman (2018 - NOCJ 15(1): 17).

Evidence

Then …

It was on 17 June 2010 that a Native Orchid Conference Field Trip found its way from the Jasper area to Tête Jaune Cache, especially to see the populations of Mountain Lady's-slipper. In an open roadside area of 10 x 50m, my field notes indicate 500 flowering stems, most with 3 flowers each. We made a plate to show the orchids and the scene (Figure 1). The habitat was noted as a "shrubby area with small *Salix*, *Populus*, *Picea* as well as *Arctostaphylos*, *Shepherdia* and *Clintonia uniflora.* In the illustration of the habitat, Brenda Kostiuk is standing on the far left, Ron Coleman (deceased) is sitting down facing away from the camera, and Hal Horwitz (deceased) is standing on the far right (Figures 1 and 2). The vegetation was certainly very low based on its height in relation to people in the photo. We suspect that the area was 'brushed" (cut) two or three years prior to the habitat photo based on stumps and woody material on the ground, and its recovery height. Some of the spruce stumps were 7-11 years old at the time of cutting based on growth rings.

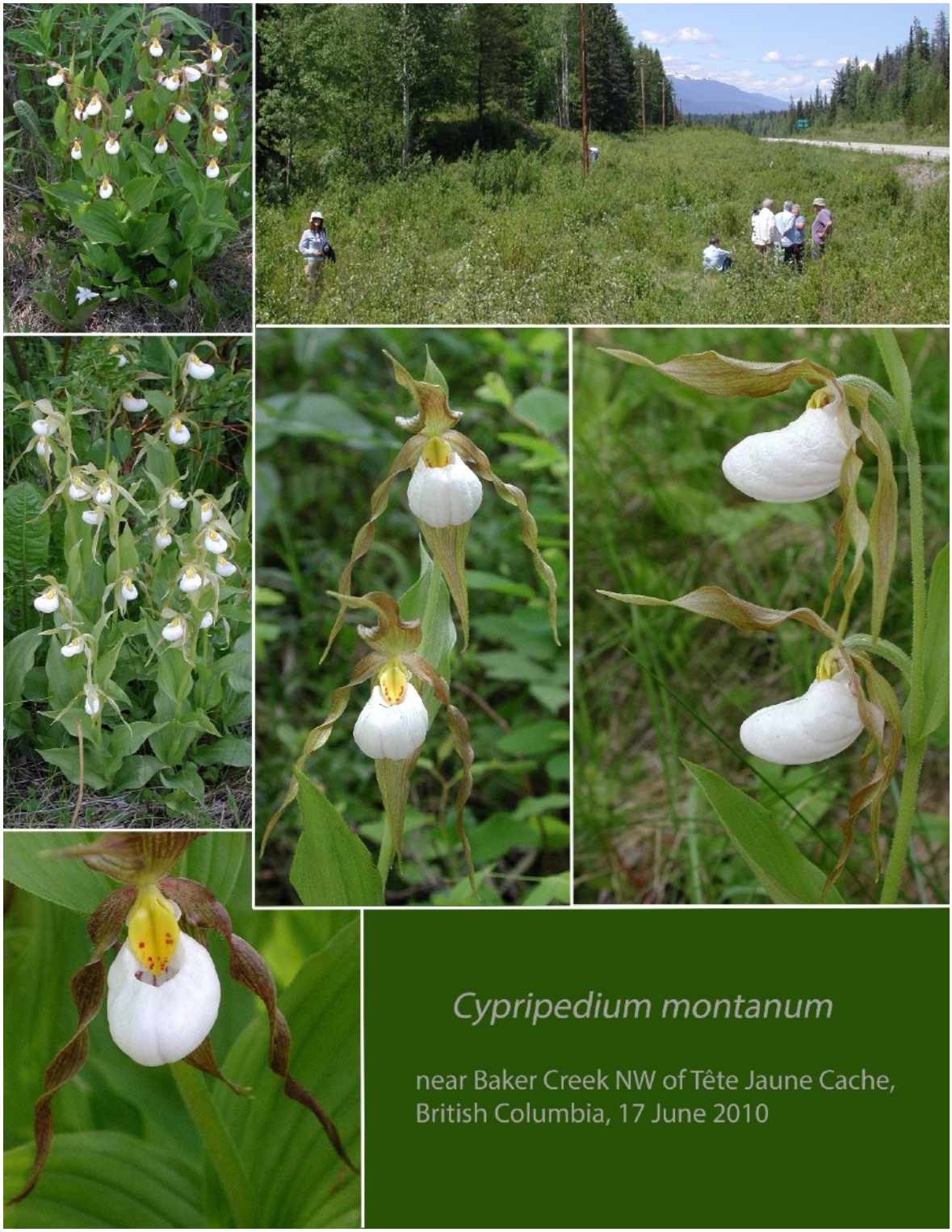

Figure 1. *Cypripedium montanum* based on photos taken on the NOC fieldtrip south of McBride, British Columbia on 17 June 2010 (site 1). At the bottom of the upper left figure is the frequent associate of Mountain Lady's-slipper, the Bride's Bonnet Lily (*Clintonia uniflora*). For more on upper left photo see Figure 2 caption. Photos by P.M. Catling.

Now …

This year (2022) we visited this exact site and found it largely overgrown (Figure 2) with willows (*Salix* spp.) and poplars (*Populus* spp.) up to 10‘ tall. There were also spruce (*Picea* spp.), Bracted Honeysuckle (*Lonicera involucrata*), Saskatoon (*Amelanchier alnifolia*), Soapberry, Western Thimbleberry (*Rubus nutkanus*), Horsetails (*Equisetum* spp.), and a sparse cover of graminoids. We inventoried the Mountain Lady's-slippers and found that there were fewer clumps, fewer flowering stems, and fewer flowers compared to 2010 (Figure 3). It occurred to us that the formerly impressive orchid population was a result of reduced competition due to brushing, and the later decline was a result of increased competition due to recovery of woody vegetation.

Figure 2. Comparison of site 1 on 17 June 2010 (above) and 10 July 2022. The shrubs and trees have grown dense and from less than 1 foot (upper photo) to 10 feet tall in the (lower photo). In the above photo Brenda Kostiuk is standing on the far left, Ron Coleman (deceased) is sitting down facing away from the camera, and Hal Horwitz (deceased) is standing on the far right. In the lower photo people would not be seen (if present) in 2022, due to the tall and dense vegetation that had developed since 2010.

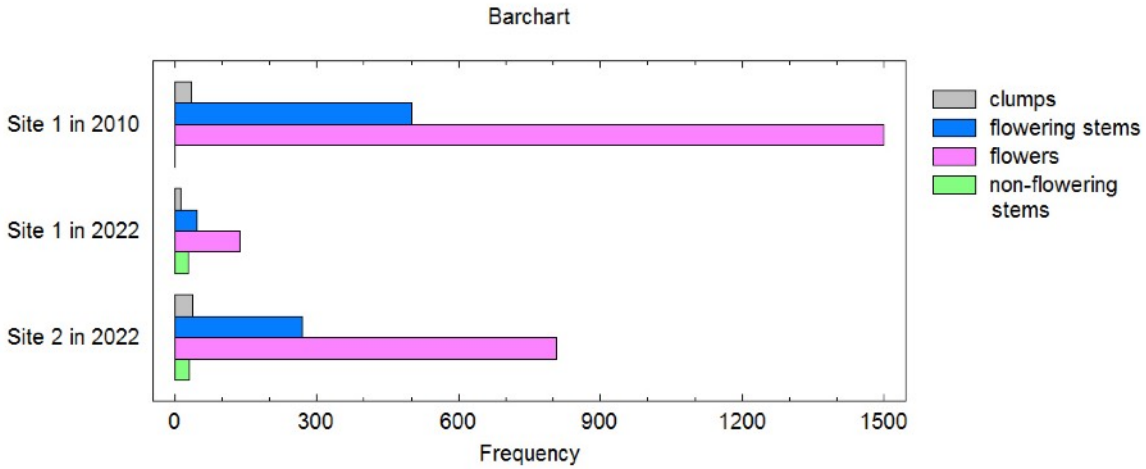

Figure 3. Population characteristics (number of clumps, flowering stems, flowers, and non-flowering stems) for two brushing times at site 1 (recent in 2010 and long-since in 2022) and site 2 for recent brushing.

The need for brushing

The maintenance of a broad shrub-free zone along highway verges is designed to reduce serious accidents when Moose suddenly emerge from the thick vegetation. Moose (*Alces alces* -northwestern subspecies *andersoni*) weigh up to 1100 lbs and collisions are a significant risk of death or injury to motorists. Collisions are also usually fatal to Moose. Each year in Canada they not only lead to death and injury, but cost hundreds of millions of dollars.

Moose browse the willows along the highway and are attracted to highway edges where willows are abundant. They are hidden from the view of drivers until it is too late. The vision of the Moose is also impeded by taller vegetation. Based on data for the area under consideration here, Rea *et al.* (2014, and many other studies) have suggested "cutting roadside brush to improve driver visibility and reduce browse resprouting and attractiveness."

With the shrubby vegetation maintained at a low height, accidents may be substantially reduced. The protection of Moose, and other wildlife, is a desirable benefit and some adjacent landowners assist by mowing and cutting highway properties. The benefit to a diverse native flora is very substantial. Native wild plants choked out by woody shrub and tree growth are released from light and substrate competition.

Brushing cycle

We speculate that the vegetated road verges go through a series of changes on a regular 5 -11- year cycle along different sides and sections of the highway (Figure 4). There will always be a place somewhere where the time since brushing, perhaps 3-7 years, is at its maximum for recovery and recruitment. In other places the populations will be declining, only to rise again after a new episode of brushing. In some places on certain slopes where vision is less of a problem, cutting may be deferred for more than 11 years. Substrate and moisture content also play a role in determining the length of the cutting cycle. Contractors responsible for the cutting operations usually work large areas.

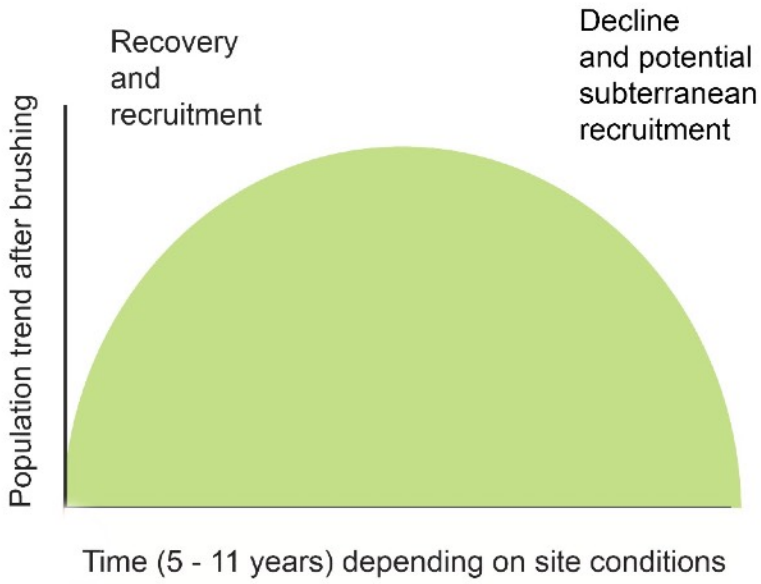

Figure 4. Proposed general response of Mountain Lady's-slipper to a regular brushing cycle. Note recovery, recruitment, and increase in population characteristics on the left, and decline on the right.

The process of brushing is remarkably clever. In other situations, highway verge vegetation is sometimes controlled by the use of poisonous chemicals or introduced species which may lead to a number of serious environmental problems. Of course, different solutions may work best in different places, but the landscape considered here is a place where a biodiversity-friendly solution is most welcome.

If we are right, that there will always be a place where recent brushing has led to an impressive population of Mountain Lady's-slipper, we should have seen some in 2022. We did find a few with a short search, some not far from the disappointing site 1. The population at site 2 (Figure 5) is good example of a recently brushed site, and it must have been spectacular a few weeks earlier judging by the clumps of Mountain Lady's-slipper.

Figure 5. Site 2. On the left plants of Paintbrush (*Castilleja* sp.) and a patch of Mountain Lady's-slipper that had 75 flowers. On the right, the 8 ft long cut stem of Lodgepole Pine (*Pinus contorta*), held by Paul Catling, is 11 years old (based on counting branch spaces on the main stem) suggesting a cut that long ago. Photos by Brenda Kostiuk on 10 July 2022, south of McBride.

Brushing Equipment

To better understand the impact of mowing, it is helpful to understand the nature of the equipment. A forestry mower has been illustrated previously in this journal in connection with management of Yellow Lady's-slipper orchid (*Cypripedium parviflorum* - Catling & Kostiuk 2020, p. 23, Figure 6) in the Midwest. The more rugged terrain near McBride requires different machinery. This usually consists of a tractor with a frontend loader, and a rear-mounted rotary "brush hog" (referring to make or general model) mower. Cutting side arms that can be raised up or down for use on slopes are sometimes also attached.

Previously 150 horsepower tractors were generally in use for wood 2-3 inches in diameter. Recently more aggressive equipment has come into use including flail mowers and mulchers to deal with thicker wood up to 7

inches diameter, especially for use on less frequently cut slopes. Now the brushing is being done with self-propelled hydraulic 165 horsepower, purpose-built machinery with a brush-cutter on an excavator arm that can easily cut wood to 6 inches in diameter (Figure 6). The weight of all of the equipment is 16,000 to 20,000 lbs, but compaction is less with modern equipment than with tractors because of the reach of the arm.

Figure 6. A self-propelled hydraulic 165 horsepower mower with a brush-cutter on an excavator arm is used for most brush-cutting work done at the present time. Photo from Graham Darragh of Valemount.

Other beneficial aspects of brushing

There is substantial ground disturbance associated with brushing. Although not all of the ground is compacted in the path, some of it is, and under substantial weight (see above). The increased occurrence of orchids along less used, but still less compacted, edges of trails (Catling and Kostiuk 2011, Catling 2012) suggests that some ground compaction may be beneficial in many cases.

At recently brushed sites there appear to have been fewer cases of flower consumption. Half of the non-flowering stems at site 1 had been clipped below the flower. The fact that mammals cannot hide to browse in recently brushed situations may explain this observation in an area of dense growth.

Mulching and subsequent decay of woody material, and contact with this over mineral soil may create the beneficial soil conditions where native orchids sometimes grow abundantly in middle-aged pine plantations.

Some Ecological Implications

Orchids (and many other plants) benefit from maintenance of a habitat with patches cycling through successional stages without ever reaching equilibrium. Mountain Lady's-slipper provides a good example of this concept elaborated well by Connell (1978). Not only does high biodiversity depend on this situation, it is also necessary for some rare species to survive, and for the development of large populations of some plant functional types (Duckworth *et al.* 2000, based especially on seed size, dispersal mode, and colonizing and recolonizing ability).

Brushing maintains a diversity of rejuvenating and everchanging microhabitats that can build up large orchid populations. This has some local relevance since orchids are often rare and require conservation effort. They are also among the most popular wildflowers enjoyed and photographed by hikers (Figure 7), and hikers are economically important in the lower Robson Valley (Rocky Mountain Trench between Rocky and Cariboo Mountains and extending from McBride to Tête Jaune Cache).

Since the astute observation of Curtis (1946), it has been known that mowing at the right time can be beneficial to populations of native orchids. The right timing is essential to any management actions, as is a knowledge of overall effects. Although the observations on the benefit of brushing to Mountain Lady's-slipper do not embrace an entirely new concept, there are some new aspects here including the species, the cycle, multiple values of a conservation action, and the value of roadsides in general.

Figure 7. Residents and visitors enjoy the local wildflowers. A 1980 painting by McBride naturalist, paleontologist, and conservationist, Natasha Boyd (MSc. University of California, 1938), captures the remarkably attractive form of the Mountain Lady-slipper. The Natasha Boyd Wetland Conservation Area was established in 2004 on the west side of the Trans Canada Highway north of McBride to honour her memory.

Roadside habitat has proven to be very important for native orchids (e.g. Catling 2012, Catling and Kostiuk, 2020, p. 20). Such observations can be explained by the decline of natural processes that maintained disturbed conditions and allowed rejuvenation and succession. There are many situations where we see more orchids along the road than in the adjacent woods (or cultivated fields). The roadside is often the primary habitat. This is the case south of McBride where Mountain Lady's-slippers do also occur along lumber roads and hiking trails, and even just in the woods (Figure 8), but generally not in as large numbers as on the roadsides. In the woodland along the Trans Canada south of McBride, we found single flowering stems, often with only one or two flowers, in the semi-open Poplar-Spruce woods under a dense canopy of Bracken. They were not doing as well here, where the last fire may have been over 60 years ago, as on the highway where the habitat was rejuvenated every few years.

Figure 8. Brenda Kostiuk demonstrates a typical off-road occurrence of Mountain Lady's-slipper involving a single flowering stem with a single flower under dense Bracken Fern in semi-open Spruce-Trembling Aspen woodland.

Large post-brushing populations of Mountain Lady's-slipper an anachronism?

Observations often raise more questions than they answer, and this seems particularly true in ecology. There is the question of whether or not there were larger populations of Mountain Lady's-slipper in the past, i.e., before brushing? Today goat, sheep, moose and caribou trails sometime have a few clumps in a small area as do landslides, post-fire succession and creek and river shores. Would these situations have been common enough over thousands of years for Mountain Lady's-slipper to survive better than they do now?

Could there have been something more like brushing that existed until recent times (let us say 12,000 years ago). There was! The brushing machines of the past were much more abundant and more important in vegetation control than today. They also had a lot of power, and although not restricted to very local areas, they may have frequented the same places on a regular basis to provide a regular optimal cut.

They were the American Mastodon (*Mammut americanum*) which was 9 ft high at the shoulder and weighed 8,000 to 10,000 lbs (Figure 9), and Jefferson's Giant Sloth (*Megalonyx jeffersonii*) which was 10 ft long, stood to that height and weighed up to 2,000 to 3,000 lbs. When paleontologist and future president, Thomas

Figure 9. American Mastodon (*Mammut americanum*). These and other large mammals "controlled" woody vegetation until quite recently. Oil painting by George "Rinaldino" Teichmann (1997). © Government of Yukon. Used with permission.

Jefferson, first saw a claw of this sloth he thought it to be that of a gigantic lion still living somewhere in the far western US. He was able to change this interpretation prior to publication. The nearest fossil of an American Mastodon to McBride is from Quesnel Forks, 75 miles to the southwest (Harrington 1993).

Although there are few fossils from these large mammals in glaciated territory, including most of British Columbia (which they colonized recently and only for a short time), there are abundant fossils from further south. Here they evolved for many thousands of years. (e.g., Osborn 1936). The southern BC flora and fauna originated from the unglaciated areas in Washington and Montana. Following melting of alpine glaciers, montane forest and parkland biomes moved into Canada, but almost by that time the sloth and the Mastodon had died out. Although the sloths and mastodons were only in central British Columbia for a short time, they had long interacted with the same vegetation further south selecting plant traits and functional types that we still see today as a result of a similar conditions. Now, south of McBride, man has become a new and suitable ecological partner (by brushing), thus replacing the extinct megafauna, and creating lady's-slipper and paintbrush (etc.) displays that may have been commonplace over 12,000 years ago and perhaps for millions of years before that (further south). Thus we have a phenomenon belonging to a period other than the one in which it currently exists (an anachronism).

Pleistocene anachronisms may involve plant traits other than morphological features such as thorns of Honey Locust (*Gleditsia triacanthos*) and claws of Devil's Claw (*Proboscidia lousiana*) (Janzen & Martin 1982, Barlow 2000). The large post-brushing populations of Mountain Lady's-slipper join other Pleistocene anachronisms such as the speed of today's Pronghorn (*Antilocapra americana*) made necessary by the extinct North American False Cheetahs (*Miracinonyx* spp., extinct 12,000 years ago), and perhaps even the very long-lived clonal patches of poplars and willows which redevelop above ground by sucker growth from roots (although this may have been selected for by both fire and megafauna).

Acknowledgements

Past NOC president and meeting organizer, Ben Rostron inspired this article during a discussion of orchid ecology. We also thank long-time highway vegetation manager, Ron Baer, of Valemount for his discussion of history of vegetation management in the local area, and of use of different equipment and cutting strategies. Mr. Graham Darragh, also of Valemount, described the currently used machinery, and provided excellent photographs. Patrick Jacobson of Yukon Tourism and Culture Branch and Erin Corbet of the Beringia Interpretive Centre, Whitehorse, Yukon provided permission to use the image of the Mastodon.

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Other articles about remarkable orchid populations in man-made habitats

One of the very special orchid sites in the northeast is an area cleared for a powerline at Hazelton, Pennsylvania. It is thought to be the largest colony of the Bicolored Orchid Hybrid ever known. Writing about this site, Mark Larocque (2009: 4) notes that "Wet powerline areas in PA are usually rich with orchids. … The regular disturbance along the powerlines via brush hogging or herbicide applications seems to open up habitat for the various orchids." For more information on this site in NOCJ see Catling (2011) and Sprague (2022a, b, 2023).

Also see below for other articles in NOCJ featuring man-made orchid habitats (and accessible following the links in a few seconds).

Catling, P.M. 2011. Notes on the Taxonomy, Nomenclature, Identification, Distribution and Conservation of the Bicolored Orchid Hybrid, *Platanthera ×bicolor.* Native Orchid Conference Journal 8(1): 11-21, 27-36. https://www.nativeorchidconference.org/_files/ugd/8170e0_b30e7f1429b047568f7744be9eaf3960.pdf

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Although there can be only one correct name corresponding to a hybrid formula (H.4.1), the International Code of Nomenclature for Algae, Fungi, and Plants (Turland et al. 2018) also states that taxa believed to be of hybrid origin need not be designated as nothotaxa (H 3 Note 1). The examples make it clear that hybrids that have become independent stabilized lineages may be treated as species regardless of their hybrid ancestry.

Pace (2023) wrote (referring to Articles H.4.1, 6.5, and H.5): "Thus, any recognizably intermediate individual or population that results from the hybridization of *S. cernua* and *S. ochroleuca* must be recognized by the priority name *S.* ×*kapnosperia*, …". This is not quite true. If one considers *S.* ×*kapnosperia* a hybrid, and *S. sheviakii* a well-established species of hybrid origin, then both taxa may be accepted as originally described, the former as a hybrid, and the latter as a species. The Code (Article H.3 Note 1 and examples) reads: "Taxa that are believed to be of hybrid origin need not be designated as nothotaxa." Whether the legitimate name *S. sheviakii* is treated as a species or as a nothospecies, and hence a synonym, is not a nomenclatural question, but rather a taxonomic one.

We would suggest a change to the wording above: "Any recognizably intermediate individual or population that results from the hybridization of two or more taxa may be recognized by the priority hybrid name, but in the case of an intermediate taxon possessing unique features, and/or independent of the putative parents (a stabilized lineage), it may be best treated as a species, subspecies, or variety, and not as a nothotaxon (Article H.3 Note 1)."

Are *S.* ×*kapnosperia* and *S. sheviakii* different?

Pace (2023) noted that Hough and Young were aware of the full hybrid parentage of their newly proposed name when they described *S. sheviakii,* but in fact they had only noted similarity prior to their description. Pace (2023) went on to suggest that the "name is likely superfluous." It ("*sheviakii*") was not superfluous at the time of publication because its diagnosis clearly excluded *S. kapnosperia* (Hough and Young 2021: 34).

While *S.* ×*kapnosperia* is a geographically restricted Appalachian taxon described as a product of "ongoing hybridization, … not coalesced into an independent, self-perpetuating lineage (i.e. species)" (Pace & Cameron 2017: 660), *S. sheviakii* appears to be independent. It occupies a large area of the southern Great Lakes and Midwest where one of the putative parents (*S. cernua*) is absent (Hough and Young 2021: 25, Fig. 2), is consistently recognizable since first described by Sheviak in 1982, and quite different from *S.* × *kapnosperia* as elaborated by Hough and Young (2021: 34) and seen in a comparison of the illustrations (Pace and Cameron 2017: 657, Fig. 16; Hough and Young 2021: 35, Fig. 10). The very high-arching flowers and narrow lip of *S. sheviakii* are unique. It frequently occurs without any other *Spiranthes* taxa in dry, open, and acid soil of successional habitats (Sheviak 1974: 54, pers. obs.). *Spiranthes sheviakii* has been described as "an independent, self-perpetuating lineage" (Hough and Young 2021: 47), and this description is appropriate.

Figure 1. Two views of an inflorescence of *Spiranthes sheviakii* M. Hough & M.A. Young, a species added to the flora of Ontario in 2021, but previously known as the "old field ecotype" of Sheviak (1974, 1982: 66-67). Kent County: railway north of Thamesville, 8 Sept. 1989. Photos by Ross Brown. Hough and Young (2021: 34) note that some of the important distinguishing features of this species seen in these photos are: "its straight lateral sepals that frequently curve inward at the tips over the top of the flower (vs. straight to somewhat falcate and not incurved at the tips), flowers that typically nod (vs. spreading or slightly ascending), and moderately gaping flowers (vs. not or only slightly gaping)." The distinctive flowers are also ivory or creamy and the central portion of the lip is fleshy and pale yellow. It usually occurs in relatively dry, acidic substrate, and flowers from mid-September to early-October in the northern portion of its southern Great Lakes range, and late-September to late-October in the southern portion.

It has been suggested that this distinctive and long known taxon (Sheviak 1974, 1982) deserves to be recognized, and with a name from the southern Great Lakes and Midwest. Hough and Young (2021: 37) made an excellent choice. The specific epithet "*sheviakii"* commemorates Charles J, Sheviak, outstanding orchidologist, and scientific advisor for the Native Orchid Conference for many years. "Chuck" was born in Illinois in 1947. He received a Ph.D. from Harvard University in 1976 for his work on *Spiranthes cernua* complex with emphasis on the prairies. He authored almost 100 articles about orchids including his classic "Biosystematic study of the *Spiranthes cernua* complex", and "An introduction to the ecology of Illinois Orchidaceae." Chuck became the most influential expert on North American terrestrial orchids for several decades.

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The Native Orchid Conference is proud to sponsor a research grant program in memory of Mr. Frederick W. Case, Jr.—teacher, botanist and an internationally acclaimed expert on the North American Orchidaceae, Sarraceniaceae and Trilliaceae. The purpose of the program is to support basic or applied research on orchids native to North America north of Mexico to university undergraduate or graduate students, or other approved researchers.

This year we are pleased to award Case Grants to two researchers:

Fernando Rocha Vento

Northwestern University, Chicago Botanic Garden

Genetic Diversity of the rare Oncidium orchids of South Florida

Fernando will be focusing on four species of Florida native orchids belonging to the Oncidiinae subtribe that are threatened or endangered due to habitat loss and poaching. He is going to conduct a genetic study to address three important conservation questions:
1) Are the remaining extant populations showing evidence of genetic decline?
2) Are ex-situ collections in botanic gardens adequately protecting the maximum diversity of these species?
3) Have we seen a loss of genetic diversity over time?

Allison A. Autry

California Botanic Garden, Claremont Graduate University

Understanding the Unusual Disjunction of a Rare Southern Californian Orchid: An Assessment of *Malaxis monophyllos* var. *brachypoda* in the San Bernardino and San Jacinto Mountains of Southern California.

A multifaceted project looking at many aspects of the orchid's biology, life cycle and interactions with other organisms in the ecosystem specifically pollinators and mycorrhizae fungi.

The Case grant funds will help cover the costs associated with DNA sequencing to understand the genetic diversity in the populations and propagation trials aimed at producing seedlings that can be used to supplement population numbers.

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