Native Orchid Conference, Inc.
Founded 2002

THE NATIVE ORCHID CONFERENCE JOURNAL

VOLUME 20.2

The Native Orchid Conference, Inc.

P. O. Box 2047 Boone, NC 28607-2047

Websites

www.nativeorchidconference.org
www.facebook.com/groups
www.facebook.com/page

Officers

President: Robert Sprague
bobsatcyndal@aol.com

Vice-President: Rick Burian
bur.rick@att.net

Secretary: Janice Yates
jyates4110@gmail.com

Treasurer: Richard Barmore
rebster61@yahoo.com

Board Members at Large

Cathy Bloome /catbloome@sbcglobal.net
David McAdoo /ncorchid@yahoo.com
Judy McCrary /jmccray2190@gmail.com
Mark Rose /rmarkrose_2000@yahoo.com
Ben Rostron, Ph.D. /ben.rostron@ualberta.ca
Dave Taft /orchiddave99@gmail.com

Case Grant Committee Chair
Doug Martin, Ph.D. /dofrma44@gmail.com

Publicity Chair
Linnea Hanson /linneachanson@gmail.com

IT/Communication Chair
Kyle Langford /klangfor@verizon.net

Webmaster
Amy Levengood /all70@dejazzd.com

Technical Advisor
Paul Catling, Ph.D. /brenda.kostiuk@gmail.com

Editor
Chelsea Kieffer /chelseakieffer@gmail.com

THE NATIVE ORCHID CONFERENCE JOURNAL

VOLUME 20, ISSUE 2 : TABLE OF CONTENTS

AMERICA THE BEAUTIFUL

By Ralph Graeser, Chizuko Tsurumi & Oh-Chan, r.graeser17@gmail.com

Figure 1. NPS systems map (modified).
Downloaded from:https://www.nps.gov/carto/hfc/carto/media/NPSWallMap.jpg

How to adequately complete a 2.5 years expat in the Northeastern US with my wife, Chizuko and dog, Oh-Chan? Exploring the rest of the country via a road trip sounded like a fabulous idea. And given the size of the country, a couple of weeks won't do, a couple of months are required at least.

I consulted with Chizuko and ultimately with my management at work – and nobody objected. At least not with an absolute road block.

Moreover, while COVID-19 caused a lot of issues, piling up holidays was a lot easier than in normal years. And staying at home left us with a lot of time to consider "where, when, and how" to do a project like a 2-month trip around the US.

"Where" was a straightforward decision. We had both seen a number of US cities already, so immediately agreed that the trip was going to focus on nature. And given the unbeatable concept of the US with its National Parks, the focus on National Parks was settled.

"When" followed relatively easy – winter was not an option, summer too busy, and between autumn and late spring/early summer there were a lot of arguments for the latter, so we decided for May/June.

"How" was a tougher debate. Camping was rejected instantly, but how about an RV? Have your own home wherever you go, or have to find places to stay? This was an intense discussion, but ultimately we decided for a car and places to stay, since it provided some more flexibility (sounds maybe counter-intuitive, but some of the roads we ended up driving would not have been RV accessible, and having an RV plus a car was way beyond our budget….).

So once the basics were settled, planning the actual route was next. First South? Or North? This was when orchid hunting came into play. Using the insights of NOC members combined with crowd sourcing (iNaturalist/iNat), it looked like going North after a little excursion into Tennessee and then turn South would make most sense (Fig. 1).

We booked all places, especially the National Park lodges, way ahead of our departure. This left little room to wiggle, but we found out quickly that nice places to stay with a dog were rather limited, even outside National Parks. So once this was done and we were committed, we had to survive the next ten months without holidays, just the perspective of a holiday of a lifetime to keep us going. Luckily there was a lot of fine tuning to be done still. A lot of time was spent checking literature and the internet and then contacting people to get a chance to see rarer orchids. This was a really good experience, as everybody we contacted both from NOC and iNat proved extremely helpful. And even better, we were going to meet some of these new acquaintances.

Once winter loosened its grip on Stamford, Connecticut, we started to clear out our house. This trip was our leave-do from the US, so everything had to go. After a grueling final effort to send boxes back to Europe, give away or dump everything else, clean the house, and pack our car for the trip, we were set to go on the morning of April 30 (Fig. 2)!

Figure 2. Oh-Chan (left) and Chizuko (right) ready for departure

Leaving our home of 2.5 years still felt slightly unreal, so it was nice to meet with our friend David Taylor in New Jersey for our first orchid hunt on the trip – looking for Dragon Mouth (*Arethusa bulbosa*) in the New Jersey Pine Barrens. We were rather early though, so went for some Southern Twayblades (*Neottia bifolia*) first that David had spotted earlier and knew were flowering. He didn't promise too much – plenty of plants, once the eyes got adjusted to the target (Fig. 3). The main challenge then was to convince our cameras to do the same and not focus on the background. With mixed success, at least for myself. Our search for *Arethusa* failed, unfortunately, but David found some later in the season. A local BBQ joint completed a really enjoyable first day of our trip.

Figure 3. *Neottia bifolia*; Pine Barrens, NJ

Encouraged by the successful start, we were looking forward to our next goal, the Blue Ridge Mountains… hoping the country roads would take us there, as so famously sung by John Denver, and inaptly repeated endlessly at campfires as a kid (even in Switzerland). According to iNat, mountain mama might present us with some flowering Yellow Lady's-slippers (*Cypripedium parviflorum*). However, when we arrived, she wasn't exactly welcoming, not blue but grey, with all flood gates open. Luckily the weather forecast predicted a dry spell in about ten minutes, and got it right. Once out of the car, we were greeted by hundreds of Trilliums (*Trillium grandiflorum*), an amazing view. We continued on that path, enjoying the Trillium carpet covering the forest floor with a gradient of white to purple flowers. Occasionally, we also came across some *Cypripedium* leaves, but only at the very end did we find it - a single plant of the Large Yellow Lady's-slipper with an open flower (Fig. 4). Very fresh, with raindrops against a misty sky – a generous gift from mama.

Figure 4. *Cypripedium parviflorum*; Blue Ridge Mountains, VA

As predicted, the rain picked up again, and we continued our journey to the Great Smokies. I was impressed to learn that this is the most popular US National Park with yearly around 10 million visitors for the past 20 years.

Since this was the first National Park of our trip, we equipped ourselves with the essentials - a National Park passport, and the annual pass (Fig. 5). The latter was a very worthwhile investment, as we were hoping to visit a total of 16 National Parks within the next two months.

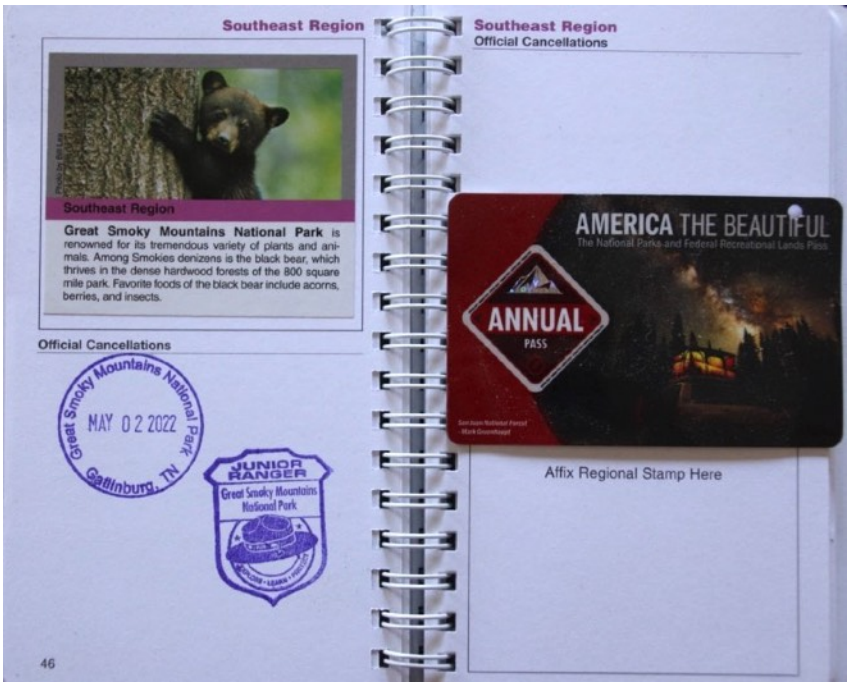


Figure 5. National Park Passport and Annual Pass

Besides a record number of tree and amphibian species, according to Stanley Bentley (2000), 'Puttyroot Orchid (*Aplectrum hyemale*)'- an orchid species we had not yet seen – 'can be found along the roaring fork motor nature trail mid-April-May.' So both timing and location should be right. We found some Showy Orchis (*Galearis spectabilis*) along the road (Fig. 6), but no Puttyroots, unfortunately. There were, however, several open observations on iNat for the area, so ultimately we were successful, and found our Adam-and-Eve orchids as they are also called (Fig. 7).

Figure 6. *Galearis spectabilis*; Smoky Mountains NP, TN

Figure 7. *Aplectrum hyemale*; Knoxville, TN

On a hike we took the next day, following the Schoolhouse Gap Trail, we found a lot more of the unique green and white striped leaves, but no additional flowering plants, unfortunately. As what seemed like a little parting gift, the setting sun put a spotlight on a single Pink Lady's-slipper (*Cypripedium acaule*) in the darkening forest on our way back (Fig. 8).

Figure 8. (left) *Cypripedium acaule*; Smoky Mountains National Park, TN

After a couple of days in the Smokies, we left May 5 for another orchid hunt in Manchester, TN. We were going to meet with Dennis Horn, a former aerospace engineer turned botanist (Fig. 9). We hoped to find the fabulous Kentucky Lady's-slipper (*Cypripedium kentuckiense*), as well as the Large Twayblade (*Liparis liliifolia*). It was a bit early for both of the species, but we had been lucky so far and hoped it would continue. We met at Wendy's just off I-24, Exit 114, joined also by Keith Lovelady, MD, the owner of the grounds that hosted the Twayblades we were hoping to see later on in the day. After a short drive to the Arnold Air Force Base and a quick walk, we found ourselves in the middle of a floodplain forest that Dennis knew from his previous line of work to host the Lady's-slippers. Sure enough we soon found leaves, and a little later also leaves with buds – but they looked as if they needed at least another week to flower, unfortunately (Fig. 10). After searching more for some potential early birds we gave in, and headed to the May Prairie. It was also too early for this site, but we were planning to return on our way back, and received some instructions on where to look in case our guides might not be available that time.

Figure 9. K. Lovelady, D. Horn; Manchester, TN

Figure 10. *Cypripedium kentuckiense*; Manchester, TN

Last but not least, we drove to Dr. Lovelady's private grounds a bit outside Manchester to find the Large Twayblade. However, these plants weren't even in bud yet. The leaves and pseudobulb suggest that these are *Liparis liliifolia* (Fig. 11). For some reason, this was one of the orchids that Chizuko really wanted to see. We had missed it the previous year already since I was too lazy to drive another couple of hours, but promised her we were going to see it on this road trip. And there was really no other place that might have worked during our trip…We learnt a lot about plants in Tennessee that day, and it was a beautiful day out with great company, but ultimately the only orchid in flower was a Large Yellow Lady's-slipper, slightly past its prime (Fig. 12)…we had to accept that it was difficult to get the timing right for every location and every species you'd like to see on a trip like this…

Figure 11. *Liparis liliifolia*; Manchester, TN

Figure 12. *Cypripedium parviflorum*; Manchester, TN

Luckily, for the Kentucky Lady's-slipper, we had a second shot the next day on our journey from Nashville to Memphis. We met Bart Jones at a Love's Truck Stop on I-40, and followed him to his parents' grounds. Upon arrival, he pointed out some plants on the entrance to his neighbor's lands. Although also still in bud, they were a bit closer to flowering than their Manchester counterparts. So Bart was optimistic, and led the way through the brush to a floodplain forest on his grounds. And then, there they were, multiple plants blooming with very fresh, seriously gigantic flowers. Even the sun broke through the dark clouds that had brought some rain before our visit here. A real treat (Figs. 13, 14)!

Figure 13. *Cypripedium kentuckiense*; Decatur County, TN

Figure 14. Bart Jones; Decatur County, TN

It turned out that Bart was a scientist as well, but our chat on the way back got cut off rather cruelly by another heavy downpour.

So then, on we drove to Memphis, waking some old memories of a German Radio comedy series featuring a cab driver who, no matter what, would always end up taking his fare to Memphis (‘Fahre Memphis’ – Taxi Sharia). However, the taxi driver was still myself, and we didn’t meet the King, either, but did get some nice burgers in a blues place in downtown Memphis to celebrate the day and our first week on the road.

For the next day, May 7, we planned to go looking for the rare and endangered Oklahoma Grasspink (*Calopogon oklahomensis*). We had obtained instructions from Mark Larocque, NOC, for the Railroad Prairie in Devall’s Bluff, AR, and the Cherokee Prairie in Charleston, AR (Fig. 15). Unfortunately, despite searching for several hours, we couldn’t find any plants at either of the two locations. Interestingly, there were no observations for the area of the Cherokee Prairie in iNat for 2022, but several for the Railroad Prairie. According to some iNat contributors, some part of the latter had recently been subject to a prescribed burn (but since this species is rare, all observations are obscured, so impossible to find the exact location). While fires can be devastating, many open grassland orchid species appear to depend on human intervention to keep competing species and bushes at bay - there are no buffaloes anymore…

Figure 15. Chizuko; Cherokee Prairie, AR

The journey then continued up North towards Kansas City. An industrial city and logistics hub, receiving and shipping goods via the Missouri River, railways, and roads. Not a place you'd expect to find orchids, but there was a little park near the Missouri that had lots of open iNat observations of Spring Coralroot (*Corallorhiza wisteriana*), another species that we hadn't encountered yet. So rather than going for dinner, we first explored the 'Hidden Valley Park,' a Natural Area that contains both old growth and old second-growth forest. A lot of Spring Coralroots grew along the trails in the loess soil, but no sun to light them up, so I decided to have a jog the next morning for some pictures in the morning sun. And it was worth it… although I am not used to jogging with a camera on the back, the light really helped to bring out the beauty of the flowers (Fig. 16). Also, it looked like a lot of new flowers had popped up overnight – although I may have missed them the day before.

Figure 16. *Corallorhiza wisteriana*; Hidden Valley Park, MO

During the next two weeks, we followed my childhood interest in Native Americans around the Lakotas and Sitting Bull. We visited the Badlands/White Hills, the Black Hills, the Devil's Tower, and then finally the Little Bighorn Battlefield, where the Lakota Chief amassed an armada of Native Americans to defend their way of living. They won the battle, but as history tells us, eventually lost the war.

We were too early for any orchids in Yellowstone and Grand Teton National Parks, but the wildlife was incredible, we saw buffaloes with calves, a brown bear mother with cubs, wolves, moose, elks, bighorn sheep…and then of course all the displays of the volcanic activity below Yellowstone.

We picked up orchid hunting again on May 23, between Yellowstone and Glacier National Parks. The target was Calypso (*Calypso bulbosa*), extremely rare in the Northeast, but rather widespread, if not frequent, in the Rocky Mountains. Adding to the fun, the area we were going to travel to featured both, the Eastern (*Calypso bulbosa* var. *americana*) and the Western (*Calypso bulbosa* var. *occidentalis*) varieties. Even more exciting, at places they cohabit, they may form hybrids (*C. bulbosa* ×*Kostiukiae*, named after Paul Catling's wife, Brenda Kostiuk). For the Western variety we got a tip from a fellow iNat contributor, 'afid,' to go looking in the area of Missoula, MT.

Already a few hundred meters into the beautiful spring forest we spotted the first little pink Greek Goddess, right next to the trail. Not unlike Odysseus, we followed her and got totally bewitched – luckily not for 7 years, but certainly the better part of an hour. Of course we did not only have one Calypso to cling on to, but several dozen spread across the brightly lit spring forest floor (Fig. 17)…so under her spell as we were, we had to seek out her Eastern reincarnation as well. After a quick check on her ever resourceful phone, Chizuko came up with directions. It was roughly on our way, on the Southern borders of the Flathead Lake. The pin from iNat was in the middle of a forest, though, which made us both wonder whether it was real – but yes, exactly at the pinned location, we found quite a number of plants of the Eastern form of the enchantress, with their cute, spotless, albeit hairy yellow lips (Fig. 18).

Figure 17. *Calypso bulbosa* var. *occidentalis*; Missoula, MT

Figure 18. *Calypso bulbosa* var. *americana*; Flathead Lake, MT

Back on the road to Glacier National Park, I mentioned to Chizuko that one manifestation was missing as yet – the hybrid. A check on her mobile made us U-turn, to try a spot further down the Southern border of the Flathead Lake. It was getting slightly late, and the Ranger at the entrance of the State Park seemed genuinely sorry to ask us an entrance fee (America the Beautiful did not work for once…), but I didn't mind. Paying a couple of bucks to meet another instance of our Greek Goddess sounded like a reasonable investment. The question was, of course, whether she would grace us with another appearance. But that day everything seemed to work - all three versions of our Greek beauty were lined up along a little forest trail (Fig. 19). The Eastern variant was a bit past prime, but the hybrid plants were in full flower, and really performed according to the perfect scenario of a geneticist's lab manual - they combined both characteristics of their parents, the yellow hairs and the dotted lip. Mythical!!

Figure 19. The three Goddesses: *Calypso bulbosa* var. *americana,* var. *occidentalis,* ×*Kostiukiae*, MT

The visit to Glacier National Park was again way too early for any orchids there, but we saw the famous mountain goats, from afar in a sheer rock face, and close up at a place they licked the salt from the rock. For a short moment it occurred to me that a coat like that might be a nice asset for a fire place…but luckily I don't carry a gun.

Anyway, our next destination was the Olympic Peninsula National Park, passing through Cascade National Park on the way. There were two orchid species we were hoping to find in-between: the Striped Coralroot (*Corallorhiza striata*), and the Mountain Lady's-slipper (*Cypripedium montanum*). The former, allegedly the most striking of the Coralroots, had been on our list for Northern NY, but we never found it. The latter reminded me a bit of Small White Lady's-slipper (*Cypripedium candidum*), which we did encounter in the Northeast, and is still one of the most elegant orchids I have ever seen. According to iNat, the area around Spokane and Winthrop, WA, seemed to be full of both, so although we were a bit early, we were hopeful to find them there.

Just before reaching Spokane, WA, on May 25, we turned and explored a Regional Park around Liberty Lake. We found both species, but only the Coralroot was flowering, the Lady's-slippers were not even in bud yet. So while it was great to find the Coralroot (Fig. 20)– which was as spectacular as promised, although the sun was not really cooperative, and didn't set the flowers on fire as suggested by Nelson & Lamont in their guide to the 'Orchids of New England and New York' – we were getting slightly worried on our prospect to see the Mountain Lady's-slipper in bloom.

Figure 20. *Corallorhiza striata*; Spokane, WA

Our next shot at the Lady's-slipper was the Methow River Valley around Winthrop, WA, on the next day. We checked out one site upon arrival, and found lots of plants - some of them even had buds, but they didn't look likely to flower within the next 24 hours. Since tomorrow's journey was going to take us to Seattle and the Olympic Peninsula National Park, I started to wonder how long a drive back and forth might take. At more than 6 hours one way, this didn't look too good, however. A couple of beers helped to lift my spirits, and we decided to try again the next day.

Thus on May 27, we checked out another floodplain forest, a habitat that these *Cypripediums* also seemed to like. One spot was a replica of the day before, but the second one looked better, with a big clump almost in flower. And then, we found the one plant, right next to the trail, fully open. In plain sun. It was like Xmas and Easter together…still a shame to miss the large clumps in flower, but that one blooming flower gave us a bit of an idea on how glorious it might look like (Fig. 21).

Figure 21. *Cypripedium montanum*; Winthrop, WA

So, relieved and relaxed as we were, we really enjoyed the gorgeous drive along SR-20 through the Cascade National Park. No orchids there, of course, people were still skiing – but the scenery was glorious.

The next extended stop, after a quick visit to Seattle with a sumptuous sushi dinner, was the Olympic Peninsula National Park with its temperate rainforest. My expectations, which were quite high, proved easily matched by these forests. As a result of the prevalent winds coming in from the Pacific, bringing in humid air that is driven up the Cascade Mountains to release its load of water, it rains almost every day (330 days/year). These extremely wet conditions support incredible plant life – not only do the trees grow

taller than normal, they themselves provide support for mosses, lichens, even ferns growing on the trees. Also the ground is totally covered by vegetation, hardly a spot left unoccupied.

This natural greenhouse provides good conditions for Darth Vader, as Philipp E. Keenan called *Neottia banksiana* in his travelogue 'Wild Orchids across North America.' On the last day of May we were still a bit early; nobody had posted the villain on iNat yet. Also, the closest it had been spotted in previous years was a 3-4 hours' drive away, so we ended up picking a hike climbing a wooded river valley in the neighborhood, hoping to get lucky.

The bad guy remained elusive, unfortunately, but we found lots of Heart-leaved Twayblade (*Neottia cordata*) (Fig. 22), Fairy-slippers (*Calypso bulbosa* var. *occidentalis*), and leaves of Western Rattlesnake Plantain (*Goodyera oblongifolia*).

Thus, after a very enjoyable time up North, we started to move southward, with our first stop at Corvallis for another orchid hunt on June 1st.

In Switzerland, there are three *Cephalanthera* species, all of them showy, and all of them with green leaves containing chlorophyll, capable of photosynthesis. So I was very surprised to discover there was a purely white member of that genus (*Cephalanthera austiniae*) in the United States, purely mycotrophic, and adequately named Phantom Orchid. Looking a bit deeper into the topic, I found that some of the European *Cephalanthera* species had also been classified as trending toward mycoheterotrophy (Gebauer and Meyer, 2003), and non-photosynthetic individuals were described for *Cephalanthera damasonium* (Julou *et al*., 2004), so the genus does seem to have a tendency towards mycotrophy. Still, so far I had only seen the European species with green leaves, and was extremely curious to see their purely white relative in the U.S. Another fully mycotrophic species, the Pacific Coralroot or *Corallorhiza mertensiana*, had also been observed in that area in previous years. We were, however, early for both of them.

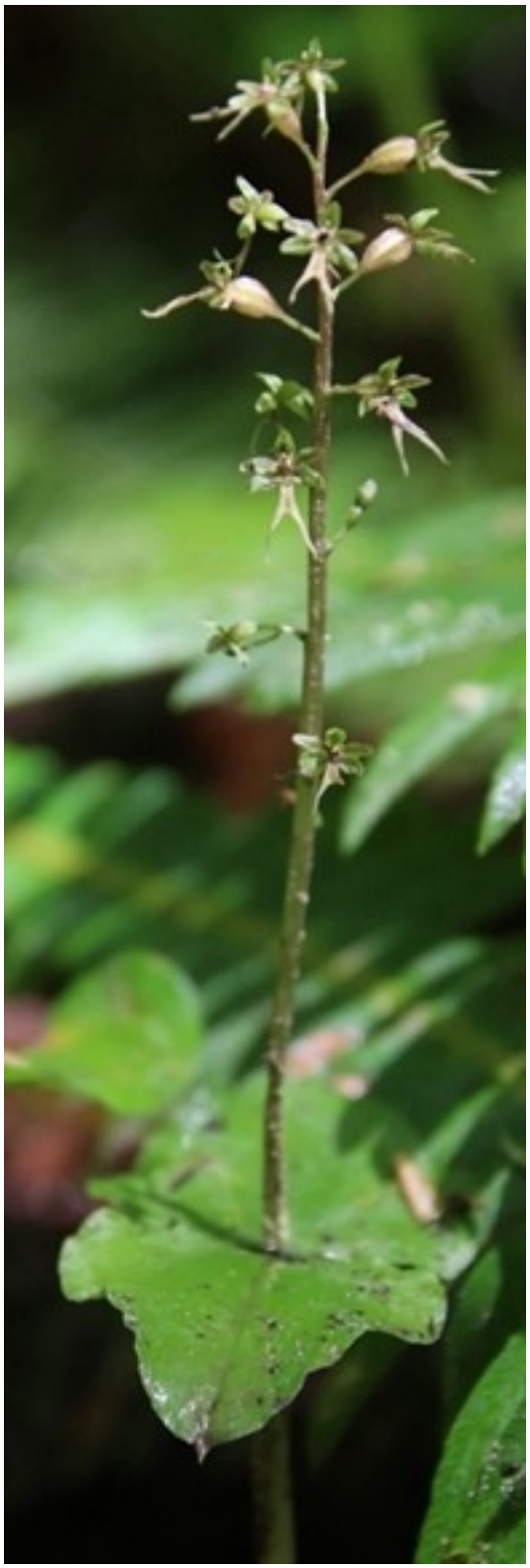


Figure 22. *Neottia cordata*; Olympic Peninsula National Park, WA

And indeed, while there were plenty of *Corallorhiza maculata* var. *occidentalis*, both *Cephalanthera austiniae* and *Corallorhiza mertensiana* (only tentative) were still in bud (Figs. 23, 24).

Figure 23. *Corallorhiza maculata*; Corvallis, WA

Figure 24. *Corallorhiza mertensiana* (?) (left); *Cephalanthera austiniae* (right); Corvallis, WA

This was seriously disappointing, I had been really looking forward to seeing this ghostly *Cephalanthera*… luckily we identified a spot a bit further south where somebody had found some flowering plants this year already, re-kindling our hope.

Next day's trip led us to Crater Lake National Park, also still deep in snow, which provided a beautiful backdrop to this serene lake, the deepest and arguably one of the cleanest in the US, only fed by rain water.

June 3rd was going to be one of the absolute highlights of the trip in terms of orchids – California Lady's-slipper (*Cypripedium californicum*), Stream Orchid, (*Epipactis gigantea*), and Few-flowered Bog Orchid (*Platanthera sparsiflora*). And we were lucky to have a fellow iNat and also NOC member, Paul Renaud, join us. He lives near and had already checked out the locations that we had obtained from Mark Larocque and Chelsea Kieffer. So we were well prepared for a glorious day to come. The area we visited was characterized by serpentinite soil, a harsh substrate for many plants to grow, having a low calcium-to-

magnesium ratio and low levels of many essential nutrients such as nitrogen, phosphorus, and potassium (Wikipedia). Not surprisingly, therefore, these soils select for a very specific plant ecosystem able to cope with the tough conditions. Even before seeing the first orchids, we had to have lots of stops to take pictures of the spectacular vegetation and landscape. But it didn't take too long until we saw the first California Lady's-slippers and Few-flowered Bog Orchids together with the California Pitcher Plant (*Darlingtonia californica*) in a seep right next to the road (Fig. 25). It was paradise – we scrambled across the rugged country, finding Lady's-slippers everywhere (Fig. 26). The Bog Orchids were restricted to the wetter areas, where we found a large clump with maybe a hundred plants on a spot of a couple of square meters (Fig. 27). Only the Stream Orchid was absent. So after a little break for lunch we moved on to another site, just

Figure 25. *Darlingtonia californica*; *Cypripedium californicum*; *Platanthera sparsiflora*; O'Brien, OR

Figure 26. *Cypripedium californicum,* O'Brien, OR

Figure 27. *Platanthera sparsiflora*, O'Brien, OR

Figure 28. *Epipactis gigantea*; Hiouchi, CA

beyond the border into California. We instantly spotted lots of Lady's-slippers, but, at first sight, no Stream Orchid. But then, while taking some more pictures of the Californian Ladies, in the edge of my eye, I noticed a small clump of plants that were clearly *Epipactis*, albeit not flowering yet, in the ditch along the road. I started running up and down the road, finding more of them, and eventually spotted a couple of flowering plants with just one flower each, but absolutely perfect (Fig. 28). Somehow being in California, having seen the Lady's-slippers, and with its Latin name 'gigantea', I expected much larger plants…but then, the flowers certainly stood up to their name…

As a final highlight of the day, Paul took us to a nearby Redwood sanctuary– an amazing close to an amazing day (Fig. 29).

Figure 29. Paul Renaud & Chizuko, Jedediah Smith Redwood State Park, CA

That day was certainly impossible to beat, but the next day also held some promise– the elusive Phantom Orchid, and the Western Ladies'-tresses (*Spiranthes porrifolia*).

Providing a proper setting for the Phantom Orchid, Mt. Shasta and Castle Crags were deeply shrouded in clouds. But not too long into the trail we started to see the ghostly white plants – and they were flowering! They appeared to grow locally in clusters, with large areas in-between totally devoid of them. There was some resemblance to one of the European species, *Cephalanthera damasonium*, but the total lack of green gave them a slightly otherworldly look (Fig. 30).

Figure 30. *Cephalanthera austiniae*; Castle Crags State Park, CA

Once out of the clouds and into the Sacramento Valley, we looked out for our next target, the Western Ladies'-tresses. We were early in the season as usual, so no iNat observations for this year yet, but there were several open observations from within the past 6 years. And we got lucky with our first shot, a grassy area under power cables. Despite the overall yellowish/beige tone of the prairie, the rather tall, spiraling racemes of the plants stood out quite clearly. There were multiple plants in full bloom, a very beautiful sight (Fig. 31).

Figure 31. *Spiranthes porrifolia*; Redding, CA

With our little diversions we arrived rather late in Lake Tahoe - tired but again very happy, after another incredible day in paradise…

Figure 32. *Corallorhiza striata* (left); *Sarcodes sanguinea* (right); Fishcamp, CA

From Lake Tahoe we continued to Yosemite National Park, where we stayed for a couple of nights until June 8. Again no orchids in the National Park, but while walking Oh-Chan behind the hotel on the last evening, we ran into some *Corallorhiza striata* and a couple of Snowplants (*Sarcodes sanguinea*) in the beautiful light of the setting sun. This was too good a sight to miss, but, of course, I hadn't brought my camera so had to jog back to the hotel. I made it just in time for a couple of shots before the sun dropped behind the hill (Fig. 32). Although some of the shots had caught the setting sun quite nicely there was a lot of room for improvement, and we decided to return next day before leaving, hoping for the morning sun. So we returned to the site next morning with my camera, and the plants were bathing in the morning light – perfect. I got into position, pressed the button to release the shutter– and nothing happened. Shouting didn't help, and after a while I noticed that I forgot to put the battery pack back into the camera. I wasn't in the mood for another jog, so had to stick to what I got the evening before…

Anyway, Las Vegas was calling, with a stop planned on the way at Ash Meadows to find the rare endemic Ash Meadow's Lady's-tresses (*Spiranthes infernalis*), for which we received a treasure hunting-style map from Mark Larocque, faxed to him 20 years ago by a then Park Ranger. Tested and proven, so the hunt was on.

The drive was a bit of a challenge, though, WAZE predicted 7 hours, and the Ash Meadows State Park was going to close at 5 pm, but we anyway decided to give it a try. And then, of course, right after a long stretch of road works on the way out of Yosemite, a pebble hit our windshield, causing a small crack. My immediate reaction was to just ignore it, but then I remembered all the advertisement on how these cracks were going to get worse, ultimately causing the windshield to break – and we did have some more dirt roads to come. So after a bit of a painful decision seeking we both agreed we needed to do something about it. We stopped at a parking lot in front of a famous coffee shop chain that provided us with free WiFi and non-free iced coffee in the sweltering heat. After 2 hours of negotiations with the leasing company, several solution providers, and a substantial investment to the Coffee chain, we got ourselves an appointment with a guy who could fix our windshield in Vegas first thing the next morning. While it looked as if this issue was going to be solved, it of course totally obliterated our plans of seeking out the Ladies-tresses.

Luckily, the prediction for our drive to Zion National Park on June 9 was only 3 hours. So after having our windshield fixed first thing, adding 1 hour in the wrong direction seemed like an OK investment to have another go at *Spiranthes infernalis*. When we arrived at Ash Meadows, however, the thermometer had climbed up to a scalding 105°F. Oh-Chan decided it was definitely too hot for him out there, Chizuko wasn't entirely happy either, so I gave in and asked the Visitor Center guys for some pointers. Unfortunately, however, they refused, due to its status as being rare and endemic and so on, but confirmed that it was flowering. While sort of understandable, it was still frustrating. So off we went, treasure hunting, using the map. The map featured 3 'X's – the area around the first 'X' had been closed, but after a bit of scrambling through the vegetation, trying to ignore the sweltering heat, the second 'X' hit the treasure chest – lots of plants along a little semi-dried out creek (Fig. 33). And they were in full bloom, incredibly beautiful – perhaps even more so because of the struggle to find them. Amazing how these plants survive in such a harsh environment…

Figure 33. *Spiranthes infernalis*; Ash Meadows State Park, CA

We certainly couldn't, and escaped the burning desert sun into our air-conditioned car, heading for Zion National Park.

Figure 34. *Epipactis gigantea*; Zion National Park, CA

Figure 35. *Platanthera tescamnis*; SR-12, UT

There were no plans to go orchid hunting in Zion National Park. So when walking into the Narrows at the back end of the valley, together with an endless stream of other visitors, we were quite surprised to find a number of Stream Orchids in a seeping alcove along the trail (Fig. 34). Luckily, people passing were bothered rather than curious why we stopped to take pictures, and we didn't have to explain…

After a quick stopover at the North Rim of the Grand Canyon, we moved on to Bryce Canyon National Park. From there, on June 14, we continued to Capitol Reef National Park via SR-12, one of the absolute driving highlights. Along the Road, we checked out a site for *Platanthera tescamnis*, the Great Basin Bog Orchid, posted on iNat a couple of years ago. Despite some damage by off-road vehicles, we found lots of plants along the riverside, in full flower (Fig. 35).

SR-12 then passed Powell Point, a lookout on one of the last white spots on the US maps, before continuing across the Grand Staircase-Escalante National Monument. The road went on offering absolutely breathtaking views until we ultimately arrived at Capitol Reef National Park.

From there, we moved on to Arches National Park, and then to the directly adjacent Canyonlands National Park on June 17. Near Moab, we had another location from Mark Larocque, for a very rare *Platanthera* species, Alcove Bog Orchid (*Platanthera zothecina*). As the name suggests, these plants like to grow on sandstone alcoves with seeping water in hanging gardens. So following the instructions and looking for suitable habitat, I climbed up the sandstone cliffs along the Colorado river, looking for the orchids. Despite scrambling around for the better of 2 hours, the best I got was dizzying views down to the river and a pair of giant eyes observing me from above (Fig. 36). But no water, and hence also no orchids. Wrong place, wrong time, or might it have been due to the recent changes in the weather conditions and the seeps had dried up? We spent two more days in the area around Moab, also looking for spots that these orchids might like, but no success…

Figure 36. Near Moab, UT

On June 19 we then swapped the red sandstone for grey and black gneiss and granite with injections of magmatic rock in the Black Canyon of the Gunnison National Park, before leaving the Rockies altogether. The drive back to Nashville took 3 days, mostly following the I-70 eastwards. There was one highlight - a stop near St. Louis on June 23 - to search for Green Adder's Mouth (*Malaxis unifolia*) (Fig. 37). Multiple observations on iNat, all obscured, suggested it grew somewhere in that area. Upon asking, luckily, one of the observers gave us the precise coordinates, as apparently this was a well-known site, warning us we may be a bit late. Indeed many plants were past their prime, but we found a few that were still fresh enough to show the fascinating Mandelbrot fractal 'broccoli-like' structure of the flower buds on top.

Figure 37. *Malaxis unifolia*; St Louis, MO

The day after, June 24, brought us back to Manchester, this time, unfortunately, without Dennis, our guide from the previous visit. The plan was to look for Snowy Orchid (*Platanthera nivea*) in the May Prairie, and for Small Spreading Pogonia (*Cleistesiopsis bifaria*) at the Arnold Air Force Base. However, timing for both species was way off – for the Snowy Orchid a few weeks too early, for the Spreading Pogonia the same, but too late.

So not entirely unexpected, we found no traces of *Platanthera nivea* yet – but then again, the May Prairie was heavily overgrown in parts, and we may have easily missed early budding plants. Indeed, multiple observations of the plant were posted on iNat for that area in July later this year.

In the forest, we found a few plants of *Malaxis unifolia*, but completely spent.

At the prairie in the airbase, also no remaining traces of the Spreading Pogonias, but we were lucky to spot some of their namesakes, the Rose Pogonias (*Pogonia ophioglossoides*), in the wetter areas, and Grass-leaved Ladies-tresses (*Spiranthes vernalis*), in the drier parts (Figs. 38, 39). So while not what we expected or hoped for, it was still a beautiful day out there.

Figure 38. *Pogonia ophioglossoides*; Manchester, TN

Figure 39. *Spiranthes vernalis*; Manchester, TN

And this left us with one final week of our trip… but with some more orchid highlights to come…

Figure 40. *Platanthera grandiflora*; Holston Mt., TN

The first brought us to the area of Holston Mountain on June 25, where we were to meet the next day with a Park Ranger, Marty Silver, AKA 'vulture' on iNat. We had contacted him on his observations of the Spreading Pogonia in the Holston Mountain area. In previous years, they appeared to flower a bit later than their counterparts in the Manchester (TN) area, and he had agreed to give us a tour. Unfortunately, when we reconnected a bit closer to our planned meeting date, he squashed our hopes stating we were two weeks late for the Spreading Pogonia sites he knew. On the up side, however, he suggested a site with Appalachian Twayblade (*Neottia smallii*) in full bloom, so after missing two species of the genus earlier on (the Large Twayblade and, of course, Darth Vader), we might have a chance to see this beautiful species, named Appalachian Twayblade for its main area of distribution. Even better, while it normally tends to hide under Rhododendron bushes, this site was supposed to be relatively easy to access.

So after this slight change of plans, we met at noon June 26 on the parking lot of his 'home' park to drive up to Holston Mountain. On the way to the site, we had a quick stop for a Large Purple-fringed Orchid (*Platanthera grandiflora*) plant flowering on the road side (Fig. 40). After a short walk, including passing through a rather large field of wood nettles- which we had been warned about and had dressed accordingly– we arrived at the edge of a little Rhododendron grove. And there they were, a small clump of the Appalachian Twayblades, in full bloom (Figs. 41, 42). Flowers for this species have been described as being either green or brown, and in this clump they were mainly brown. Interestingly, though, one plant actually featured a single green flower. This is nothing unheard of, a somatic mutation, epigenetics or similar may explain this outlier, but it's still fun to observe.

Figure 41. *Neottia smallii*; Holston Mt., TN

Figure 42. Marty Silver, Holston Mt., TN

Once all the shots were taken, we moved on to another site where our guide had found some *Malaxis unifolia* some years ago, around that same time, in an open area under power cables. We didn't find any Green Adder's Mouth, however, but two plants of the Spreading Pogonia, still in relatively good shape (Fig. 43). This was totally unexpected, and a real treat. Our guide then bid us his farewells, but not without a strong recommendation to go and find the red flowering Gray's Lily on the neighboring Roan Mt. We were lucky enough to also find this rare, endemic species, and after a full day of botanic excursions got back to our Airbnb home tired but happy.

Figure 43 *Cleistesiopsis bifaria*; Holston Mt, TN

Figure 44. *Platanthera leucophaea*; Dayton, OH

Our next day's journey took us up North, to Columbus, OH, and Eastern Prairie Fringed Orchid (*Platanthera leucophaea*). Another prairie species that has become extremely rare and endangered to a large degree due to the destruction of its habitat. Indeed, in some regions its locations are kept under total secrecy. So I was not sure whether I would hear back when I asked another fellow iNat user for the location near Columbus, where there seemed to be a large number of observations. But I got lucky – first of all, this was a relatively well known location, and second, the guy I contacted turned out to be a fellow ExPat from our neighboring country Austria, Elias Pschernig. We found a lot of commonalities and decided that, although he couldn't be there to show us the orchids, we would go out for dinner together.

When we arrived at the prairie, the road ditches were already full of the plants, so we didn't even have to get into the site. They were in prime bloom, the sun was already starting to set, providing the perfect light to photograph these wonderful plants (Fig. 44).

It was such a beautiful experience that it made me wonder whether keeping these locations secret is really the best strategy for their preservation. If more people knew about these plants, and could actually see

Figure 45. *Platanthera lacera*; Columbus, OH

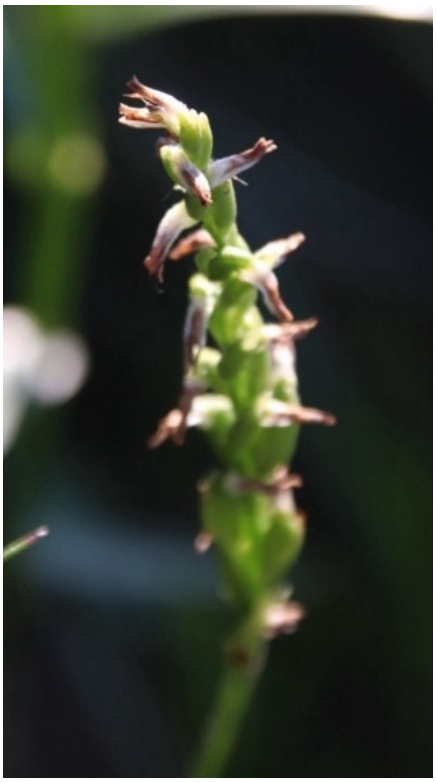


Figure 46. *Spiranthes lucida (?)*; Black Moshannon State Park, PA

them, maybe more money could be raised for their protection, and the protection of their habitat…Public bog walks like the one at the Eshqua Bog or the Philbrick-Cricenti Bog Trail are good examples that this may work. But there are, of course, also other examples like Webb's Mill where a former probably spectacular site got destroyed by people not following the rules.

After a gorgeous Sushi Dinner in great company, and a good night's sleep, we continued eastwards towards New Jersey, with one stop recommended by Elias to visit a Ragged Fringed Orchid (*Platanthera lacera*) site close to Columbus, and another one Chizuko suggested at the Black Moshannon State Park, to look for *Spiranthes lucida*.

We found the *Platanthera lacera* site (Fig. 45), and then drove on to the Black Moshannon State Park to look for Shining Ladies'-tresses (*Spiranthes lucida*), one of the Ladies-tresses that we had not yet seen. After a bit of searching along the lakefront, we found a colony of 'might-have-been-*Spiranthes lucida*'- (Fig. 46) but they were clearly past flowering, unfortunately.

And then - June 29, our last day. The original plan was to drive straight back to Stamford. But then Chizuko had the glorious idea to visit the Valmont Bog on our way back. Bob Sprague had organized a site clearing event in November 2021, which we had joined. So we were very curious to find out whether the clearing had had any effect.

We arrived there too early, of course for *Platanthera* species (see next article) that are probably the site's main attraction. But we were absolutely blown away by the number and beauty of the Grass Pinks (*Calopogon tuberosus*) that we found on our visit (Fig. 47). While we lack the comparison to earlier years, we got the impression that the clearing might have given the orchids a boost.

The remaining 3-4 hours' drive were uneventful.

And then it was nice to be welcomed 'home' again (Fig. 48)– except we didn't have our home anymore, but we had incredible neighbors who hosted us for our few remaining days in the US.

And we did not suffer….

Figure 47. *Calopogon tuberosus*; Valmont Bog, PA

Figure 48. Welcome back Dinner!

Literature Cited:

Gebauer G. and Meyer M. (2003) ^{15}N and ^{13}C natural abundance of autotrophic and myco- heterotrophic orchids provides insight into nitrogen and carbon gain from fungal association. *New Phytologist* 160: 209–223.

Julou, T., Burghardt, B., Gebauer, G., Berveiller, D., Damesin, C., and Selosse, MA. (2004) Mixotrophy in orchids: insights from a comparative study of green individuals and nonphotosynthetic individuals of *Cephalanthera damasonium*. *New Phytologist* 166: 639–653.

Wikipedia on Serpentinite: https://en.wikipedia.org/wiki/Serpentine_soil

Keenan, P. E. 2005. Wild Orchids Across North America: A Botanical Travelogue. Timber Press.

Nelson, T. and Lamont, E. 2012. Orchids of New England & New York. Kollath-Stensaas Publishing.

Bentley, Stanley. 2000. Native Orchids of the Southern Appalachian Mountains. UNC Press Books.

VALMONT BOG UPDATE- PART III:
HARK… THE DRUMBEAT OF NATURAL SUCCESSION

By Robert Sprague, bobsatcyndal@aol.com
(Photos by the author unless otherwise noted)

Part II concluded on an ominous note. We saw how right-of-way management can have a profound impact on the orchids of Valmont Bog. Cooperation between Pennsylvania Power & Light (PP&L), North Branch Land Trust (NBLT) and the Native Orchid Conference (NOC) has helped mitigate some of the major concerns. However - natural succession can, and will, take a toll.

Small trees and shrubs continuously infiltrate the bog from the surrounding woodland. Pitch pine, red maple, scrub oak, black birch, winterberry, hemlock, rhododendron, spirea, sheep laurel and other shrubby plants can quickly wreak havoc on the orchids. PP&L has in place a maintenance plan which prevents succession plants from "taking over" their right-of-way. On one sad occasion their use of a powerful herbicide killed numerous orchids. On a subsequent occasion, out of deference to the rare plants, a more expensive hand-cutting technique was employed. That worked well but things got out of synch. Hand clearing was curtailed (possibly due to scheduling issues during the height of Covid). By 2019 the bog was severely overgrown. Many of the orchids for which Valmont Bog had become so well known were deprived of sunlight and they simply failed to emerge. The bog was doing what bogs are destined to do… it was well on its way to becoming a meadow and ultimately a woodland. Decisive and drastic action was warranted!

Since controlled burning is not an option, it was determined that a volunteer work day might just be the short-term solution that could stall encroachment of trees and other woody plants. Just who determined that? I invoke my 5th amendment privilege. Many people argue that, "It's not nice to fool Mother Nature" or, in this case, interfere with a natural process. In most circumstances I agree with that premise. However, this is not a natural circumstance. Given the long term presence of the power lines (and the likelihood that they will remain for decades to come) it's obvious that human interference is the order of the day for Valmont Bog. As long as it's going to be managed one way or another, why not manage it in such a way as to "preserve" this unique, living laboratory?

Grandma Was Right… Again

The morning dawned, to my great relief, as predicted… it was cool, calm, crisp and clear. Although we had no influence over that outcome, Challenge #1 had been met; the weather would be perfect. Challenge #2 was completely within our control; could we, would we arise on time, make the two hour drive from Berks County, PA to West Hazleton, PA, safely transport our equipment and set-up a "command post" before everyone else arrived? We could and we did. We arose at 6 am on Saturday November 20, 2021 and

Red maple and pitch pine seedlings advance unabated

View to the North - bog clogged up with trees and shrubs

White-fringed orchid habitat overwhelmed by pitch pine, rhododendron, winterberry, hemlock & more

Photo: Duane Erdmann

departed thirty minutes later (the truck had been packed the day before). We reached the Valmont Industrial Park in West Hazleton at 8:20 am, negotiated a narrow gravel road into the now internationally recognized Valmont Bog and began to set-up shop. A few volunteers arrived and helped erect a canopy, deploy tables, place trash cans, start a generator, warm the cocoa, lay out sign-in sheets and post photos, signage and exhibits of bog plants. With Challenge #2 successfully accomplished, we waited … but not for long.

It began, right on schedule, at 9:00 am. In the distance they emerged from behind the trees and marched down the path in single file. With smiling faces and tools in hand, they were reminiscent of Snow White's friends. I could almost hear the cheerful refrain of "Heigh-Ho, Heigh-Ho". Most appeared happy and, although a few seemed bashful (or was it sleepy), none were grumpy. All were curious… what had they gotten themselves into? Oh, who were they you ask? Scouts, of course! Boy Scouts and Girl Scouts from regional troops #25, 207, 790, 2019, 5209 and 32254 who had been recruited as volunteers. It didn't take long for the scouts, some accompanied by parents, siblings, and troop leaders, to gather around the check-in table.

Everyone signed-in and enjoyed hot chocolate.

The scouts were prepared… as advertised!

Photos by Duane Erdmann

Soon after the scouts arrived it happened again. But this time I thought I heard the unmistakable blaring of trumpets. And once again they came… out of the forest and along the trail like so many Roman legions. Instead of banners, lances and swords, however, they carried chain saws, brush cutters and loppers. They were prepared to challenge the toughest foe. These were the more experienced volunteers. Scientists, gardeners, hobbyists, educators and naturalists… they represented the Native Orchid Conference, the Smithsonian Environmental Research Center, Longwood Gardens, Southeastern Pennsylvania Orchid Society, Delaware Orchid Society, Drums Garden Club, Fishing Creek Herb Guild, Hazleton Area Garden Club, Back Mountain Bloomers, Philadelphia Botanical Club, Friends of the State Line Serpentine Barrens, Pennsylvania Natural Heritage Program, Mount Cuba Center and the Brandywine Conservancy. They traveled from six states (PA, NJ, CT, MD, DE and NC). The distance traveled award went to Dick Barmore and Elizabeth White who drove 573 miles (one way) from Oriental, NC. I still owe them a beer for their dedication.

Scientists from various agencies offered their expertise. They cut brush too!

View to the North

finished product

Great job

view to the West

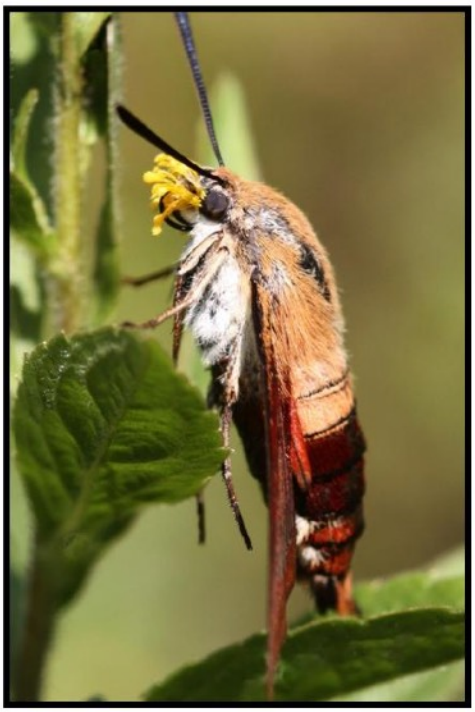
Photos by Duane Erdmann

I had lost sleep wondering if we would have enough help. Not to worry. By the time everyone signed in there were more than 100 (no, that's not a typo) one-hundred eager volunteers ready to tackle the daunting task ahead. We crushed Challenge #3.

Challenge #4 was another story. How could we possibly clear a two acre sphagnum bog in the time allotted? After a brief orientation we were about to find out. We had delineated ten "sectors" on the Luzerne County tax map. The thinking was that we would tackle the toughest sectors first and work our way through as many as we could before lunch. In fact, we had enough people to assign two or three folks with chain saws and brush cutters to each sector. These "lumberjacks" felled trees, some as large as 8" in diameter, and cleared thick patches of 8'-10' tall shrubs and brush. The older scouts acted as "haulers"… they dragged the trees and cuttings out of the wetlands and onto the service road where they were met by a gauntlet of "clippers". This group used an assortment of hand tools to cut the material into manageable pieces. Finally, "loaders" piled the cuttings onto trucks so they could be carted out of the orchid habitat to an area where they would quietly biodegrade.

Watching a group of scouts at work is a genuine pleasure. Everyone stayed on task and the coordination between groups was seamless. There was a great deal of curiosity, lots of questions and numerous requests to return in the Spring to see the orchids in bloom. I couldn't help but recall my days as a Boy Scout. Of course that was during the Dark Ages, long before there was such a thing as female Boy Scouts.

Although it wasn't possible to greet all the scouts individually, I did manage to interact with some. I recall Hope, who gave me a high-five every time our paths crossed. A young scout wearing a rose-pink ski jacket flashed a pretty smile … her name, quite appropriately, is Rose. During orientation (we had visited several Scout meetings in the weeks leading up to Nov. 20) a young lady named Teagan made written notes … she

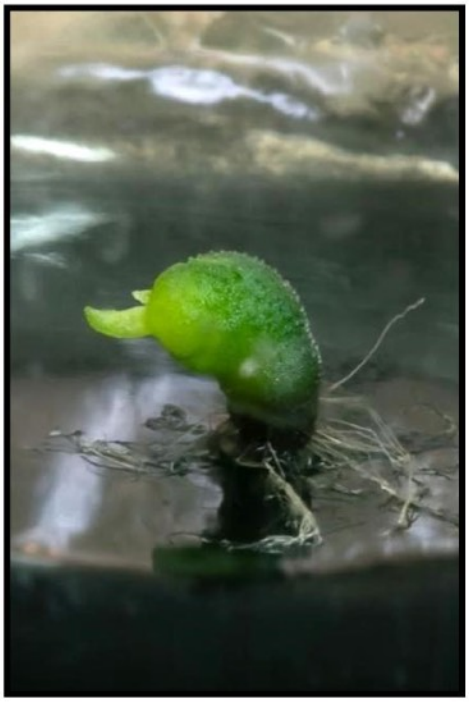


Sphinx moth ssp. with Platanthera pollinia attached to its eyes.

Photo: Stefan Ambs

Motion activated cameras were used to record pollinator activity. The cameras needed periodic monitoring. When you need a techie who ya gonna call … the Girl Scouts*!*

Longwood staff working in the bog.



Platanthera seedling germinated in vitro at Longwood Gardens.

Photo: Peter Zale

Lumberjacks felling big stuff

Haulers hauling

Clippers clipping

Loaders loading

The final push

The last load pulls out

Photos this page: Duane Erdmann

led me to suspect that there were a few budding botanists (pun intended) in the group. Eagle Scout Jareth came out a few days early to "practice" and, in so doing, he helped establish our cutting techniques. Logan and Conner stayed until the bitter end to be sure the last piles of cuttings got loaded onto the truck.

Out of an abundance of caution, we had arranged to have an EMT on site. He didn't have to dispense so much as a Band-aid. Ten area restaurants generously donated lunch for the volunteers. Shortly after Noon everyone enjoyed burgers, tacos, bagels, chicken sandwiches, pizza and beverages. In the weeks following the event we distributed certificates of appreciation to the scouts as well as the restaurants. All things considered, our planning and logistics were quite effective.

Did I mention that we crushed Challenge #4? Much to everyone's amazement, the entire area of concern was cleared in three hours***!!*** And this is where Grandma enters the picture. "Many hands make light work," she would say. Indeed they do.

And the Beat Goes on

Kent Jackson (the aforementioned local reporter) began following the Valmont project a decade ago; he also attended our work party. Kent's interest, enthusiasm and reporting are surely responsible, in part, for generating local interest. Over the years, as they have come to know more about the natural treasure in their "backyard," area residents have begun to assume a "sense of responsibility." It is those people who hold the keys to success. They are the ones who will ultimately assure that Valmont Bog continues to shine as a beacon of conservation. It is expected that they will monitor the bog, discourage vandalism and help keep the bog accessible to scientists and nature enthusiasts.

Scientific research at Valmont continues. Because of its unique flora and relative ease of access, Valmont Bog is the subject of much curiosity and interest. Scientists and hobbyists from across the continent have visited, photographed and pondered Valmont. Australian scientist Zoe Smith PhD planted orchid seed packets to study germination. Melissa McCormick, PhD from SERC collected tissue samples for DNA analysis which will reveal the relationships between the orchid hybrids. She also collected root samples in order to isolate, identify and hopefully cultivate the mycorrhizal fungi that are essential for successful germination and seedling growth. In addition, Dr. McCormick is actively tracking pollinator activity in the bog. Peter Zale, PhD, Ashley Clayton, and Kevin Allen of Longwood Gardens collected orchid seeds which were successfully germinated (no simple task) and the seedlings were brought to flower.

The objectives of this research are many and varied. In addition to an inherent obligation to preserve our native flora for legal and aesthetic reasons, there could be practical ramifications. Further understanding of the complex relationship between plants and fungi may have application in the fields of horticulture and even agriculture. Longwood's germination studies will lead to establishing orchid populations in new

habitats and/or returning them to degraded habitat. That, in turn, will enable public display of rare and beautiful species and perhaps pave the way for hobbyists to grow native orchids.

Meanwhile, NBLT is contemplating ways to make the flora of Valmont more accessible to the public. Thought is being given to a trail, interpretive signage and even a viewing platform so everyone can enjoy the extraordinary spectacle of this most unusual assemblage of orchids at Valmont.

Spring 2022

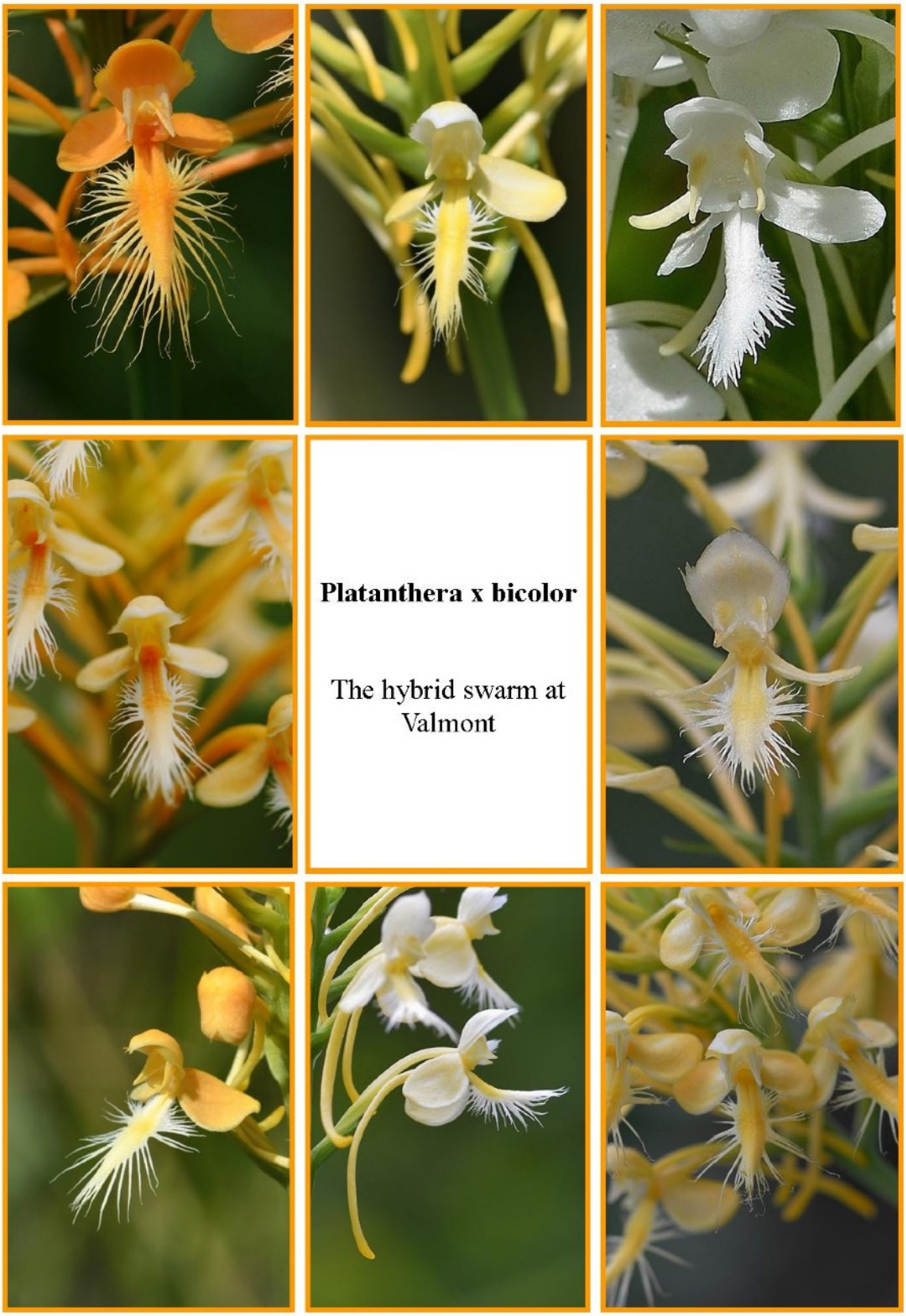
Ready for Orchids

July 2022

Calopogon put on a remarkable show after the clean-up

Photo: Ralph Graeser

Scouts and vendors received certificates of appreciation


Platanthera x bicolor
The hybrid swarm at Valmont

Pink Lady's-slipper
(Cypripedium acaule)

Loesel's twayblade
(Liparis loeselii)

Nodding ladies'-tresses
(Spiranthes cernua)

Other Orchids of Valmont

Club-spur orchid
(Platanthera clavellata)

Grass pink
(Calopogon tuberosus)

Lily-leaved twayblade
(Liparis liliifolia)

OZETTE CORALROOT-
IDENTIFICATION, ECOLOGY, DISTRIBUTION, AND STATUS

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

Ozette Coralroot (Figure 1) was described as a new variety of Spotted Coralroot (*Corallorhiza maculata* Raf. Amer. Monthly Mag. & Crit. Rev. 2: (1817)) in 2001. The new var., called *ozettensis* E.L. Tisch (Tisch 2001a), was named after the Ozette band of Makah people on the Olympic Peninsula of Washington, and the type locality is Cape Alava, near Ozette.

For some time, this Coralroot was thought to be endemic to the Olympic Peninsula, where 10 endemic plant species are known (Gavin 2015). Gradually var. *ozettensis* was observed to have a broader distribution which extended further to the east, where found by Chelsea Kieffer on Whidbey Island, Island County, Washington (Brown 2006b, Hanko 2022). This and other discoveries resulted in an increasing interest in finding more locations. By 2022, it was found to be widespread in the region of the Straits of Juan de Fuca, southern Vancouver Island, and north in the Straits of Georgia to the northern Gulf Islands.

By this time, it had attracted a lot of attention and many people were wondering how to identify it, whether or not it should be treated as a distinct variety, or a colour variant, and what its distribution really was.

***Housekeeping - Corallorhiza maculata* var. *ozettensis* - new after the split**

Corallorhiza maculata var. *ozettensis* was accommodated in *Corallorhiza maculata* f. *immaculata*, until *C. maculata* was split into var. *maculata* and var. *occidentalis* by J.V. Freudenstein in 1997. *Corallorhiza maculata* f. *immaculata* was originally described by well-known Oregon botanist, M.E. Peck who noted simply: "stem averaging more slender than in the species, the perianth parts, except for the lip, averaging larger and decidedly narrower, the lip pure white and wholly unspotted." Peck did not refer to the colour of the rest of the plant. Thus, var. *immaculata* can be a yellow, or brownish, or reddish-purple plant, but with a white (unspotted) lip. Such plants occur in the Cascades of west – central Oregon. The type is from Cottage Grove in the lower Willamette valley, where it was collected by H.B. Taylor in 1947. The specimen, in the Willamette University (WILLU) collection at Oregon State University (OSU, https://oregonflora.org/dbimages/OFPimages/OFPImages_big/2017/OSC0001995.jpg), has been annotated by expert on *Corallorhiza*, J.V. Freudenstein in 1992: "Holotype of *Corallorhiza maculata* (Raf.) Raf. var. *immaculata* M.E. Peck, Leafl. W. Bot. 7: 177. 1954. = *C. maculata var. occidentalis*." The pressed plants appear to have been brownish- or reddish-purple. Since f. *immaculata* has been determined to be within var. *occidentalis,* a taxon with a broad lip, then var. *ozettensis,* with a relatively narrow lip, does not belong here.

The only white-lipped form described in the narrow lipped var. *maculata* is f. *flavida,* which is described as, and well known as, a yellow plant based on *Corallorhiza multiflora* var. *flavida* M. Peck *in* New York

Figure 1. *Corallorhiza maculata* var. *ozettensis*. a, b, c, d, e, g, Cape Flattery, Olympic Peninsula, Washington, USA, 29 June 2022. f, Devonian Regional Park, Metchosin, west of Victoria, British Columbia, Canada, 6 July 2022. a, Frontal view of flower showing brown anther cap at tip of column; b, Oblique frontal view of flower showing anther cap shrivelled and pollinia rotated onto stigmatic surface and dangling below tip of column; c, Side view of flower showing pollinia rotated onto stigmatic surface and shrivelled anther cap; d, Frontal view of flower showing relatively narrow terminal portion of the lip; e, inflorescence showing nodding pollinated flowers at the base; f, Brenda Kostiuk photographing Ozette Coralroot along a trail on a slope along trail in open Douglas Fir woodland; Plants in open conifer woods.

State Bot. Rep. 15(501): 126 (1897). Peck writes: "nearly the whole plant has a pale yellow color, the lip of the flower being white and unspotted" (https://books.google.ca/books?id=IzclAQAAMAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false). Since var. *ozettensis* is a brownish- or reddish-purple plant with a narrow unspotted lip (sometimes with a pale reddish-purple or rose central line), it was new, when it was described in 2001.

Identification

Tisch (2001a, 2001b) provided a few characters to help define his new variety, including simple lateral nerves of the lip (usually) and subentire margins of the central lobe of the lip. These features are helpful but a little more difficult to evaluate, and also somewhat variable. Most botanists and photographers know the plant by its white lip, and it has become widely known this way with almost 100 locations now on the iNaturalist map. We tested a number of additional characters, but we did not find others that were useful.

It can be distinguished from other white-lipped *C. maculata* using the following key:

> **1a.** Middle lobe of lip distinctly expanded toward the tip, 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
>
> **1b.** Middle lobe of lip expanded slightly or not at all toward the tip; 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 … 2
>
> **2a.** Plant mostly yellow and lip white … ***Corallorhiza maculata* var. *maculata* f. *flavida*** (Peck) Farwell
>
> **2b.** Plant mostly reddish-purple or brownish and lip white … ***Corallorhiza maculata* var. *ozettensis*** Tisch

In terms of colour and morphology, var. *ozettensis* differs from var. *maculata* f. *flavida* principally in the colour of the plant. It differs from reddish-purple or brownish-purple plants of var. *occidentalis* f. *immaculata* principally in the terminally narrow lip.

Pollination Ecology

In some flowers of Ozette Coralroot the tip of the column of recently opened flowers has turned dark brown (Figure 1a). This may be a result of the anther cap drying out to release the pollinia from the compartment on the top of, and at the tip of, the column (Figure 1b, c). This enables the pollinia to rotate onto the stigmatic surface on the lower side of the column. A similar process has been described for other Coralroot taxa where the anther cap is raised on tissue acting as a hinge on its upper side (Catling 1983,

1990: Freudenstein 1997: 7). The shrivelled anther cap of var. *ozettensis* can be seen in older flowers. Pollinated flowers, lower in a mature inflorescence, bend downward (Figure 1e).

When the pollinia are suspended, movement onto the stigmatic surface may be facilitated by wind, rain, and excess stigmatic fluid (oversecretion of the stigma). The possibly increased importance of wind in this case, in comparison with rain-assisted autogamy in other species, requires more study. The fact that the method of auto-pollination may be recognized by the dark spot at the tip of the column in a fresh flower, may provide helpful information in future studies

Distribution and climate ecology

We examined photos of all of the white-lipped *C. maculata* in Oregon on iNaturalist (https://en.wikipedia.org/wiki/iNaturalist) to determine whether or not the colour variants had a distinctive distribution pattern. To identify the variants, we used the key above. There were 602 observations of *C. maculata* in Oregon (534 as *C. maculata*, 61 as *C. maculata* var. *occidentalis*, 7 as *C. maculata* var. *maculata*, and none as *C. maculata* var. *ozettensis*). There were 19 with white lips, and for many of these, terminal lip expansion was measurable, or at least clear.

Of these white-lipped spotted coralroots: 2 were *C. maculata* var. *maculata* f. *flavida*, 4 were yellow *C. maculata* var. *occidentalis* f. *immaculata*, 7 were reddish-purple *C. maculata* var. *occidentalis* f. *immaculata,* and 6 were *C. maculata* var. *ozettensis.*

It is clear from the map (Figure 2) that var. *ozettensis* has the most distinctive geographic distribution which is mostly coastal with only one inland location. The coastal area is an ecologically distinct climate region.

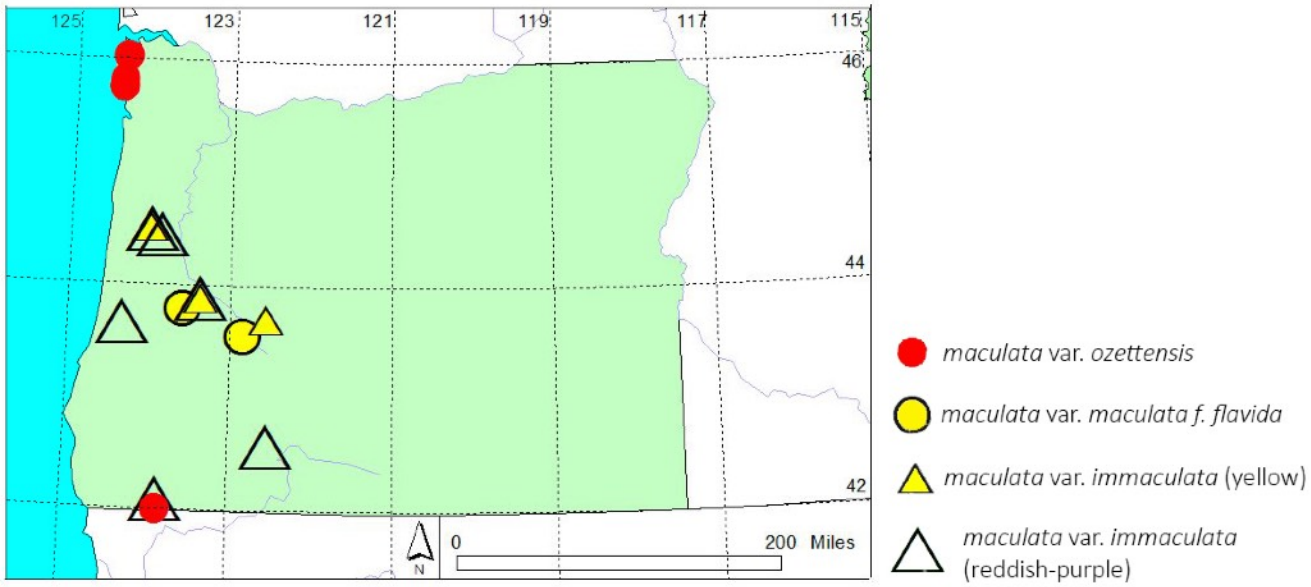


Figure 2. Distribution of white-lipped coralroots in Oregon.

This is the same pattern that we have seen in British Columbia and Washington. Var. *ozettensis* has a mostly coastal distribution with few inland locations. Preliminary observations suggest that it may also apply to California.

The observations from Oregon are the first reported to date. Four of them are for the northwestern Pacific coastal area of Seaside, Arch Cape, and Oswald West State Park. In California, Ozette Coralroot appears to be common in the San Francisco Bay area. There are many observations on iNaturalist from this area (47374880, 50352321, 51659946, 80830747, 80980391, 79573526, 81113578, 81879211, 112942521, 115854264, 121464073, 122065917, 123449790, 125321020, 128263191, etc. To see any of these, insert the number after the following link: https://iNaturalist.com/observations/). Some of the plants in this area are more robust, have more dense flowering spikes, and have a more prominent reddish-purple stripe in the centre of the lip, as well as reddish-purple, or rose, in the terminal part of the lip (Figure 3). The southern limit of the presently known range is in Cleveland National Forest, Pauma Valley, north of San Diego, California (Figure 4).

Figure 3. Ozette Coralroot in Wildcat Canyon Regional Park, Richmond, California, in the San Francisco Bay area. Here, it is the predominant colour variant in some areas. In this region plants are sometimes robust with a dense inflorescence and a prominent reddish-purple stripe on the lip, and the tip of the lip pinkish, or rose-coloured. iNat. Photo 82090836, photo by mugwortd, 30 June 2020, CC BY-NC 4.0.

Figure 4. Ozette Coralroot in Cleveland National Forest, Pauma Valley, north of San Diego, California, the southern limit of its known range. The relative number of photos from this region suggest that it is rare here. iNat. Photo 206259994, photo by smfang, 13 June 2002, CC BY-NC 4.0.

***Corallorhiza maculata* var. *ozettensis* … a form or a variety?**

Many white flower variants are treated as forms, and all northwestern Coralroot orchids have named white-lipped forms. Would this plant be better treated as a form? Some have observed that it only differs from *C. maculata* var. *maculata* f. *flavida* by the colour of the plant (see key above).

We are acquiring more information on distribution all the time, but based on what we have at present, the reddish-purple plants with a narrow unspotted lip are mainly coastal. They occur inland at a comparatively low frequency. They occur along the coast in an ecologically distinct climate region as the dominant kind of coralroot, and in many (but not all) places, are the only kind present. This suggests that they are, to some extent, ecologically distinct.

Another indication of their distinct nature is a different peak flowering time. Although they may overlap with other forms and varieties of *C. maculata* in flowering, a degree of separation is suggestive of a genetic difference. In southwestern British Columbia and northeastern Washington, *C. ozettensis* may flower later than *C. maculata* var. *occidentalis* and *C. maculata* var. *maculata* f. *flavida*.

Epilogue

The two very interesting and related questions about "Ozettes" are: (1) Does the taxon deserve recognition? and if so; (2) What rank is appropriate? A taxon deserves recognition when it is discrete, but how discrete? Rank also depends on "how discrete." The concept of v*arietas* is considered useful only in the sense of morphological discontinuity involving one or a few differences that have a geographic basis (Catling & Lucas 1987). A geographic pattern with discontinuity between two conditions, separate peaks on a graph (bimodality), or separate clusters, any of which are based on another feature, may be satisfactory to define a variety.

Some of the features considered above including lip shape, lip colour, distribution, ecology, and flowering time, seem to make varietal rank appropriate, … for the present. For the future, we will enjoy gathering and debating new information on "Ozettes." People will take the time to make careful observations over long periods. We will make progress with a variety of people, with a variety of skills, and various kinds of information.

As we have considered more information, some varieties have become forms (e.g. *Corallorhiza trifida* var. *verna*), and some varieties become species (e.g. *Platanthera macrophylla* which was even treated as a form by Morris and Eames in 1929 until more information proved Goldie to have had the best idea, in 1822, about it being a species!) The point is that methods of recognition and the ranks change, but the classification system gradually improves. We make the best decisions we can at any time. The final outcome may be less interesting than what we learn along the way. "It's not the destination. It's the journey." (attributed originally to Ralph Waldo Emerson). The journey with Ozette Coralroot will continue to unfold.

References

Brown, P.M. 2006a. Wild orchids of the Pacific Northwest and Canadian Rockies. University Press of Florida. Gainesville. 287 pp.

Brown, P.M. 2006b. Ozette Coralroot rediscovered in Washington. North American Native Orchid Journal 12: 72.

Catling, P.M. 1990. Auto-pollination in the Orchidaceae. pp. 121-158 in J. Arditti, ed. Orchid Biology, reviews and perspectives, V. Timber Press, Oregon. 451 pp.

Catling, P.M., and Z. Lucas. 1987. The status of *Calopogon tuberosus* var. *latifolius* with comments on the application of varietal rank. Rhodora 89: 401-413. https://www.biodiversitylibrary.org/item/24166#page/395/mode/1up

Freudenstein, J.V. 1987. A preliminary study of *Corallorhiza maculata* (Orchidaceae) in eastern North America. Contr. Univ. Michigan Herb. 16: 145–153.

Freudenstein, J.V. 1997. A monograph of *Corallorhiza* (Orchidaceae). Harvard Papers in Botany 10: 5-51.

Freudenstein, J.V. and J.J. Doyle. 1994. Plastid DNA, morphological variation, and the phylogenetic species concept: the *Corallorhiza maculata* (Orchidaceae) complex. Systematic Botany 19(2):273-290. https://doi.org/10.2307/2419602

Gavin, D.G. 2015. Vegetation stability and the habitat associations of the endemic taxa of the Olympic Peninsula, Washington, USA. Frontiers of Biogeography 7(2): 38-51. https://par.nsf.gov/servlets/purl/10018062

Hanko, R. 2022. Ozette Coralroot – *Corallorhiza maculata* (Raf.) Raf. var. *ozettensis*. American Orchid Society. https://www.aos.org/orchids/additional-resources/ozette-coralroot.aspx

Heshka, L. 2006. Plant of the month – Spotted Coralroot, *Corallorhiza maculata* (Rafinesque) Rafinesque. Native Orchid News (Native Orchid Conservation Inc.) 8(2): 2 pp. http://www.nativeorchid.org/news200604.htm

Magrath, L.K. and J.V. Freudenstein. 2002. 56. *Corallorhiza.* Flora of North America. Flora of North America vol. 26: 633-638. Online http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=200853

Tisch, E.L. 2001a. *Corallorhiza maculata var. ozettensis* (Orchidaceae), a new coral-root from coastal Washington. Madrono 48:40-42. https://www.biodiversitylibrary.org/part/171507

Tisch, E.L. 2001b. New variety of *Corallorhiza maculata* (Raf.) Raf. in coastal Washington. https://www.ou.edu/cas/botany-micro/ben/ben276.html

BANANA SLUGS, OZETTE CORALROOT ORCHIDS, …AND WHY NOT, … DOGS

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

There is a delightful book about Banana Slugs (*Ariolimax columbianus*) by Alice Bryant Harper (1988). It has many very clever observations, but one that struck us in particular was the quote from John Muir, "When we try to pick out anything by itself, we find it hitched to everything in the universe."

Pacific Banana Slugs are native to the foggy, damp forests of the west coast of North America (from Sitka, Alaska, south to central California). They eat a great variety of foods. Harper (1988) writes, "what don't Banana Slugs eat?" Fungi are a favourite food. They also eat garden plants, animal droppings and carcasses.

At a few sites on the Olympic Peninsula, and also west of Victoria, we found Banana Slugs frequently along trails. In some of these sites, they seemed to be more frequent along the trail than elsewhere in the woodland. An explanation for congregating along the trails soon appeared. We found both Banana Slugs and Chocolate Arion Slugs (*Arion rufus*) feeding on decomposing dog feces (Figure 1). We wondered if dogs may be contributing to apparent higher populations of slugs along the trails.

Figure 1. Two large slugs (4 inches) feeding on decomposing dog feces. The black slug on the left is the Chocolate Arion Slug (*Arion rufus*). On the right is a Banana Slugs (*Ariolimax columbianus*). Both of these slugs appear to congregate along trails where they are attracted by decomposing feces. Devonian Regional Park, Metchosin, west of Victoria, Vancouver Island, 6 July 2022. Photo by P.M. Catling.

Orchids, particularly Ozette Coralroot (*Corallorhiza maculata* var. *ozettensis*), were also more common along the trails than in the adjacent woods. This was probably due to intermediate disturbance gradients along trails. Although trampling may kill almost everything along the middle of a trail, the edges experience various levels of trampling which favours some species over others. Orchids are often favoured, probably due to their dispersal and colonization capabilities, and because of the presence of appropriate fungal species (as well as a general adaptation to changing conditions).

Ozette Coralroot still a restricted species, so threats are relevant

This orchid has been listed among the 10 plants that are endemic to the Olympic Peninsula (Gavin 2015). Although it has a more extensive distribution than initially thought, extending at least from the northern Gulf Islands in the Strait of Georgia in British Columbia south along the coast at least to northern Oregon, it is not found only on the Olympic Peninsula as initially thought. Based on our current knowledge, it is still a restricted taxon with a largely coastal distribution that occurs in small, sporadic populations.

With such a varied diet, it should be no surprise that Banana Slugs eat orchids. At two sites we found Banana Slugs feeding on Ozette Coralroot Orchids (*Corallorhiza maculata* var. *ozettensis,* Figure 2), and at other sites we noticed damage that was likely due to slugs. On 29 June 2022, at a trail at Shi Shi Beach, south of Cape Flatterly on the Olympic Peninsula, we watched a Banana Slug eat two entire flowers of Ozette Coralroot (Figure 2). Later, on 6 July 2022, west of Victoria (Canada), and south of Metchosin in Devonian Forest, we found a Banana Slug feeding on an inflorescence of Ozette Coralroot where all the flowers had been destroyed.

What to do?

The first thing that comes to mind is to put up some signs (don't do this, you can't do that, - everywhere signs) like … "No Slugs," "No eating orchids," "No dogs," "Scoop poop," "Trail closed," "Proof of having taken the Non-consumptive Use Course, must be in hand before using this trail," "Closed to orchids," etc. Some of this seems funny at first, but it is also sad. We often do not really know what to do!

What are the other options. We could wage war on the slugs. Various articles have been written about controlling slugs commercially and otherwise, and on orchids (see https://www.aos.org/orchids/orchid-pests-diseases/snails-and-slugs.aspx, https://oregonorchidsociety.org/cultivation/orchid-pests-disease/slugs-snails).

For example, slugs can be conveniently (if not safely) controlled with food pellets containing the poison metaldehyde, which can affect other animals, including humans. Another possibility is to use beer in

Figure 2. Banana Slug (*Ariolimax columbianus*) finishes eating a flower of Ozette Coralroot (*Corallorhiza maculata* var. *ozettensis)* on the right. The eye tentacle of the slug is on the right, the slug's breathing pore is in upper centre, and an intact flower is on the left. Shi Shi Beach, south of Cape Flattery, Olympic Peninsula, 29 June 2022. Photo by P.M. Catling.

shallow containers. Slugs are attracted to beer and drown in it. There are also ways of using coffee to control slugs. Surely there are better uses for these favourite beverages!

There are already slug recipe contests on the Pacific Coast, where celebrities act as tasters and judges. The basis for these events is fun, money, and the idea that the slugs are common and repulsive, and therefore expendable. We agree that "it is not ecologically defensible to slaughter non-game animals just for laughs" (Harper 2015). We respect a will to live in every living organism, and we do not find slugs repulsive, or without value.

Thinking back to Muir, and with people now possibly enhancing Banana Slug populations, we may consider something that might reduce them in some areas. If local habitat was made more suitable for the Pacific Giant Salamanders (*Dicamptodon* spp.), which eat Banana Slugs, this may contribute to the survival of orchid populations. Of course, the salamanders may eat the insects that pollinate the orchid. We have had so many ecological disasters as a result of introducing something to control something else. It seems wiser to just manage our own negative impacts.

Perhaps the most important consideration is whether or not the slugs are really the enemies. They do not eat seedlings of forest conifers, but they do eat everything else, even a variety of poisonous plants. In this way they protect their cover and moist habitat by removing competition for the trees. Thus, they do play a role in protecting orchid habitat.

We have only touched on some of the thoughts that grow out of a simple observation, but our brief discussion has made it very clear that nothing exists by itself, and that our impacts are often unimaginable, and the solutions multiple and controversial. Often, when elaborated, they come back to us as a cause. "We have met the enemy and he is us" (From Walt Kelly, Pogo Possum to Porkypine referring to a pile of garbage in a primeval forest). Relationships in nature may be extensive, but the problems in nature may trace back to humans without a long investigation. We might call this the "boomerang effect." Whatever we call it, knowledge of the root cause may be helpful in developing optimal solutions.

More information would be useful here. If more data shows that people are substantially enhancing slug population where susceptible orchids occur, then we like the "scoop poop" idea. This may work well for some particularly important orchid trails. All the friendly dog walkers on our street scoop off our front lawn, but we would rather have scooping on some Pacific Northwest trails, … if we had a choice. We note that the dogs are often a major reason for trails, and that dogs also contribute to the disturbance gradient along trails, thus promoting orchids. It also matters that dog-walkers are some of the most supportive people when it comes to the protection of natural landscapes, and we don't gain much by fighting amongst ourselves.

Apart from the philosophical aspects of our observations, it is to be noted that the understanding of threats to native orchids is very incomplete. Threats due to slugs are generally not well documented. Detailed reports of slug damage to orchids mostly involve commercially cultivated species such as *Vanilla, Dendrobium*, and *Phalaenopsis*, or generally apply to cultivation of tropical orchids. Examples of slug damage in natural habitats is useful, but generally not quantified, or assessed in terms of significance (e.g. Keenan 1986, Wells and Cox 1991, Chute 2004, Williams 1994, Taylor and Roberts 2011, and Rhinehart 2019). It may be very helpful to protection and management of native terrestrial orchid populations to learn more about the impact of slugs.

"OUR WAR ON SLUGS"

Of course, we are only interested in terrestrial orchids, and only those in North America (in the restricted sense of north of Mexico). However, we did not mention diatomaceous earth as a control method (which we are **not** recommending to be sprinkled along woodland paths). An interesting and helpful article about using diatomaceous earth to control slugs on cultivated epiphytic orchids is worthy of mention (http://www.theorchidcolumn.com/2016/08/our-war-on-slugs.html). The Rainbucket Orchids are particularly sensitive to greenhouse pests such as slugs. This may be another example of the boomerang effect. The roots grow up and out forming a matrix for an ant colony. The mass may be a few feet in diameter and contains thousands of biting and stinging ants and bees. They attack anything that threatens the plant. Cultivated plants have been disarmed by humans killing insects in greenhouses. They need their armies to survive, so it is our fault. We meet the enemy once again.

References

Gavin, D.G. 2015. Vegetation stability and the habitat associations of the endemic taxa of the Olympic Peninsula, Washington, USA. Frontiers of Biogeography 7(2): 38-51. http://escholarship.org/uc/item/3dk4069j

Harper, A.B. 2015. The Banana Slug, a close look at a Giant Forest Slug of Western North America. Otter B Books, Santa Cruz, California. 32 pp.

Williams, S. 1994. Observations on reproduction in *Triphora trianthophora* (*Orchidaceae*). Rhodora 96(885): 30-43. https://www.biodiversitylibrary.org/item/102737#page/31/mode/1up

Keenan, P. E. 1986. New stations for *Platanthera flava* and *Triphora trianthophora* and other observations. Rhodora 88: 409-412. https://www.biodiversitylibrary.org/item/24165#page/409/mode/1up

Chute, L. 2004. Introduced slugs are damaging threatened orchid in New Hampshire. Botanical Electronic News 321. http://mpb.ou.edu/ben/ben321.html#6

Rhinehart, J. 2019. Orchid of the month – February, *Tipularia discolor* (Pursh) Nutt., the Crane-fly Orchid, Native Orchid Preservation and Education Society Newsletter. February 2017.

Taylor, L., and D.L. Roberts. 2011. Biological Flora of the British Isles: *Epigogium aphyllum* Sw. Journal of Ecology (British) 99 (3): 878-890. https://doi.org/10.1111/j.1365-2745.2011.01839.x

Wells, T.C.E. & Cox, R. (1991). Demographic and biological studies on Ophrys apifera: some results from a 10-year study. In Wells, T.C.E. & Willems, J.H. eds, Population Ecology of Terrestrial Orchids, 47–61. Academic Publishing, The Hague.

The Native Orchid Conference Journal is published by the Native Orchid Conference, Inc. as a service to its members. The organization is devoted to fostering the study, conservation, and enjoyment of orchids native to North America.

Membership dues are $15 (student), $30 (individual), $35 (family). Apply online: www.nativeorchidconference.org/membership

Address inquiries about membership and requests for copies of the bylaws to: Richard Barmore, Treasurer, rebster61@yahoo.com

For printed back issues of the Native Orchid Conference Journal, contact: Jean Stefanik, jeango4it@aol.com

Thanks for our contributors and our peer-review editors from our Publications Committee:
Katharine Gregg, Ph.D.
Judy McCrary
David Taylor

We are looking for articles and peer-review editors to join our Publication Committee. Please inquire or send articles to: Chelsea Kieffer, Editor chelseakieffer@gmail.com

Organization registered as 501(C)(3) with Federal EIN number 20-0216770

Native Orchid Conference Journal registered with ISSN 1554-1169

Copyright 2023

Native Orchid Conference, Inc.
Founded 2002

nativeorchidconference.org

NOC Facebook Group: www.facebook.com/groups

NOC Facebook Page: https://www.facebook.com/The-Native-Orchid-Conference-Inc

ISSN 1554-1169