THE NATIVE ORCHID CONFERENCE JOURNAL

VOLUME 16.1

The Native Orchid Conference, Inc.

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THE NATIVE ORCHID CONFERENCE JOURNAL

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Greetings members of the Native Orchid Conference and all who encounter this *first electronic edition* of the Journal. You might not have heard from us for while, but the Board has been busy behind the scenes with the affairs of the organization including holding monthly Board meetings and organizing this year's Native Orchid Symposium. We hope to see you there.

I am pleased to announce the appointment of Ms. Chelsea Kieffer as the new Editor of the Native Orchid Conference Journal. Chelsea is a Maryland native who holds a degree in Interdisciplinary Studies in Visual Communication Design and Biology from Stevenson University. Her varied background in the fields of botany and conservation will serve her well as she undertakes this new role in the NOC.

As a volunteer at the Smithsonian Environmental Research Center, Chelsea assisted with native orchid surveys. She is experienced as a lab technician and imaging specialist in the photography business and has worked for the Maryland Park Service as well as the Missouri Department of Conservation. For the last five years, however, she has worked on the west coast as a botanist for the National Park Service and the U.S. Forest Service.

Chelsea credits her parents and grandparents for instilling in her a love of nature and photography. Her summers were spent in the Adirondack Mountains among the beautiful lakes, forests, streams and bogs where she loved exploring, identifying plants and taking photos. Her interest in native orchids and her relationship with the NOC go back many years. Chelsea is passionate about her work, especially locating and monitoring rare plants (orchids in particular). She also enjoys hiking, biking, camping and kayaking; all while taking pictures along the way!

Since it debuted over fifteen years ago, the NOC Journal has been an important part of our organization. Past editions have included a variety of articles recounting the efforts and activities of our members and associates as well as other respected scientists, educators and conservationists across North America. Our technical articles have focused on laboratory analysis and field research. Other entries have included profiles of native orchid species or genera, summaries of projects in which members participate, reviews of unique orchid sites, articles of interest outside North America, exciting travelogues, symposium summaries, personal encounters with specific orchids or habitats, and much more. I'm sure Chelsea will continue this fine tradition of producing a Journal that highlights our special organization and which will make us all proud to be part of its important conservation effort.

My thanks go out to Dr. Paul Catling who continues as technical advisor to the Journal and to our great team of volunteer copy editors.

Sometimes perceived as a reflection of the personal interests and expertise of its editor, the Journal is more than that. It depends on contributions from you. We welcome articles related to Native Orchids of North America and we can't produce a Journal without your input.

On behalf of the entire Native Orchid Conference, I would like to extend sincere thanks to Dr. Bob Ferry for his outstanding work as Journal Editor. He completed two stints in that capacity (most recently from July, 2014 to June, 2018) and retired from the position; we wish Bob and Wilma all the best.

Ben

Ben Rostron, President

Native Orchid Conference

Bruce Peninsula, Ontario, Canada
June 14 - 17, 2019

Symposium Over view

In June of 2003 our second annual symposium was held on the Bruce Peninsula in Ontario, Canada. This year, our eighteenth consecutive, annual event will revisit the world-famous, orchid-rich "Bruce".

As has been our standard practice, there will be two days of presentations and two days of field trips. An optional visit to Flowerpot Island will be offered. A list of potential accommodations (motels, campgrounds, B&B's) for the peninsula area is available on our website.

Registration will be limited to the first 100 people from whom we receive responses. For your convenience, electronic registration and a PayPal option will be available. Visit our website for instructions:

www.nativeorchidconference.org

Registration at the door is *not* available.

Feel free to copy and share conference information with friends and let us know of others who might be interested.

CONFERENCE FEE:

Full Registration: $150 US per person

Student Registration: $ 75 US per person

(available for full-time students at any high school, college or university)

Case Grant Program: The NOC supports native orchid research and conservation through its Fred Case Grant program. Twenty-five dollars from each full symposium registrant will be directed to an endowment fund which supports the program. That amount is tax-deductible under US IRS regulations governing charitable contributions.

After receipt of your registration, a confirmation notice, updated symposium details (if any), and an orchid species list will be sent to you via email.

Our base of operations and venue for the Thursday ice-breaker is the Tobermory Princess Hotel. The nearby Tobermory Community Center is our lecture venue.

For those who wish to extend their stay, there are many interesting places to explore across this rich region. Information about points of interest on or near the Bruce is available on-line. In addition to orchids, there are many rare and unusual plants, birds and geological formations to be found.

A most important aspect of this event is the opportunity to meet people who share a common interest in natural history in general and native orchids in particular. Many long-lasting friendships and professional relationships have been formed at NOC symposiums Why not take this opportunity to renew them and/or make new ones on the wild, wonderful Bruce Peninsula?

Fairy Slipper Orchid
(Calypso bulbosa)

Highlights:

- *Optional ice-breaker & early check-in Thursday evening*
- *Presentations on Friday & Sunday*
- *Field trips on Saturday, Sunday & Monday*

FEATURED SPEAKERS

Paul Catling- ***"Why Are There So Many Orchids on the Bruce"***

Tom Sampliner- ***"Orchid Flora of the Bruce"***

Collin Walter- ***"Collection and Transport of Orchids From Palau"***

Julianne McGuiness- ***"NAOCC Update"***

Nile Dusdieker- ***"Orchids Over the Andes"***

Pati Vitt- ***"Prioritizing Orchid Conservation: From Global to Local"***

Duane Erdmann- ***"Cyrtosia on the Loose"***

John Horner- ***"No Chlorophyll ? ... No Problem !"***

Tentati ve Weekend Schedule

Thursday, June 13

6:00pm - 8:00pm	Early check-in; reception
8:00pm - 9:00pm	Board of Directors meeting

Friday, June 14

8:00am - 9:00am	Check-in
9:00am - 9:15am	Welcome
9:15am -11:30am	Presentations
11:30am -12:45pm	**Annual meeting**
12:45am - 1:30pm	Lunch (provided)
1:30pm - 4:00pm	Presentations
4:00pm - 5:00pm	Field trip planning

Saturday, June 15

8:00am - 5:00pm	**Field trips**

Sunday, June 16

8:30am -11:15am	Presentations
11:15am -11:45am	Field Trip Planning
11:45am -12:30pm	Lunch (provided)
12:30am - 5:00pm	**Field Trips**

Monday, June 17

8:00am - 5:00pm	**Field trips**

18th Annual Native Orchid ConferenceSymposium
June 14–17, 2019

For additional information or assistance write to the NOC via the "Contact Us" tab on our website.

OR EMAIL THE FOLLOWING:

Ben Rostron - President
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bobsatcyndal@aol.com

Linnea Hanson - Secretary
linneachanson@gmail.com

Richard Barmore - Treasurer
rebster61@yahoo.com

Doug Martin - Conference Facilitator
dofrma44@gmail.com

Miscellaneous Information:

Call For Presentations:

Time may be available for those who wish to share information about orchid sites or species which they have been studying. If you want to make such a presentation (30 minutes maximum), please advise immediately.

Sales Area:

There will be an area available for those who wish to sell orchid related items (books, plants, prints, etc.). Board approval is required and limited space will be granted on a first-come, first-served basis. If you have items you wish to sell please advise immediately.

Cancellation Policy:

75% of the conference registration fee may be refunded if written notice of your intent to cancel is received by May 31, 2019.

Some Rare Ferns of the Bruce Peninsula

- Hart's Tongue Fern
- Moonwort
- Northern Holly Fern
- Purple Stemmed Cliffbrake
- Robert's Fern
- Walking Fern

Bruce Peninsula Overview

The Bruce Peninsula and Flowerpot Island off its northern tip are legendary places for native orchid (and nature) lovers. These are spectacular botanical areas!

Forty-three taxa (species, forms, varieties & natural hybrids) of orchids have been documented on the Bruce. It is one of the richest North American native orchid sites outside of Florida. Many of the orchids are found in the open coastal marl or boreal forest. In addition to orchids, numerous species of carnivorous plants, rare ferns and other wildflowers can be found in the area.

Our field trips could produce 30 orchid species (many in bloom). The most likely are:

- *Aplectrum hyemale*
- *Calopogon tuberosus*
- *Calypso bulbosa*
- *Coeloglossum viride*
- *Corallorhiza: maculata, striata, trifida*
- *Cypripedium: acaule, arietinun, parviflorum, reginae*
- *Galearis spectabilis*
- *Goodyera oblongifolia, repens, tesselata (leaves only))*

Ram's-head Lady's-slipper
(Cypripedium arietinum)

- *Listera: convallarioides; cordata; ovata*
- *Malaxis: monophyllos; unifolia*
- *Piperia unalascensis*
- *Platanthera: dilatata; flava; orbiculata; hookeri; huronensis; obtusata; psycodes*
- *Pogonia ophioglossoides*
- *Spiranthes lucida*
- *Liparis loesellii*

Along with a rich display of other wild flowers and ferns, we should see several sundew, bladderwort and pitcher plant species.

Most areas where we will hike are within a short distance of roads and have relatively easy access. We will carpool in order to minimize congestion. You should wear good hiking boots and bring plenty of insect repellant, snacks (or a box lunch) and water.

If you plan to stay after the conference, this is a great area to explore. There are lots wildflowers, ferns, and birds on the Bruce at this time of the year. You might even see a black bear. As you drive around, keep an eye on the roadside for unbelievably dense displays of *Cypripedium parviflorum.*

SPLITTING THE *CERNUA* ATOM

Text and Photos by Mark Larocque, pesllc@metrocast.net

Pace and Cameron redefined the *Spiranthes cernua* complex, creating three new species: *S. arcisepala*, *S. incurva* and *S. niklasii.* (The systematics of the Spiranthes cernua species complex (Orchidaceae): untangling the Gordian knot, M.C. Pace and K.M. Cameron - Systematic Botany, 2017). *S. niklasii* is a species noted only from a small area in eastern Oklahoma and western Arkansas. This article will only address the eastern races of the *S. cernua* complex. The ranges of the three species *S. arcisepala*, *S. incurva, and S. cernua* are shown on Figure 1. S. *cernua* is now only found along the coastal plain in the northeastern U.S. and eastern Canada (Nova Scotia through to Maryland) and then is found throughout the south extending to northern Florida. *S. arcisepela* and *S. incurva* are found in the inland areas of New England extending west to the Great Lakes region.

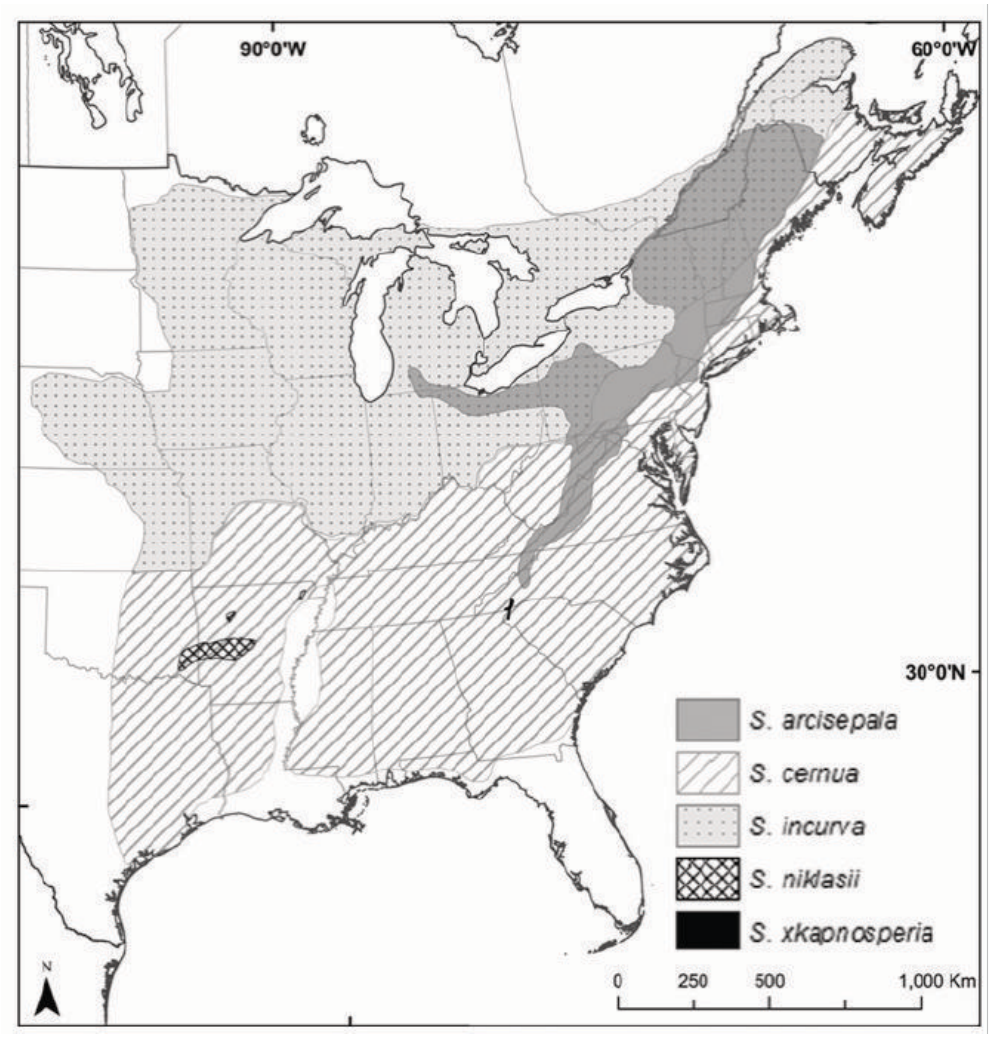
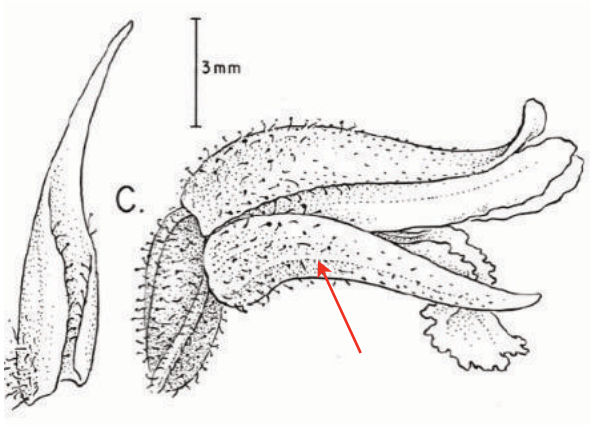
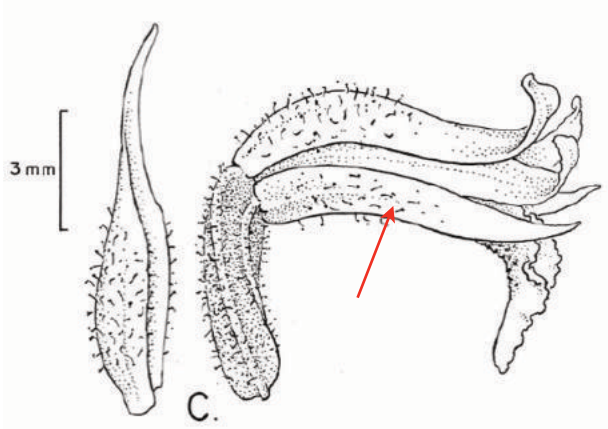


FIG. 14. Distribution maps of the *S. cernua* species complex s. s., based on herbarium specimens and phylogenetic sampling. A. *S. arcisepala*, *S. cernua* s. s., *S. incurva*, *S.* ×*kapnosperia*, *S. niklasii*. B. *S. casei* and *S. ochroleuca*. Maps produced by Elizabeth Kiernan, New York Botanical Garden GIS Lab.

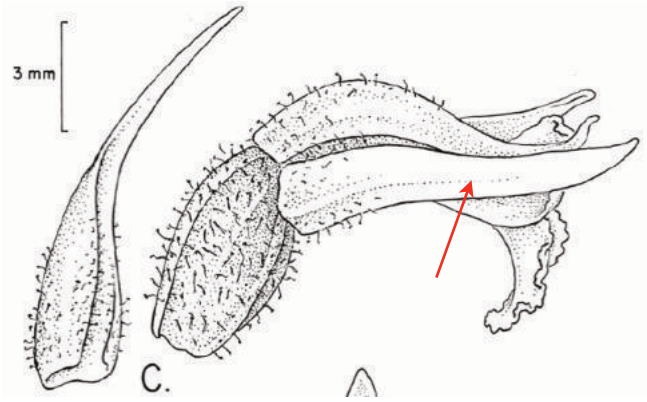
Figure 1: Distribution map: The systematics of the Spiranthes cernua species complex (Orchidaceae): untangling the Gordian knot, M.C. Pace, K.M. Cameron - Systematic Botany, 2017).



Spiranthes arcisepela
Hunkins Pond Rd, Sanbornton, NH population 9-9-18
Top Right: Note the down turned sepal - hand drawing by Bobbi Angell (Pace and Cameron, 2017).



Spiranthes incurva
Hoyt Road, Gilford, NH 8-27-18
Top Right: Note the up turned sepal above lip - hand drawing by Bobbi Angell (Pace and Cameron, 2017).



Spiranthes cernua
A conservation area in Pembroke, MA 9-22-18
Top Right: Note the sepal well above hood of flower - hand drawing by Bobbi Angell (Pace and Cameron, 2017).

The key characteristics for differentiating the speciesin the field is the orientation of the lateral sepals. *S. arcisepala* has the sepals downturned below the lip. *S. incuva* has sepals up turned level or slightly above the lip. *S. cernua* has sepals that are well up over the lip and the hood of the flower. In the field, these can be confusing, and local populations can have dramatic variations. The range of the species seems to be a good field indicator. In New Hampshire we have mainly *S. arcisepela* and *S. incurva*, with only a small area along the coast for *S. cernua*. During the late 2018 season, I set out to document the three species in New England. Locally in the lakes region of NH, I found several populations of *S. arcisepela* and *S. incurva* close by my house. I travelled to southeastern MA for photos of true *S. cernua*. My investigations indicate that the *S. incurva* seem to like wetter habitats similar to *S. cernua* along the coast, whereas *S. arcisepela* like it a little drier, where it is only seasonally wet. My photos of each species from the 2018 season and the line drawings (Pace and Cameron, 2017), are provided for comparison.

I would like to congratulate both Matt and Ken on this paper. It took a great deal of patience and determination to get this characterization accomplished. The *S. cernua* complex is very frustrating to identify in the field.

Key: The systematics of the *Spiranthes cernua* species complex (Orchidaceae): untangling the Gordian knot, M.C. Pace, K.M. Cameron - Systematic Botany, 2017).

17. Labellum margin crisped and lacerate ..... 22.
    22. Lateral sepals downwardly falcate, apices pointing toward the labellum apex .... *S. arcisepala* M.C. Pace.
    22. Lateral sepals sweeping upward, apices pointing toward dorsal sepal and petals ..... 23.
        23. Labellum abaxially yellow, abaxial glands rounded ..... 24.
            24. Lateral sepal apices linear-lanceolate ..... *S. ochroleuca* (Rydb.) Rydb.
            24. Lateral sepal apices bluntly acuminate..... *S. ×kapnosperia*. M.C. Pace.
        23. Labellum abaxially white or very pale yellow, abaxial glands conical and reduced.... ..... 25.
            25. Labellum essentially white; lateral sepals lanceolate; flowers frequently nodding; essentially to the south and east of the Eastern Continental Divide and Ohio River; rarely cleistogamous ..... *S. cernua* (L.) Rich.
            25. Labellum centrally yellowish (sometimes faintly); lateral sepals linear-lanceolate; flowers frequently ascending; essentially to the north and west of the Eastern Continental Divide and Ohio River; occasionally peloric or cleistogamous..... ..... *S. incurva*. (Jenn.) M.C. Pace.

WILDFIRE EFFECTS ON POPULATIONS OF *CYPRIPEDIUM FASCICULATUM*

Text and Photos by James Belsher-Howe, Jbelsher-howe@fs.fed.us

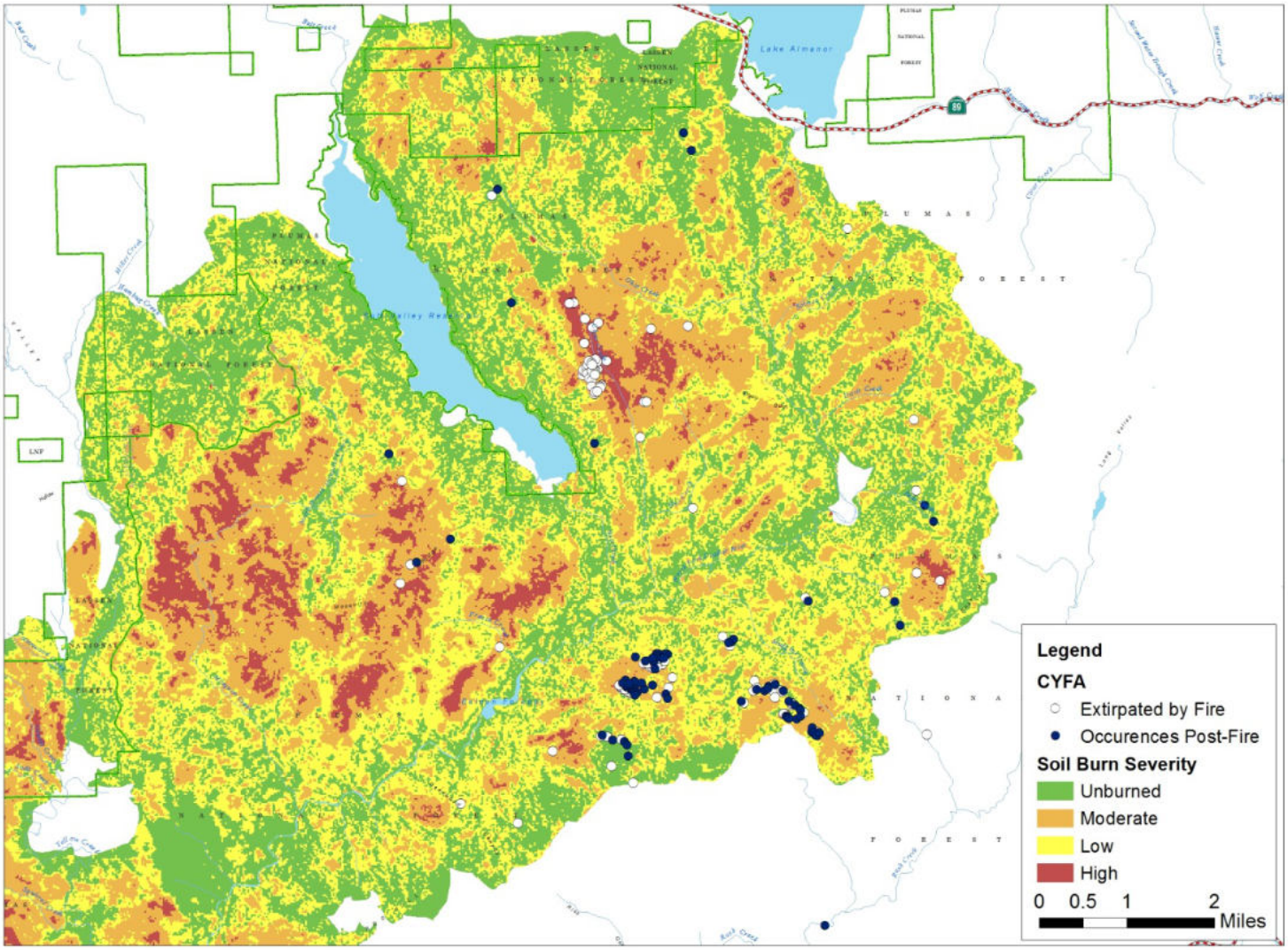
Cypripedium fasciculatum is a rare understory herb whose populations are highly vulnerable to wildfire. While much of the native California flora requires or tolerates periodic wildfire, *Cypripedium fasciculatum* is among a small portion of the flora that is adversely affected by wildfire (Kaye and Cramer 2005).

In California, Clustered Lady's-slipper (*Cypripedium fasciculatum*, CYFA) is most commonly associated with mixed conifer forests in the mid-to-late stages of successional development. On the Plumas National Forest, plants most frequently occur in microsites with moist soils, steep slopes, sufficient dogwood (*Cornus nuttallii*) cover, and a relatively open over-story canopy (Brown 2008). Clustered Lady's-slipper orchids lack physiological adaptations to regulate and tolerate drought and heat stress; therefore they depend on species, such as dogwoods, to limit the amount of direct solar radiation that reaches the forest floor (Brown 2008). Mycorrhizal fungi play a pivotal role in the biology of orchids.

Several stages in the orchid's life-cycle, particularly the early stages of seedling development, depend on mycorrhizal fungal symbioses (Shefferson 2004). Dormancy is known to occur for one or more years. Dormancy may result in underestimating population size by up to 30% (Kaye and Cramer, 2005).

A typical cluster of *Cypripedium fasciculatum* in flower

The Chips Fire burned 75,431 acres between July 29 and August 31, 2012 across private and public lands (USDA 2012). Approximately 48,300 acres of the Plumas National Forest were within the fire perimeter. The fire burned in a mosaic with burn severity variable across the landscape. On the Plumas National Forest, about 3,065 acres burned at high severity, 15,215 acres at moderate severity, 17,080 acres at low severity, and 12,940 acres within the fire perimeter were unburned (USDA 2012).



Map 1: Chips Fire with *Cypripedium fasciculatum* occurrences and soil burn severity

Based on Plumas National Forest records and GIS data (1981 to 2012), there were 210 sites grouped into 44 occurrences of Cypripedium fasciculatum documented in the fire area before the fire. An occurrence is defined as all sites within ¼ mile of each other.

Post-fire monitoring of 44 of the populations in the North Fork Feather River Watershed was found to have large declines in both population size and density. High-severity burn extirpated sites while low-severity burns had mixed impacts, but resulted in an overall decline.

In the pre-fire data, counts are often vague such as "several individuals," "20 clusters with 1 to 18 stems per cluster," or "about 50 plants." Often there is no distinction between stems and plants. Based on the growth and distribution of plants, it is often difficult to determine exactly what an individual is at a given location. *Cypripedium fasciculatum* reproduces asexually via rhizome and sexually by seed. When viewed, many stems are present, but individuals are difficult to discern. Shefferson estimates an average of two stems per individual based on his research in California that involved digging up around 100 individuals (pers. comm. 11/9/2005).

During the post-fire monitoring, stems were used as the counting unit in order to have a consistent and repeatable measure of abundance. Furthermore, by comparing post-fire stems to pre-fire plants, the most favorable post-fire scenario is portrayed. For example, if pre-fire plants are stems, all comparisons are direct, but if plants actually represent 1+ stems per plant, then all decreases are minimized and increases are maximized.

Between 2013 and 2015, 171 sites were monitored after the 2012 Chips Fire. Thirty-nine sites within the fire perimeter were not monitored. These 39 sites are included in the calculation of occurrences but not in the other abundance change calculations.

The total numbers were reduced from approximately 9,310 "plants" to 2,430 stems or a decrease of 6,880 stems / plants (-73.9%) at the 171 sites monitored (Table 1). At 117 locations zero stems were observed. Fourteen locations dropped more than 80%, 9 from 50% to 80%, 4 from 25% to 50%. Seven locations had essentially no change (+/- 5%). The other 20 locations increased in size from 35% to 900%, an increase of 768 stems.

During the monitoring of documented sites, 42 new sites were discovered that were presumably extant but undocumented before the fire. Twenty-eight of these 42 were discovered in 2013 and monitored in 2015, providing additional insight into the response to wildfire.

Overall, there was a decrease of 41 stems from 644 to 603 between 2013 and 2015 (-6.4%). None of the 28 were unchanged (+/- 5%). At six locations no stems were located during 2015 monitoring. An additional 11 locations decreased in size and 11 increased in size. This suggests that population decline continues, if at a somewhat slower rate, for several years post fire. Richard Shefferson observed several populations of *Cypripedium fasciculatum* declined to zero after the 1999 fires in the

Soil Burn Severity	Pre-fire count	Post-fire count	Change in count	Percent change
High	559	0	-559	-100.0
Moderate	3,554	546	-3,008	-84.6
Low	3,915	1,230	-2,685	-68.6
Unburned	1,282	655	-627	-48.9
Total	**9,310**	**2,430**	**-6,880**	**-73.9**

Table 1: Changes in populations after the Chips

Bucks Lake area of Plumas National Forest. Shefferson postulated the species came back from rhizome-stored energy, but eventually depleted that storage and died out (pers. comm. 10/18/2005).

Wildfire effects on *Cypripedium fasciculatum* were analyzed based on soil-burn severity mapping conducted by the Chips Fire BAER (Burn Area Emergency Rehabilitation) team. Soil-burn severity was chosen based on the importance of mycorrhizal fungi, their association with well–developed duff layers, and their relatively shallow root crowns and rhizomes.

Twenty-six of 171 locations burned at mixed severity. Twenty-two locations burned at two severity levels and four at three levels resulting in 201 sites analyzed for impacts by fire. Population counts
were proportionately split between fire severity levels.

Historic fire regimes of smaller less intense fire were likely more compatible with the populations that tend to consist of low plant densities over large areas. Pre-settlement likely had mixed impacts similar to low-severity burn areas.

Thirty-six unburned sites within the fire perimeter showed a decrease in the number of stems from 1,282 to 655 (-627), or -48.9%. Based on a review of photos taken during the revisits, it is clear that some of these sites did actually burn and may be the cause of the population decline.

Population Change	Number of unburned sites	Percentage of sites
Decrease	23	64%
Increase	9	25%
No Change	4	11%
Total	**36**	

Table 2: Population trends for unburned sites within the fire perimeter

An unburned site within the fire perimeter. This site had a decline from 9 plants in 2004 to 2 plants in 2015.

Sixty-nine sites burned at low soil-burn severity. Most sites (78%) had a decrease in numbers. All the low severity sites, there was a decrease of 2,685 stems from 3,915 to 1,230 or -68.6% (Table 1).

Population Change	Number of low severity sites	Percentage of Sites
Decrease	54	78%
Increase	11	16%
No Change	4	6%
Total number of sites	**69**	

Table 3: Population trends for sites that burned at low intensity.

A site that burned at low-intensity. This site declined from 232 stems in 2009 to 7 stems in 2015.

A site that experienced low severity fire that increased from 13 plants in 2009 to 34 in 2015.

Sixty-nine sites burned at moderate soil-burn severity. Sixty-four sites showed a decrease in the number of plants (93%) and 5 had an increase (7%). Overall there was a decrease from 3,554 to 546 stems (-3,008) -84.6%.

Population Change	Number of moderate severity sites	Percentage of Sites
Decrease	64	93%
Increase	5	77%
No Change	0	0%
Total number of sites	**69**	

Table 4: Population trends for sites that burned at moderate intensity.

Twenty-seven sites burned at high soil-burn severity. Each of these sites was extirpated by the fire for a loss of 559 stems.

Left: A site that burned at moderate-severity that declined from 9 plants in 1989 to zero in 2015.

Below: A 2012 picture of a high-severity burn are that had 45 plants in 40 sq. ft. before the fire. No plants have been found during post-fire monitoring.

Results

Cypripedium fasciculatum sites experience natural fluctuations in population numbers over time, as shown in our data from the unburned sites and those outside the fire perimeter. Fire, even at low-severity, has a detrimental effect on populations. The duration of the effects are unknown, but it seems virtually impossible for populations burned at high-severity to recover any time soon. It may be possible for populations burned at low or moderate-severity to recover and potentially benefit in the long-term.

The loss in individuals and localized extirpation described above, results in a reduction of occurrences on the Plumas National Forest. Within the fire perimeter, 13 occurrences were lost (-28.3%) and forest-wide there was a decrease from 154 to 141 (-8.4%). Based on California National Forest data, the loss of 13 occurrences represents a decline of 3.5% on National Forest lands (USDA 2012). The California Natural Diversity Data Base does not track this species so a complete state-wide decrease cannot be calculated.

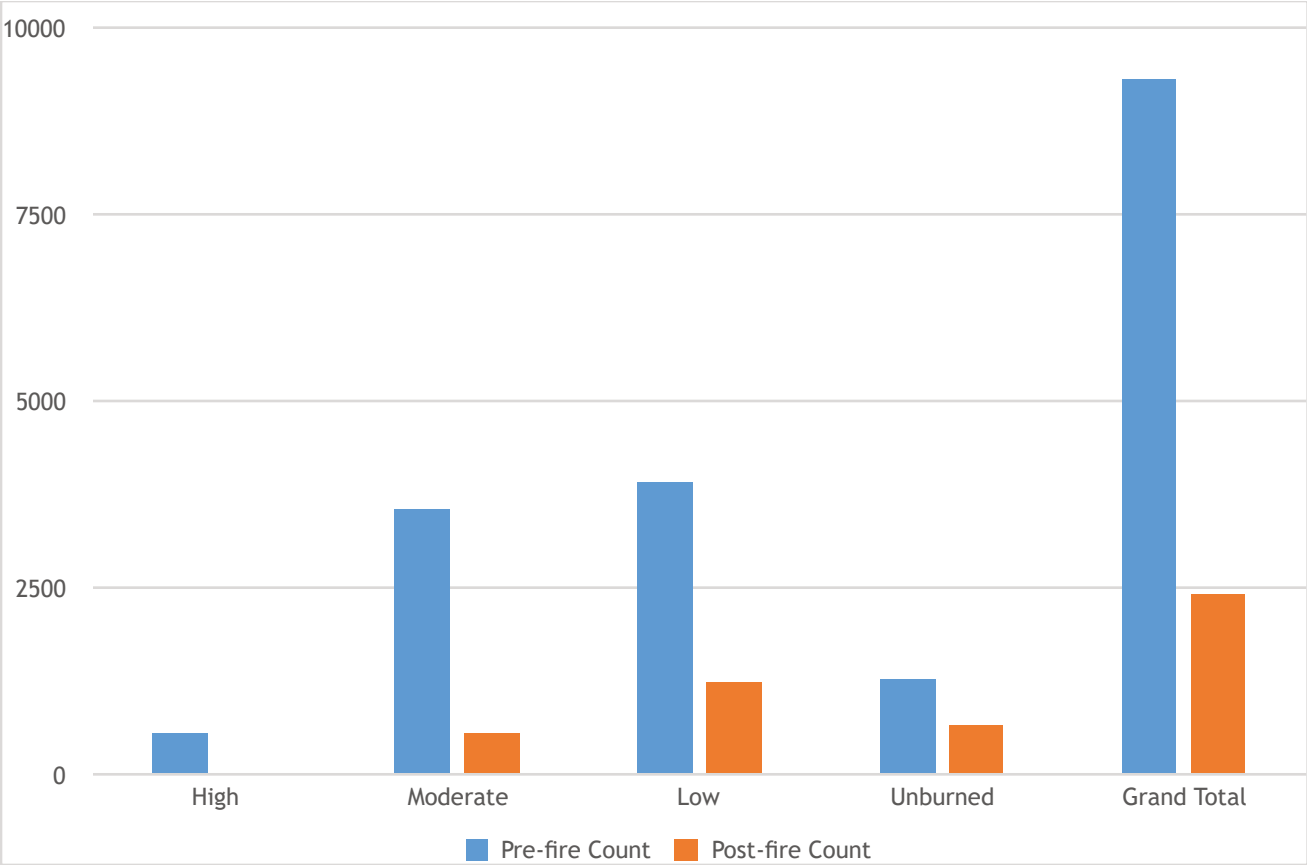


Chart 1: Results show an overall decrease in each of the burn areas. Total loss is highest in the areas that burned compared to those that did not.

Conclusion

Fire is a serious threat to *Cypripedium fasciculatum*. The Chips Fire, just under 76,000 acres, resulted in a significant loss of individuals, populations and occurrences.

Cypripedium fasciculatum's susceptibility to lethal impacts from wildfire raises management concerns for the species. Active management of populations and habitat is preferable to total avoidance. Actively managing stands surrounding populations to reduce fire intensity while maintaining stand characteristics necessary for the species is the best option for long-term viability. Future management includes proactively working to reduce fuels in and around *C. fasciculatum* populations to reduce the severity of future fires.

High intensity fires have a detrimental effect on Cypripedium fasciculatum. Since portions of populations that experienced low and moderate-intensity fires survive, thinning to reduce the fuel load of future fires while maintaining current habitat characteristics should be initiated by land managers. Also, funding for a future monitoring would allow to assess the fire impacts to *Cypripedium fasciculatum* to be assessed six to seven years after the Chips Fire.

References

Brown, M.R. 2008. Predicting the Persistence of a Rare Forest Orchid (*Cypripedium fasciculatum*) Under Simulated Land Management, University of California, Davis. 46 p.

Kaye, T.N., and J.R. Cramer. 2005. Conservation Assessment for *Cypripedium fasciculatum* and Cypripedium montanum; September 2005; Prepared for USDA Forest Service, Region 5. Institute for Applied Ecology.

Shefferson, R.P. 2004. Evolutionary Ecology of Rare Geophytes: Dormancy and Mycorrhizae in Cypripedium Species. University of California, Berkeley.

USDA 2012. Burned Area Report, Chips Fire: Plumas and Lassen National Forests. USDA Forest Service, Plumas National Forest, Quincy, CA.

Acknowledgements

Thanks to Hannah Garcia and Linnea Hanson for their contributions in the development of this article. Special thanks to all those who helped collect the data used in this study: Chelsea Begeman, Gabe Cashman, Scott Chamberlain, Michelle Coppoletta, John Dittes, Josephine Guardino, Japhia Huhndorf, Dana Ludington, & Ryerson Pamplin.

A *CYPRIPEDIUM ACAULE* (LADY-SLIPPER) MYSTERY—RESOLVED!

Text and Photos by John Mattor, Ph.D. mattor@sacoriver.net

C*ypripedium acaule* with pale pink flowers

Maine has over 300 unorganized townships or plantations, each of about 36 square miles, accessible by logging roads. The opportunity for botanical discovery abounds. If anyone wants to explore, it is free range, but make sure that you have a *Maine DeLorme* gazetteer and a GPS with fresh batteries, for there are no signs.

On one of these ventures in the year 2000, I found a station of lady-slippers in Lang Township, Maine with flowers in the thousands. They ranged in color from deep rose to white, and many were in large clumps. I have seen lady-slippers in Maine all my life, but I had never seen anything remotely like this. The pictures shown here are all from this site.

The site is east facing, very moist and had a forest of mature white pine, fir, spruce and a broad assembly of other shrubs and herbaceous plants. There were sunlit mossy glades, and the site is an over-wintering yard for white-tail deer that browse back shrubs and brambles, leaving abundant droppings. I estimate the area is about four to five acres.

I monitored the site through 2004, several times each season, and there was no obvious change. I have shown it to only two others: my niece Lorrie Mattor and orchid friend Jean Stefanik. When I made my first visit in 2005, I discovered that it had been logged the previous winter.

The owners had harvested the marketable white pine by cutting and dragging the whole trees to the road. Limbs and tops were cut away and piled high on both sides of the road, making accessto the interior very difficult. I had to wait for the barricade of slash to decay and settle before I could get back into the interior.

About 5 years later, I finally broke through to the inside. The general appearance was unchanged, for the limbs and tops had all been removed, and the work was done in winter when frozen ground and heavy snow cover protect the forest floor. The big difference was that the large clumps of lady-slippers were gone. I managed to find about a dozen single plants along the road. I have returned many times since, in early June when they flower, but they show no sign of returning.

I was at a loss as to explain what had happened in such a devastating manner. Was there some mysterious connection between the pine trees and the lady-slippers?

The question never left my mind. Then in April, 2015, I found references that put me on a track that explains the entire situation.

Lady-slippers growing in a mature conifer forest

C*ypripedium acaule* with white flowers

Recent work done in the Pacific northwest by professor Suzanne Simard of the University of British Columbia, K. J. Beiler, Y. Y. Song and others has shown that trees of many species, such as Douglas fir, Ponderosa pine and even birches are connected by a network of mycorrhizal fungi. The web connects the trees' rootlets, sending nutrients and signals of distress. Many fungi species are involved in this web. They called this "The Wood-Wide Web." I have since found a large body of information on the entire subject. It seems to be a well-studied and understood phenomenon throughout our temperate forests that few are aware of.

I have found four other major references on mycorrhizas that flesh out everything. "The Olympic Rainforest, An Ecological Web" (1992) by Ruth Kirk and Jerry Franklin gives a good layman account. "The Fifth Kingdom (1992) (meaning fungi) by Bryce Kendrick, devotes an entire chapter on mycorrhizas that goes into university-level detail. "The Cabaret of Plants" by Richard Mabey (December, 2015) explains how vital the mycorrhizal web is for maintaining complex, natural communities of plants in a forest setting. "The Hidden Life of Trees," by Peter Wohlleben, published in English in late 2016, presents a very accessible and up-to-date reading of the underground world of

the forest floor. The soil layer of a northern forest is a complex ecosystem. Trees provide 99% of the photosynthesis and share their nutrients with the fungal community in the soil. The fungi return the favor by decomposing the annual drop of broken limbs, needles and leaves, returning essential minerals for the trees to reuse, and providing a soft layer of humus, needed by the tree root systems.

Lady-slippers need a fungal partner to allow their seeds to develop, as do all orchids, but this is a different kind of fungus that lives entirely underground. This is a topic for another day. Fungi that are the long-term sustainers are called ectotropic mycorrhizas, and they produce mushrooms as fruiting bodies to disperse their spores. Lady-slippers must somehow tap into this system, and live off the stream of nutrients in the vast fungal mycelium. The ectotropic mycorrhizas involve about 2,000 species of plants and 5,000 species of fungal partners. A particular pine tree can associate with any number of fungi. The whole underground system is unimaginably complex.

The reason for the collapse of the Lang Township lady-slippers becomes clear. If you harvest the pine the fungi no longer have a source of nutrient, and die, as do the other forest floor plants that tap into the system.

White and bright pink-colored Lady-slippers growing side by side

It's a widespread, but wrong notion that mycorrhizal fungi are a source of nutrients for orchids. Fungi do not produce their own energy. Fungi and animals are both consumers and rely entirely on green plants for survival. A mycelium in the forest floor is analogous to a placenta connecting a mother with a fetus. It is widely recognized by every author that describes *Cypripedium acaule* that they are nearly impossible to transplant. They always die. Even Lorne Heshka notes this fact in "The Native Orchid Conference Journal" V. 7(4). Digging the plant necessarily cuts it away from its essential ecological niche, and it is unable to establish a new one.

The practices being used to improve forest orchid habitats need to be reconsidered. For example, trees have been cut at rare orchid stations to let in more light, which may be a very bad thing to do. Those attending the 2015 Native Orchid Conference in Gorham, New Hampshire observed vigorous stands of lady-slippers in deep shade in the town of Jackson, and also in full sun in the Mount Washington area. The idea of cutting trees to let in more light makes little sense. In so doing, the primary source of energy to the ecosystem has been eliminated. Forest ecology must be foremost in making these decisions, taking many factors in account.

Pale-flowered Lady-slippers

To study the roots of *Cypripedium acaule*, I purchased a new O-Max compound microscope and a small hand-held microtome to make thin-sections. Root samples of *Cypripedium acaule* were collected from five sites in western Maine, including three from the Langtown site. This proved to be particularly interesting, because I could find no orchids until I spotted a large white pine tree that the loggers had overlooked. There a dozen or so lady-slippers were growing within a few feet of it! There was also a small flush of *Inocybe caesarita* mushrooms nearby. *Cypripedium acaule* roots collected near the Saco heath were in the immediate presence of *Suillus placidus* mushrooms. All of the collected root samples were in the vicinity of white pine. The root samples were preserved in 40% vodka.

Thin-slices of the samples were stained with methylene blue, which is substantive to fungal hyphae, but not ordinary structural polysaccharides. This is because hyphae are composed of chitin, which contains an acetamido group instead of a hydroxyl in structurally identical cellulose. This, strangely, is the same material that comprises the exoskeletons of arthropods like crustaceans and insects. Orchid
roots are made up of plain polysaccharides, and do not stain, but hyphae stain vividly blue.

All eight samples were heavily infiltrated by fine (5 micron), branching hyphae of Basidiomycetes and Ascomycetes mushrooms. These hyphae formed a dense mantle around the orchid roots, and were present throughout the velamen and inner root. Two of the root samples had another larger (~50 micron) hollow hyphae without cross-walls that are produced by the phylum Zygomycetes, or conjugating fungi. These hyphae didn't penetrate the velamen, but butted against it with blunt toes, which I call "Cats paws" ("The Fifth Kingdom, 3rd ed. Kendrick, p34).

All of these features that I have described can be found online with better images than I can hope to produce. Please, take a look.

If another phenomenal station like the one that was in Lang Township can be found, a full botanical and mycological inventory should be conducted to establish an ecological baseline for future understanding. If this happened to be found in a commercial forest, a follow-up survey after tree harvest would reveal what plants and fungi disappeared, revealing a state of dependency. I would also alert The Nature Conservancy and The New England Wildflower Society to see if the site could be protected. Maine also has experimental forests that may very well welcome such a project, even if there only a few lady-slippers. If anyone doing field work finds such a miracle place like the one in Langtown, please contact me.

There is a great need for ecological studies in our North-Eastern habitats, of the depth and quality that has been done in the Pacific North-West. We need to study ecological systems, not just monitor populations.

There is curious twist in this story. It would seem at first glance that lady-slippers parasitize white pine, and although its takings are inconsequential, the white pine receives no direct benefit. However, if plant conservationists, particularly of the orchid loving type can verify that white pine are essential for exceptional vigor and flowering at exceptional lady-slipper sites, they will do everything in their power to protect white pine. Thus, the inadvertent generosity of white pine finally receives its just rewards.

ORCHID ADVENTURES IN THE FAKAHATCHEE

Text and Photos by Chuck Wilson, chuckwilson5@bellsouth.net

March 9-11, 2018, marked the 20th anniversary of the annual Central Slough Survey in the Fakahatchee Strand Preserve State Park in Collier County, Florida. Initiated in 1999 by Park Biologist Mike Owen, this is an annual gathering by a small group of professional and amateur biologists to gradually inventory the Park's rare plants, section by section, until occurrence data and distribution maps can be eventually compiled.

Fakahatchee is a Seminole Indian word for "muddy creek." Located in the Big Cypress Swamp region of southwestern Florida from "Alligator Alley" (I-75) south to the coast, the dense, heavily vegetated swamps of this region are known as "strands" because they are usually narrow and elongated. Fakahatchee Strand runs predominantly north to south, and the Preserve that contains it is about five to seven miles wide and 20 miles long. The entire region is remarkably flat, with very little elevation change, so that natural drainage flows of surface and sub-surface waters are slow and gradual. The Preserve consists of densely forested sloughs surrounded by extensive pinelands and marl prairies; although these surrounding areas sometimes dry out and are subject to fires in periods of drought, the sloughs themselves drain slowly and generally remain wet enough to block the fires from entering.

Maxillaria species

Between 1944 and 1952, before it became protected as a preserve in the 1970's, the Fakahatchee Strand was logged for the cypress timber. To get the timber out of the swamp, a network of narrow-gauge railroad tracks was constructed. The railroad beds were created by digging and piling up the underlying limestone and dirt from ditches on either side. The iron rails have long since been salvaged, but the system of branching tramways remains and serves as a means of both traversing the swamp and delineating locations within it. The main stems of this branching tram network have been mostly cleared and allow travel by high-clearance vehicles that can get through the frequent muddy ruts. Foot travel is usually fairly easy on the cleared main trams, but the branching tramways are often covered with thick vegetation that has grown up, making it sometimes easier to walk in the water-filled ditches on either side, among alligators and cotton-mouthed water moccasins.

Bromeliad garden in a remote part of the swamp

The Fakahatchee is biologically very diverse, due in part to its subtropical location and weather, and its various habitat types. The air temperature can drop below freezing on occasion but the water in the central slough generally stays deep enough and warm enough to provide a frost-free zone of several feet above it. In the more remote parts of the swamp, the limbs and trunks of pop-ash and pond-apple trees and other tree species such as cypress are often festooned with ferns, bromeliads, and epiphytic orchids. Here also, decaying stumps and floating logs under the tree canopy accommodate various terrestrial species, including several orchids. Some terrestrial plants are more at home in the sunny marl prairies, and still others seem to prefer the transition zones with thinning tree canopy. At least 16 species of bromeliads and 48 species of orchids have been known to occur in the Fakahatchee, the latter being roughly evenly divided between terrestrial and epiphytic species. This large concentration of orchid species is without parallel and is why the Fakahatchee is often considered to be the orchid capital of the United States.

Although almost all the orchid species in the Fakahatchee are regarded as native, the area is not immune from invasives; these range in quantity from the seldom encountered *Zeuxine strateumatica* in disturbed areas to the omnipresent *Oeceoclades maculata* on the tramways. Being subtropical, Florida

has long been plagued by invasive species of both flora and fauna. As an example of the latter, Burmese pythons have now been found in the Fakahatchee.

Some participants in the Survey live close enough that they can return home evenings, but the majority prefer to camp out in the swamp, sleeping either in tents or personal vehicles or in a private inholding cabin known as the "Fakahatchee Hilton." The owners of this cabin, which has bunks for eight and a gas-fired stove but no electricity or heat, have been very gracious in allowing its use by Survey participants. The only running water comes from an elevated cistern to the kitchen sink, and light is provided by candles and gas lights in the evenings. Nearby to the cabin is an outhouse, which completes the rustic but memorable experience of camping out in a wild swamp. With its large covered porch, the cabin is a convenient refuge when it is raining, and is far more comfortable than tents and vehicles during storms. It was regarded as nothing short of a miracle that Hurricane Irma did only minor damage to the lightly-constructed sixty-year-old cabin.

Camping in the swamp

Epidendrum anceps

Slogging along in thigh-deep tannin-colored water in the central slough, survey participants are careful to avoid tripping on unseen underwater hazards such as logs and tree roots. Other potential hazards requiring attention are biting insects, alligators, and venomous snakes. But the rare plants encountered are always interesting and sometimes spectacular if they are in bloom. The Survey is usually conducted in early March, when the weather has started to warm up a little, but the leaf canopy has not yet begun to limit visibility, and the mosquito population has not become intolerable. At this time of year only a few of the plants can be blooming, which requires identification of the others in their vegetative state. The four most common orchids encountered in the central slough are *Epidendrum rigidum*, *Epidendrum anceps*, *Epidendrum nocturnum*, and *Encyclia cochleata*. But a number of other epiphytic orchid speciesare encountered in the sloughs less frequently, such as *Vanilla phaeantha*, *Encyclia tampensis*, *Epidendrum difforme*, *Harrisella filiformis*, *Ionopsis utricularioides*, *Polystachya concreta*, and *Campylocentrum pachyrrizum*. On floating logs and tree stumps in the sloughs can be found terrestrial species like *Bletia purpurea*, *Habenaria distans*, *Habenaria repens*, *Liparis nervosa*, and *Malaxis spicata*. Some species like *Oncidium floridanum* can be either terrestrial or epiphytic. Wading reverently through this wonderful and beautiful biological cathedral is an experience never to be forgotten, and has proven to be highly addictive to those fortunate enough to experience it.

Pelexia adnata

Sacoila paludicola

In hammocks and on the tramways leading to the sloughs, some terrestrial species such as *Habenaria odotopetala, Sacoila paludicola, Erythrodes querceticola, Eulophia alta, Cyclopogon cranichoides, Ponthieva racemosa* and *Platanthera quiqueseta* can also sometimes be encountered. Though perhaps not as throughly enchanting as the sloughs, these habitats can nonetheless hold a number of species well worth seeking.

In the open wet prairies outside the sloughs and transition zones, terrestrial species such as *Calopogon tuberosus, Calopogon pallidus, Platanthera nivea, Sacoila lanceolata, Spiranthes odorata, Spiranthes laciniata, Spiranthes logilabris, Spiranthes praecox,* and *Spiranthes vernalis* can be found. These seemingly endless wetlands trimmed at the edges with thin stands of pinelands have a subtle but magnificent beauty all their own, and can contain their own attractive discoveries for the patient visitor.

But the greatest joy comes perhaps from finding the rarer species such as *Polyrrhiza lindenii* (the famous "Ghost Orchid"), *Cyrtopodium punctatum, Encyclia pygmaea, Epidendrum strobiliferum, Epidendrum blancheanum* (Syn. *Epidendrum acunae), Maxillaria crassifolia,* and *Pleurothallis gelida.* And on very rare occasion, a discovery may be made of something really notable, such as finding *Cyclopogon elatus* or *Pelexia adnata,* terrestrial orchids never before recorded in the Fakahatchee until relatively recently. It is always in the back of the minds of survey participants that the chance always remains for rediscovery of species that have not been seem in many years, such as *Bulbophyllum pachyrhachis, Camaridium vestitum* (Syn. *Maxillaria conferta*), *Leochilus labiatus,* or *Lepanthopsis melanantha.* This tantalizing and ever-present possibility combines with the magnificent beauty of the unique Fakahatchee habitats to make the Central Slough Survey the greatest recurring botanical adventure in the U.S.

Pictured left to right: *Polyrrhiza lindenii, Cyclopogon elatus,* and *Cyrtopodium punctatum*

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North American Orchid Conservation Center

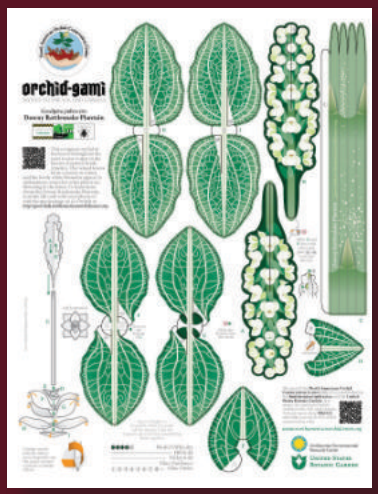
A public- private collaboration to conserve orchids native to the U.S. and Canada

. . .orchid resources

protocorms to punch-outs

Germination of dust-like orchid seeds, such as these Ladies' Tresses, produces *QSPUPDPSNT* orseedlings, the first step toward growing plants to re-establish orchid populations. Exposing these young seedlings to an appropriate fungus improves their growth and increases their chances to survive when planted in their native habitats.

The *(P 0SDIJET* websitetakes you on a journey across the continent to discover over 200 native and non-native orchid species – even those orchids that seem to have disappeared but may be waiting to be rediscovered. When out for a hike or nature walk, turn your mobile device into a field guide to identify orchids by answering simple questions as photos and drawings guide you through the *(P 0SDIJET* key.



Downy Rattlesnake Plantain orchid-gami template

0SDIJE HBNJ providesinformation about the conservation status and ecology of our native orchids using three dimensional models that are colorful, fun and designed to capture imaginations. Start a conversation about orchid conservation and discover how flower shape and color attract pollinators necessary for seed production.

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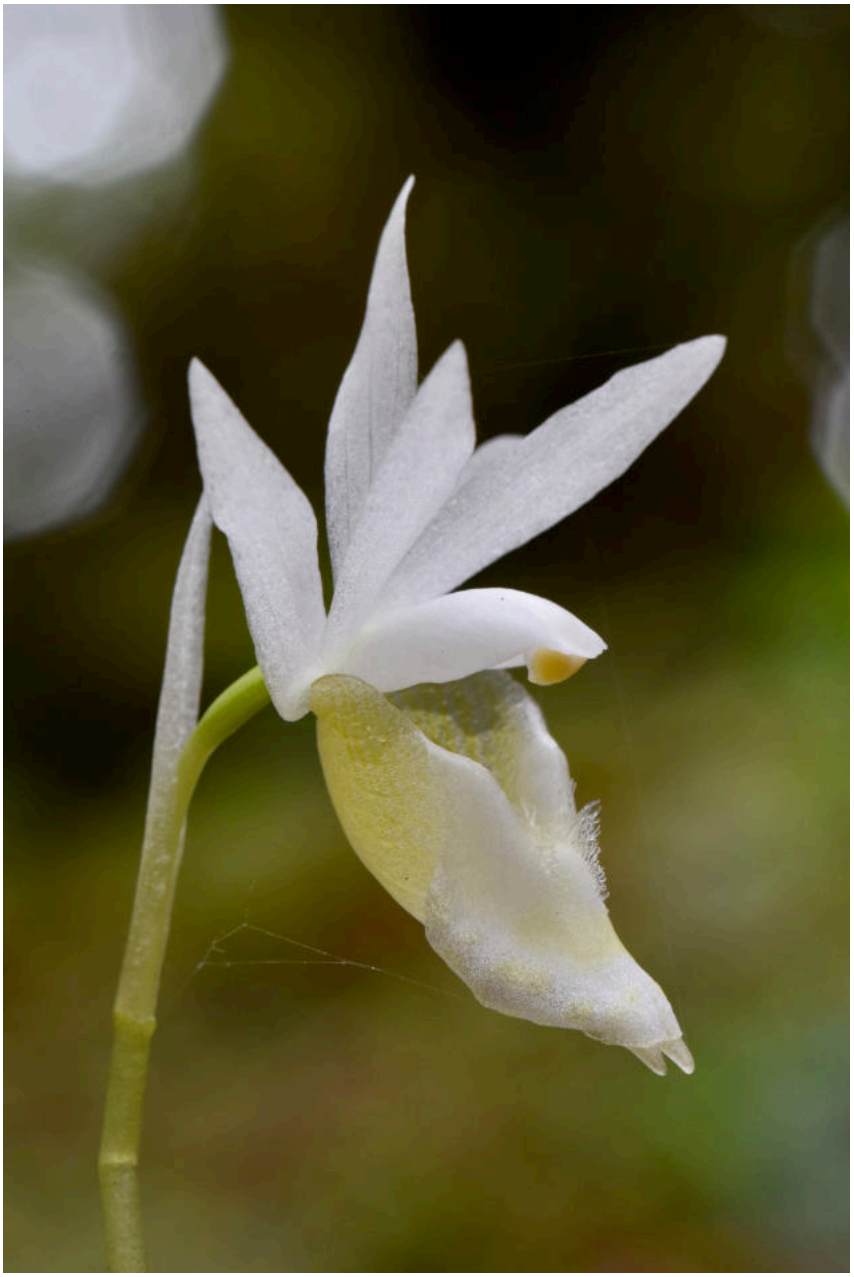
Crested Coralroot orchid-gami model

FEATURE PHOTO:



Calypso bulbosa var. *occidentalis* fma. *nivea*
Photo: Chelsea Kieffer

The Fairy Slipper orchid takes it name after a nymph in Greek mythology who detained Odysseus for seven years. *Calypso*, meaning *to conceal* or *to deceive*, reflects how these orchids favor sheltered areas on conifer forest floors. These orchids can vary in color variation, from rich purple to shades of pink and rarely white. This single white-flowered Calypso was growing among typical pink-flowered plants near Orick, California.

The Native Orchid Conference Journal is published quarterly 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.html

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