



Minnesota Plant Press

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Upcoming Monthly Meetings

The Minnesota Native Plant Society holds monthly meetings from October through May, on the first Wednesday of each month, unless noted through special mailing. Meetings are held in room 335 Borlaug Hall, St. Paul campus U of M. Meetings are 7:30 - 9:00 PM.

Mar. 3 - Anita Cholewa, Dept. of Plant Biology, U. of M. Common Plant Families of Minnesota and How to Know Them.

April 7 - Clarence Lehman. Music of the Leaves.

May 5 - Plant Sale and Photography Show.

Pollination Notes On Minnesota Orchids: The Lady's-slippers

Charles Argue

So different are lady's-slippers from other, more specialized orchids that botanists sometimes place them in a family of their own. They are distinguished by a number of characters, but the most conspicuous difference is the deeply saccate, pouch-like lip of the flower, from which the plants take their name.

This lip plays an important role in pollination. All lady's-slippers have flowers of a type known as trap or semi-trap blossoms. The flowers temporarily imprison their insect pollinators and force them to follow a

prescribed sequence of behaviors in order to obtain their release. The insect, usually a bee, enters the lip through the obvious large opening at its top, but the in-rolled edges and slippery inner surface often prevent it from leaving by the same route. There remains but one way out. A foothold is provided by a row of tightly packed, long hairs on the bottom of the lip. These lead

along a pathway toward escape holes at the base or heel of the slipper. The escaping bee may also be attracted along this path by colored lines on the lip's inner surface and by light coming from the escape holes or from translucent window-panes in the side of the lip near its base. In its escape the bee must pass two points where the passageway is narrowed. At the first of these it is forced to squeeze under and rub its back against the surface of the stigma. The

Inside

Announcements.....	2
Planting Your Own Prairie.....	7
Board of Directors....	9

Orchids continued on pp. 4.

Announcements

- **ANNUAL MEETING BOARD ELECTION** - The Minnesota Native Plant Society will hold an annual meeting and election of Board of Directors at 7:30 PM on March 3, 1993. The Board has nine members and the term of office is three years. Members whose terms expire Sept. 93 are Don Knutson, Pat Ryan and Becky Schirber. Our year begins October 1st.

The Nominations Committee composed of Char Menzel, Pat Ryan, Nancy Sather and David Stevenson has met and recommends the following slate of candidates: Arden Aanestad, Nancy Albrecht and Becky Schirber. Following is some biographical information about the candidates.

ARDEN AANESTAD - Arden's interest in native plants began early in life as he explored the Antelope Hills prairie area of North Dakota. During college at NDSU he taught botany labs and as a graduate student had a job as a range vegetation specialist (he "counted grass"). After working for much of his career in the development of biological chemicals for Dupont he began working in the areas of establishing research grants with Land Grant College and the Hennepin County Parks covering the subjects of wildflowers, mushroom identification and beekeeping among others. The summer finds Arden operating the Crow Wing Bird Banding Station near Emily, MN.

NANCY ALBRECHT - Nancy presently serves as Coordinator of Natural and Cultural Resource Management in the Division of Parks and Recreation for the MnDNR. Her background is in botany; she holds an M.S. in botany with a minor in ecology. Her undergraduate degrees are in botany, zoology and microbiology. Nancy has worked as a botanist for Mn/DOT and as a naturalist in Voyageurs National Park. She has done research on the use of lichens to monitor air quality. A recreational pursuit is gardening with native plants.

BECKY SCHIRBER - Becky has been serving on the Board for a little over a year, and having enjoyed the experience has agreed to run for a full term. She has an M.S. in rehab counselling and works as a volunteer coordinator for a mental health program. Becky has volunteered on a project to remove leafy spurge from two remnant prairies in Bloomington. She has a strong interest in gardening and landscaping with native plants and puts her knowledge of plants to work in the outdoor space around her downtown Minneapolis home.

- **EDUCATIONAL OUTREACH PROJECT** - In an effort to expand our educational work a project has been initiated to set up a speaker's bureau. We would then be able to respond to requests we receive from garden clubs, civic organizations and others who want to learn more about gardening and landscaping with native plants, the use of native plants in wildlife plantings, etc. As the public becomes more aware of the loss of native habitat we have an excellent opportunity to reach a wider audience. In this regard we want to establish a list of members who would be available to serve as speakers, and also develop a slide show (possibly two) with a script. The need then is for slides showing natural areas, native plant gardens, and also individual plants. Help is also needed in the development of scripts. If you have slides to loan, (slides will be copied) or would like in any way to help with the project please contact Pat Ryan at

- **WELCOME LETTER TO NEW MEMBERS** - This letter is being sent to all new MNPS members.

Welcome to the Minnesota Native Plant Society!

Enclosed is a copy of the latest newsletter the Minnesota Plant Press and a reference guide to publications on native plants. Monthly meetings are held on the University of Minnesota St. Paul campus in Borlaug Hall (as shown on the map on the back page of the newsletter) on the first Wednesday, September through May, at 7:30 p.m. Open board meetings are held at 6:00 p.m. that same evening two blocks away in the Student Center. Besides the regular monthly program, there are several special events we enjoy:

Spring Plant Sale - Members share their extra native Minnesota plants, seedlings and divisions, raising money for the society at our May meeting.

Seed Exchange - In October, members trade native plant seed and information about habitat preferences and cultivation.

Plant Photo Show - Award winning photos from an international competition are presented at one of our monthly meetings co-sponsored with the Minnesota Nature Photography Club.

Spring Symposium - A day-long event, we explore some issue relations to native flora in greater depth.

Members may want to join one or more of the following Action Groups. We welcome you to give your input, learning and sharing in the following goals and activities:

The Conservation Committee has three primary areas of potential activity:

1. Members review issues and upcoming legislation, lobbying and forming liaisons with other conservation groups.
2. In the salvage network, members identify sites and work to re-locate native plants from areas of future development.
3. Members join with public and private organizations to manage their natural area preserves.

The Education and Outreach Committee is involved with outreach and publicity through potential avenues including:

- information booth at events state-wide
- educational programs
- distribution of brochures
- general publicity of Society events
- respond to inquires for membership and other information.

The Publications Committee members publish the newsletter and print the brochures. They also develop and send out written materials. The Program Committee plans and organizes the monthly programs, symposiums, field trips and special events.

Please note that memberships are due in September. A notice is posted in the fall newsletter. New members joining after April 1st shall be considered paid through September of the following year. The year your membership has been paid through is typed before your name in the membership listing which is included in the newsletter annually as well as on your address label.

Once again, we welcome you as you join us as we explore and enjoy our rich natural heritage--the native plants of Minnesota!

Sincerely,

Diane Hilscher,
Minnesota Native Plant Society
Education and Outreach Committee

Orchids from pp. 1

second narrow passage is the exit hole itself. One exit hole is located on either side of the base of the flower. An anther is so positioned beside each exit that a bee of the proper size cannot force its way out without contacting the anther and carrying away a mass of sticky pollen on its back. Since the bee contacts the stigma before the anther and usually does not reverse directions, it does not ordinarily transfer pollen to the stigma of the same flower. Rather, pollination is effected when the bee, upon escaping from the first flower, is subsequently trapped again, usually in a different flower, and the escape procedure is repeated. This strategy is often effective in bringing about cross-fertilization.

Botanists are uncertain just why the bee enters the flower in the first place. In some cases the entry is inadvertent. The bee, exploring the outer surface of the lip, tumbles into the trap. In other cases entry appears quite deliberate. It has been conjectured that small amounts of nectar are present or that the bees feed on the hairs on the inside of the lip. But it now appears likely that the flower provides no food, and the bee is simply deceived by false nectar guides and the odor of the blossom, which promise nectar where none is available. Bees must learn by experience which flowers offer the best reward in nectar (orchid pollen can't usually be deliberately collected by bees because of the anthers' positioning on the flower), and will certainly avoid flowers that offer no reward at all. Lady's-slippers may therefore be dependent upon newly hatched, inexperienced bees for their seed production.

The size of the bee involved in the pollination is, of course, determined by the size of the flower and especially the diameter of the exit holes. Research is still at an early stage, but selected pollinators of some species of lady's-slipper can now be tentatively identified.

The largest exit holes are found in the stemless lady's-slipper (*Cypripedium acaule*), and this species appears to be pollinated by various sorts of bumblebees. This conclusion is based, in part, on observations made in a northern Michigan bog by Warren Stoutamire, University of Akron. Initial attempts to identify the pollinators (by trapping them in aluminum mesh traps as they emerged from the exit holes) were unsuccessful. Yet it was evident that pollination was occurring: the stigmas of numerous flowers were covered with fresh smears of pollen, and the anthers, which face inward toward the exit holes in fresh flowers, had been displaced and forced

outward. A corbicular load from the leg of a large bee was also found in the lip of one flower. An analysis of the pollen in this load revealed tetrads of *Vaccinium* and monads of a rosaceous species, probably *Aronia melanocarpa*; both this species and *Vaccinium corymbosum* were blooming in the area. In addition, large holes had been chewed in the lips of several flowers by visitors that had entered the lip but refused to enter the trap. Finally a bumblebee, *Bombus vagans*, common in the bog, was captured in the lip of one flower. It carried pollen of the stemless lady's-slipper on its thorax from earlier visits to other flowers in the area. Like other bumblebees, it had avoided entering the trap. Observations of the foraging behavior of this bee revealed numerous visits to the flowers of *Vaccinium* and *Aronia*. Subsequent examination of bumblebees in the collection at Michigan State University disclosed the presence of smears of what looked like *Cypripedium* pollen on several specimens of *Bombus borealis*, and further work has identified other bumblebees as pollinators.

However, more extensive studies have demonstrated that these insects visit *C. acaule* infrequently: only about 3-9% of the pollen masses are removed. Artificial pollinations have been found to produce 70-75% fruit-set in selfed and cross-pollinated flowers, respectively; but enclosed, unpollinated flowers do not form capsules. Thus, self-pollination, if it is significant in natural populations, does not appear to occur unless pollinators are present, and development of seed in the absence of fertilization is probably absent. Collectively, these observations suggest that *Cypripedium acaule* is highly fertile but that seed production is limited by the activity of pollinators. A similar pattern is found in other orchids that rely on deception. Relatively few capsules develop, but this deficiency is compensated by the large number of seeds produced in each capsule.

The showy lady's-slipper (*C. reginae*) is the largest of our native orchids, but its exit holes are smaller than those of the stemless lady's-slipper and would probably not allow for the passage of bumblebees. Many floral visitors have been recorded, including butterflies and beetles; but until recently, only a medium sized, black bee, tentatively identified as a species of *Megachile*, had been observed to enter the flower, follow the prescribed course to the base of the slipper, and emerge through the exit hole, removing pollen from the anther. A new study in Vermont, however, has reported over 90% of pollinations to be performed by syrphid flies (*Syrphus torvus*) and a lesser number by flower beetles (*Trichotinus assimilis*). If confirmed, these results, along with scattered earlier reports of non-hymenopterous pollinators, would require a re-evaluation of the postulated bee-pollination syndrome for all *Cypripedium* species.

At the other extreme, the smallest *Cypripedium* flowers are those of the ram's head lady's-slipper (*C. arietinum*). These have a 1-2 mm opening to the interior of the lip, which is further constricted by long trichomes. The exit holes are also small, about 1 mm wide, and in Ontario the pollinating agents are said to be small bees of genus *Dialictus*. In one study, these bees were observed to land on or near the signal patch, a contrasting white, pubescent area that surrounds the small opening to the interior of the lip. They then entered the lip, where they remained for 1 to 2 minutes, and emerged from the anther opening carrying a pollen deposit on their thorax.

The yellow lady's-slipper (*C. calceolus*) is the most common member of the genus in our area. Solitary bees (*Andrena*, *Lasioglossum*, and perhaps *Halictus*) act as pollinators in Europe. The flower's scent includes constituents found in the pheromone secretions of *Andrena* species, which may trigger instinctive landing responses. In our area a variety of bees have been collected in the flowers. One, *Ceratina calcarata*, has been reported to transport pollen among flowers of variety *pubescens* in Michigan, and visits by other species of *Ceratina* have been observed elsewhere in North America. The 2 mm exit holes in this variety could just accommodate these small bees.

Two local varieties of yellow lady's-slipper differ in their habitat preferences. One is more

common on lower wetter sites, the other, on dryer upland sites. This distribution may correspond with the nesting and foraging habitats of different, ecologically restricted species of bees, and a divergence in floral morphology in these varieties may reflect an ongoing adaptation to different pollinating agents. It has been conjectured that populations of this orchid were separated during the Pleistocene glaciation. Isolation and exposure to different groups of pollinators during this period may have led to edaphic and floral specializations, which following the retreat of the ice, plant migration, and limited introgression have produced the variation pattern currently observed in this species.

The only published study of pollination in the small white lady's-slipper (*C. candidum*) indicates that halictine and andrenid bees, 6-7 mm long, may be the principal pollinators of this species in southern Ontario. These bees were observed carrying pollen smears of *C. candidum* on their dorsal thorax and are said to be well suited, both in terms of size and seasonal abundance, to the pollination of this orchid.

It is evident from the often circumstantial and largely anecdotal evidence available that additional, systematic studies of pollination are needed in *Cypripedium*. Pollination studies in orchids, in general, are of particular interest because orchid flowers and their pollinators provide numerous examples of highly specialized relationships. Orchids are often fertile across species and even generic boundaries, and selection for intraspecific pollination has led to the co-evolutionary development of novel floral morphologies and the correspondingly specialized behaviors needed by pollinators to exploit them. The more spectacular and most frequently cited cases are usually drawn from exotic and often tropical orchids, but many interesting examples also occur among Minnesota species, especially in the more advanced orchid groups. Some of these may be examined in future issues.

Selected References

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Guidelines for Planting Your Own Prairie

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The following instructions will help you establish a native prairie landscape. By following these recommendations you can successfully establish populations of prairie grass and wildflowers that will compliment your traditional landscape and add a touch of Minnesota's natural heritage to your life.

1. Site Selection: Prairies thrive in sun and do best in open spaces. When selecting your site look for areas with maximum sun exposure and lack of competition from trees. Elm, Basswood and Maples are especially bad because of their high surface root density.

Also, remember that prairies are quite combustible during times of dry weather. Consequently they should not be planted near structures that may ignite easily. Allow approximately 20 feet of traditional sod or non-combustible surface between your prairie and buildings.

2. Seeding Dates: Optimum - May 20th to June 20th. Range - May 1st to August 10th and September 20th to freeze-up.

3. Seed Bed Preparation: The primary objective is to clear the site of existing vegetation. Make sure the seed bed consists of freshly worked, open soil. Seed broadcast into existing vegetation has little chance of success. If vegetation does exist it should be sprayed with a Glyphosate herbicide such as Roundup or Ranger following all label directions. Tilling, raking, seeding and re-raking should follow. On sites with open soil the tilling can be eliminated but the raking, seeding and re-raking must still be done.

4. Seeding: Seed can be hand broadcast or applied with certain spreaders. The most important thing is to get an even distribution of seed and to establish seed to soil contact. The seed must be in contact with the soil to achieve maximum results.

When hand broadcasting, try to seed slowly and cover each area in two directions. Flower seed can be concentrated in high priority areas or spread throughout the site. Much of this seed is small and should be spread thinly to achieve best results. One pound of grass seed covers approximately 2000 square feet. Flower seed rates vary, 2 ounces per 1000 square feet should give you a colorful prairie. Follow all seeding with another light raking. Watering is helpful and it is best not to fertilize!

5. Management: Prairie takes time to develop, requiring patience and management during the first year or two. However, if you have executed the previous steps properly and follow these management guidelines, your prairie seedlings will eventually mature and create a unique natural landscape. Management procedures can be planned on a yearly basis as follows.

- Year one - During the first growing season you should cut the planting 2, 3 or even 4 times. This is generally done on 30 day intervals using a scythe, mower or line trimmer. Scything is often best as the cutting height should be kept between 5 and 8 inches. If a mower is used, set it as high as possible. Hand weeding can be done during the first growing season. Individual noxious weeds or invading woody plants should be removed.

- Year two - During the second year one mowing is occasionally done between mid- June and mid-August. Weed control and height regulation should help you decide if and when.
- Year three - By the third year (and in years to follow) your patience will really begin to pay off. Both grasses and flowers will be mature, providing low maintenance and good aesthetic returns. One cutting can be done each year as a clean-up procedure. This is best done late (November) or early (May). Burning is a possible alternative but be certain to get permits and use caution.

MNPS Board of Directors Winter 1993

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