



Minnesota Plant Press

Vol. 11:3 Newsletter Of The Minnesota Native Plant Society, Spring 1992

Upcoming Monthly Meetings

May 6 - North American Chestnut Breeding Program; Dr. Lawrence Inman & Seed/seedling exchange

Wildflower Habitats and Microhabitats

May Wright

Just where should I put this plant? This question often arises when considering planting a native wildflower in a wildflower garden or restoration area. Among gardeners there is a common saying as follows: "If you have three specimens of the same species, plant two where you think they will do well. Plant the third where you know it will have difficulty surviving. The latter will probably be the one to succeed." To refute this pessimistic outlook, here are a few suggestions.

- 1) Remember that plants in the general garden trade were picked originally, and continuously selected, for their ease of culture. Therefore, wildflowers are more likely to have special requirements than common garden plants.
- 2) Think in terms of individual species, not the general group or genus. Because many violets grow in the woods does not mean that the Bird's-foot violet, *Viola pedata*, will do well there. It requires a sunnier spot with sandier soil. Many new wildflower gardeners have tried putting the various lady's-slippers all in the same general area and wondered why they didn't flourish. Some of these species have quite diverse needs. The stemless lady's-slipper, *Cypripedium acaule*, has to have a highly acid soil, whereas, the small white lady's-slipper, *Cypripedium candidum*, grows in calcareous (limey) soils.
- 3) Obtain information available from local growers - not just sellers. Their catalogues are very helpful. Books on wildflower culture are good references if they are for this general region. Those for the far south or west may not apply as directly.
- 4) Pertinent information may be obtained not only from books about wildflower culture, but also from ones that tell where the plant grows naturally. Northland Wildflowers by John Moyle and Evelyn Moyle includes many Minnesota summer-flowering species. Spring Flora of Minnesota by Thomas Morley deals with the spring-flowering ones.

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Announcements

• **MNPS Banquet** - On Friday evening, 10 April, 1992, about 35 members of the Minnesota Native Plant Society met on the high bluffs above the Mississippi River to celebrate the 10th anniversary of the Society. It was a jolly party! We met at the Emporium of Jazz in Mendota Heights and dined on Cajun food, Walleye Pike and delicious fresh bread along with tasty wine and beer. During ice cream and coffee, President Don Knutson gave a brief welcome after which Bonnie Harper-Lore opened the program. The first part was a series of verbal snapshots about the Society. Harriet Mason gave a synopsis of the LAWSUIT, concerning the dwarf trout lilies at Naerstrand Wood. Many of us were glad to get the details of this event, which happened before we were members of the Society.

Ruth Phipps told us of her early interest in native plants, but lack of specific information about them. She saw a newspaper article about May Wright and her garden, so she called May, and through this contact soon was a member—and a very active one—of the Society.

Chris Souter then told us of the early days of the Society—the months before, during and after the Michigan Botany Group started meeting. Peg Kohring was a very prominent member of this group who decided Minnesota needed a group similar to the one they had worked on in Michigan. Chris also listed the people who signed the articles of incorporation, and the members of the first Board of Directors. Diane Plunkett and Professor Ownbey added other details. Truly, our first 10 years were a colorful period! During these years, issues about native plants were being raised. Positions were defined. Advocacy became established. As a footnote, Chris Souter announced that Peg Kohring, serving with the Nature Conservancy in Guatemala, is beginning a native plant society there. Peg, we're all very proud of you!

The second part of the program was devoted to honoring several members of the Society who are distinguished by their devotion to native plants. To May Wright went the Showy Lady Slipper Award for Outstanding Commitment to Native Plants. Ruth Phipps received the Wild Rose award for Surpassing Dedication to Native Plant Gardening. Gerald Ownbey and Tom Morley were presented the Pasque Flower Award for Excellence in Education for their Atlas of Minnesota Plants. Don Lawrence, for his dedicated work in establishing the Allison Savanna and the Cedar Creek Natural Area, received the Allison Savanna Award for Stewardship of Nature.

Char Bezanson raffled off the *Dianthus* plants that adorned our tables just as the Hall Brothers Jazz Combo swung into a Dixieland tune that had us all tapping our toes as we left to get ready for the annual symposium the next morning—ably developed by Esther McLaughlin. It was a fine celebration of ten years of our Minnesota Native Plant Society. You may all feel very proud!

• **Old Growth Forest Conservation Alert** - It has been called to our attention that the lumber industry in Minnesota has been lobbying against the designation of stands of old growth forest as Scientific and Natural Areas, a designation that would permanently protect these stands by prohibiting logging and other disruptive activities. The industry also objects to management practices which would protect the old growth forests by establishing buffer zones in which logging activities would be restricted, and which would ensure the protection of future old growth forests by setting aside forest areas which do not yet qualify as old growth (see March Speaker article for criteria) but which will qualify in the near future. It is also possible that these groups will try to complicate the process of designating areas as Scientific and Natural Areas across the board, resulting in fewer SNA designations at a higher cost.

If you are concerned about this issue, let your state legislators know. Without input from you, the voice of the lobbyist may be the only voice your legislators hear. Let them know that you favor:

1. the protection of old growth forest
2. management of resources for future generations, and not merely for short-term profit for a few
3. the designation of sensitive areas as SNAs

Address your letters to:

Representative (or Senator) _____
Minnesota House of Representatives (or Minnesota State Senate)
State Office Building
St. Paul, MN 55155

• **Summer Field Trips - May 16th** - Landscaping with native plants workshop and garden tour at the Maplewood Nature Center. Find out how using native plants in your yard attracts wildlife, decreases maintenance, and can contribute to home energy savings. Douglas Owens-Pike will perform site evaluations and select trees, shrubs and wildflowers. The program will include a slide presentation, practical how-to-tips, and a garden tour. There is a \$10.00 fee for this workshop (due by May 8th) payable to the Maplewood Nature Center, 2659 E. 7th St., Maplewood, MN 55119. The phone number there is 612-738-9383.

May 30th - Search for ramshead orchid and other bog orchids in Mad Dog Lake Bog in southern Cass County (co-sponsored with TNC). Meet at 10:00 AM at Annies Cafe on Main Street (which is highway 5) in Longville. To get to Longville go south on highway 84 from highway 200 about halfway between Walker and Remer. Bring mosquito repellent, a bag lunch and beverage, and binoculars. Wear shoes that can get wet, long sleeves and long pants. Plan to be in the bog 4 to 6 hours. The search area is a large bog, expect to walk at least 2 miles and climb over fallen logs. Trip leader is Donna Sheridan from the Minnesota County Biological Survey.

June 6 & 27th - Habitat survey Crow Wing Bird Banding Station, Emily, MN. Arden Aanestad will lead a group to count canopy, mid-range, and ground cover vegetation at the Crow Wing Banding station. Overnite camping/cabins are available Saturday night. Time: 9:00-12:00. Contact: Arden Aanestad before May 1st for more information at

June 27th - Western fringed prairie orchid search and prairie trip in Polk County (co-sponsored with TNC). Meet at 10:00 AM at Mac's Cafe, 106 Washington Avenue NW, in Fertile. We will visit a known site of Western fringed prairie orchids in the morning and spend the afternoon assisting in the orchid search and mapping project in a nearby area. Participants should bring a bag lunch and beverage, mosquito repellent, a hat and binoculars if you wish. Wear long sleeves over a short-sleeved shirt, long pants and shoes that can get wet. Plan to spend 4 to 6 hours on the trip. The search areas are level prairies. Expect to walk up to 2 miles on level but possibly wet terrain. The trip leader is Nancy Sather from the Minnesota County Biological Survey.

June 27-28 - Spring Beauty & Northern Hardwood Forest. Come enjoy the beauty of spring along the shores of Lake Superior. The trip will include an exploration of an old growth sugar maple

forest and investigation of an old beachfront landscape of ridges and swales. Participants will camp under the starry skies or stay in a room in Grand Marais. Contact: Eileen Jordahl at _____

July 11th - Theodore Wirth Park, Quaking Bog Restoration and Eloise Butler Wildflower Garden. Meet at the main parking lot for the wildflower garden. Do not leave valuables in your car. Time: 12:00-2:00. Contact: Mary Maguire Lerman at _____

July 11th - Trip to see the Western Jacob's Ladder, known only to occur in Minnesota and Wisconsin. Meet at 10:00 AM at the DNR Forestry station on county road 5 about 16 miles north of state highway 169 (Co. Rd. 5 intersects Hwy 169 between Hibbing and Chislm). Participants can plan to see the Jacob's Ladder at one of its two known Minnesota sites and spend the afternoon assisting with searches and mapping in a nearby area. Participants should bring a bag lunch and beverage, mosquito repellent (and a net if you have one), a hat and binoculars if you wish. Wear long sleeves, long pants and footgear that protects your ankles and can get wet. The work is in cedar swamps and the going is fairly rough underfoot. Expect to walk 2-4 miles. The trip leader is Roger Lake, DNR Research in St. Paul. Roger can be contacted at _____

July 18th - Lost Valley Prairie/St. Croix Savanna. 9:00-Noon. Bonnie Harper-Lore will lead a trip to Lost Valley Prairie and the St. Croix Savanna. For more information contact Bonnie at _____

August 1st - Prairie Landscapes in the Metro Area. 9:00-Noon. Visit several sites in the Twin City area that have used several different methods of establishing native prairie species in the landscapes. Trip leaders are Roy Robison and Bob Jacobson. Contact Roy at _____ or Bob at _____ for more information.

August 8th - Northfield Area Prairie Remnants. Charles Umbanhower will lead a trip to explore the prairie remnants of the Northfield area. Bring a bag lunch. Meeting place to be decided later. Time: 10:00-1:00. Contact: Charles Umbanhower at _____ (evenings). Leave a message.

Sept. 19th - Cedar Creek Natural History Area. Jan Janssen will lead a trip exploring the mosses of Cedar Creek. Bring a bag lunch, rain gear, waterproof boots and a hand lens. Limited to 15 people. Meet at the lab building at Cedar Creek. Time: 9:00-3:00. Contact: Jan Janssen at _____

Sept. 19th - McKnight Prairie. Mark McKowen and Myles Bakke will lead a trip on the fall wildflowers, grasses and natural history of McKnight Prairie. Time: 1:00-4:00. Contact: Mark McKowen or Myles Bakke at _____

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- 5) Recall where you have seen the species growing naturally. Or, better yet, take a field trip for that purpose. The Minnesota Native Plant Society has a publication, "Guide to Spring Wildflowers of the Twin Cities Region" by James Schuster and Sandy Hansen that lists nearby natural areas and some of the wildflowers found in each*.

When at the site you will probably have little trouble deciding the general habitat such as deciduous woods, prairie, or north woods (evergreen forest). Also note particularly the mini-habitat, places where one or more of the ecological factors differ. Is it a low spot with a little more moisture? or is it a ridge where wind and drainage are greater? Is the degree of shade more or less than in the surroundings? Companion plants may be important in keeping down some competition and also indicating the acidity or alkalinity of the soil. Nearby rock outcroppings can reveal this also.

- 6) Apply this more precise knowledge to picking the proper spot or for making one for your species. "Openings in woods" may not be available, but the plants could receive a little more sun along paths or at the edge of woods. The Shooting Star, *Dodecatheon meadia*, does well there.

Sometimes there can be a "trade-off". The Cardinal Flower, *Lobelia cardinalis*, is found on wet sand-bars in full sun along the St. Croix river. It will grow in a less moist spot if in partial shade, probably because there its moisture loss is less.

You may not have a wet prairie, but again, a little shade rather than full sun may suffice. The Bottle Gentian, *Gentiana andrewsii*, will grow there but too much shade will keep it from flowering.

Both the Bearberry, *Arctostaphylos uva-ursi*, and the Trailing Arbutus, *Epigaea repens*, grow in sandy acid soil in pine woods. The Bearberry grows at the edge of the woods where it is sunnier and drier, whereas the Arbutus stays among the pines in shadier and more moist conditions.

The American Pasque Flower, *Anemone patens* (or *Pulsatilla nuttalliana*), grows in Minnesota in sunny, sandy, somewhat alkaline areas where there is good drainage. Planting it on a steep south-facing slope helps to insure the necessary drainage.

- 7) Do not be surprised if some species will grow under conditions other than those expected. This could be due to limited observation or to the lack of its natural competitors.
- 8) Keep in mind that mini-habitats can change. The spot that had a fair amount of sun may become too shady because that buckthorn seedling wasn't removed in time. The loss of a tree can make quite a bit of a difference in its immediate surroundings.
- 9) Anything that helps prevent failures conserves not only time and money, but limited wildflower sources. It is well then to study and prepare sites for the native plants before they arrive from the nursery. Several of the Minnesota Native Plant Society members do this very well.

*This booklet can be obtained for \$2.00 by writing to Marcia O'Connor, 2168 W. Hoyt Ave., St. Paul, MN, 55108.

Water Pollination in Minnesota Plants

Charles L. Argue

Part 1. Surface Pollination

Although the flowers of the overwhelming majority of aquatic angiosperms are adapted to aerial pollination, a few have come to utilize water rather than animal vectors or wind currents as the agent of pollen transport. These so called hydrophilous plants are capable of dispersing their pollen either on or beneath the surface of the water, depending on the species.

Dispersal directly on the surface of the water (surface hydrophily) is relatively rare and is often considered transitional between wind pollination and submerged, or true, hydrophily. It occurs in Minnesota in the waterweeds (*Elodea canadensis* and *nuttallii*) and in some pondweeds (*Potamogeton*). The Canada waterweed (*Elodea canadensis*), a gregarious and widely distributed plant in Minnesota, bears its functionally male and female flowers on different plants. Male plants, however, are uncommon, and the frequency of seed production remains to be determined. Both the male and female flowers open at the water surface. They reach the surface dry on an elongated hypanthium, protected by a narrow, closed, biserriate perianth tube. The male flowers open suddenly: three water-repellant outer perianth segments reflex against the surface film and hold the 9 stamens erect. Anther dehiscence is explosive, and pollen is scattered over the water surrounding the flower. The pollen grains are joined in groups of four and are densely ornamented with small, air-trapping spines, which maintain the body of the pollen grain above the water surface, allowing for easy movement over the surface film. Initially, the pollen may spread like oil droplets due to an outer coating of oily material. Slight breezes or other disturbances disperse the pollen grains, some of which come into contact with the female flowers. These lie obliquely in small depressions of the surface film. The three water-repellant stigmas extend beyond the margins of the perianth and two usually contact the water surface. Pollen grains that pass close to the female flowers are "captured" in the depressions by gravity and contact the stigma bringing about pollination. The single uniloculate ovule contains three or four ovules, and retention of the pollen in groups of four, only two of which usually germinate, may promote fertilization of more than one ovule even if only one pollen unit locates the female flower.

Elodea nuttallii, also well represented in Minnesota, provides an interesting variation. It is the only known *Elodea* among some 10-12 species World-wide in which the male flower is normally detached from the parent plant. These flowers are thus able to drift freely prior to dehiscence, and it has been conjectured that this increased mobility may enhance the chances of a successful pollination. Except for the absence of petals in the male flower, both the male and female flowers closely resemble those of *E. canadensis* in structure and behavior.

Pollination in *Elodea* differs from the frequently described sequence in *Valisneria*, where the pollen does not touch the water. *Elodea* and *Valisneria* are related, and pollen dispersal in the former represents a clear specialization in the direction of hydrophily.

Surface hydrophily has also been reported in two Minnesota species of pondweed (*Potamogeton*), a genus in which most species have wind pollinated, protogynous flowers. The flower spikes of *P. filiformis* and *P. pectinatus* are lax and floating. Pollen is transported on the surface film to the stigmas, said to have larger receptive papillae than wind pollinated taxa. Pollen of these species is also reported to tolerate wetting much better than that of wind pollinated species. Pollination of the same or other inflorescences can occur. However, the need for further study is suggested by reports of seed set in plants of *P. pectinatus* growing in deep

water without the spikes reaching the surface. The flowers of two other Minnesota species, *P. pusillus* and *P. berchtoldii*, resemble those of *P. pectinatus*. Their small, few-flowered spikes project only a short distance above the surface, and their pollination biology needs investigation to be continued.

Part 2. Underwater Pollination

Minnesota taxa exhibiting submerged pollination (true hydrophily) include species of *Ceratophyllum*, *Zanichellia*, *Najas*, and *Callitriche*.

The familiar hornwort (*Ceratophyllum demersum*) is rootless and usually free-floating. Small flowers are formed under water and are either male or female, with a single male or female flower present at different nodes or leaf whorls on the same plant. Male flowers are comprised of a fascicle of 10 to 20 stamens surrounded by a cup-shaped involucre of bracts. Female flowers contain a single carpel with a slender tapering style and elongated bifid stigmas surrounded by an involucre similar to that found in the male flowers. As the stamens mature they break off one-by-one and rise to the surface, buoyed by an expanded, broad-tipped connective. At the surface the anthers burst open and release very thin walled, nonaperturate pollen grains which sink slowly down through the water around the female flowers. This process is notable in that the anthers dehisce in the air, and the pollen subsequently returns to the water. Such a large number of pollen grains are released that they can cloud the water around the female flowers. Pollen that is caught on the stigmas will germinate and fertilize the single ovule in each carpel.

Like the hornwort, the flowers of the horned pondweed (*Zanichellia palustris*) are pollinated under water, but unlike the hornwort, their anthers also dehisce under water. Flower clusters occur in the leaf axils, with both male and female flowers in each cluster. The female flowers have been variously interpreted, but according to many authors, consist of a cup-shaped spathe surrounding several carpels, each a separate and reduced female flower with one ovule and a peltate stigma. The male flower is reduced to a single stamen with a long filament elevating the anther above the carpels. Pollen is thin walled and nonaperturate. When released it sinks slowly onto the stigmas of the same or a neighboring inflorescence, in either case sliding down the stylar canals where it germinates to fertilize the female flowers.

Pollen tubes develop precociously in some species of horned pondweed, and this also occurs in two species of Minnesota naiads, the slender naiad (*Najas flexilis*) and the large naiad (*N. marina*). Both species are annuals, an unusual circumstance among aquatics. The male flower is reduced to a single sessile anther surrounded by a sac-like perianth. The female flower is a solitary ovary terminated by a style and 2 or 3 stigmas. In *N. flexilis* both male and female flowers occur on the same plant, whereas in *N. mariana* they are borne on separate plants. The pollination of *Najas* has yet to be studied in detail. The pollen lacks an outer wall, and its germination prior to release produces an elongated structure. This shape, found in the ungerminated pollen of some other hydrophilous plants and in fungal spores among several aquatic Hymenocetes, is thought to increase the probability of the slowly sinking pollen being captured on the elongated stigmas.

The water starworts (genus *Callitriche*) include terrestrial and amphibious species that are probably normally wind pollinated. However, submerged species of section *P. sudocallitriche*, including *C. hermaphrodita* in Minnesota, produce flowers and fruits underwater. The flowers are much reduced with male and female flowers usually solitary in the leaf axils and regions of male and female flowers sometimes alternating along the stems. The male flower consists of a single anther on a short filament. The female flower is reduced to a single pistil with two long and reflexed free styles, papillose along their entire length, and a 4-locular ovary, each locule with a

single ovule. The pollen grains, released under water, have a thin, undifferentiated wall and contain many oil droplets. The oil droplets reduce the specific gravity of the pollen grains, allowing them to remain suspended in the water as they are carried about at all depths by currents, eventually in some cases reaching and adhering to the stigmatic papillae. The thin walls, as in other hydrophytes, represent an energy conservation measure, thick walls not being needed to prevent desiccation.

Another Minnesota species deserving careful study is the western ditch grass or widgeon grass (*Ruppia occidentalis*). A related species, *R. maritima*, is sometimes reported to have submerged hydrophily, whereas other authors say pollination in all species takes place at the water surface and involves floating pollen. The pollination of *R. occidentalis* is currently under study in central Minnesota. Along with the absence of bright colors, scent, and nectar, many characteristics of hydrophilous plants are also common in wind pollinated species. The flowers are frequently unisexual with a tendency to separation of the sexes on different plants, as in *Elodea* and *Najas marina*. They have a reduced perianth, the stigmas are large, ovule number is reduced, often to one, and a relatively large number of pollen grains are produced for each ovule available for fertilization; fewer are produced in surface hydrophily, which occurs in two dimensional space, than in subsurface hydrophily or wind pollination. Reductional tendencies can be traced within many groups. For example, a series for taxa within the Najadales suggests a trend from bisexual to unisexual flowers, reduction and loss of the perianth, and reduction in stamen number from *Potamogeton* through *Ruppia* to *Zanichellia*.

Other characteristics, such as the absence of plumose stigmas and pollen grains that are thin walled and often somewhat elongated or that germinate precociously or include oil droplets reflect the difference in character and density of the transporting medium.

Much additional work is needed before the reproductive biology of hydrophilous plants can be fully described. It is likely that additional pollination mechanisms will be discovered, and studies of sexual compatibility, apomixis, mate choice etc. are not yet available. Hydrophily is often viewed as something of an oddity. Rather than merely unusual, however, this form of sexual reproduction provides a case dependent guide to the interplay of unusual and extreme selective pressures on the evolution of a variety of specialized reproductive programs, many of which remain to be examined in detail.

Selected References

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Summary of Guest Presentations at MNPS Monthly Meetings (February - April, 1992)

February 5, 1992 - Plant-of-the-Month: Welby Smith, Minnesota DNR Botanist, focused on the orchid genus *Malaxis* which has the smallest flowers of any orchid. There are 3 species in Minnesota. *M. unifolia* (Green Adder's-Mouth) has a single leaf in the middle of the stem. Most of the flowers of this orchid are clustered at the top of the stem. There are up to 50 tiny flowers in the inflorescence. It grows primarily in bogs in the timbered area of the state but can be found in upland sites in sandy jack pine forests.

M. brachypoda (White Adder's-Mouth) is very rare. It has an elongated flowering stalk or spike and one leaf.

M. paludosa (Bog Adder's-Mouth) is the rarest orchid in North America. It is 4.5 inches tall and has a single stem leaf and 2 - 4 basal leaves. It also has the smallest flower of any orchid in N. America. The fungus gnat is the only insect known to pollinate this flower. The only time this insect has been seen in North America was on a Bog Adder's-Mouth. So it's a rare insect, as well! Although many orchids in Minnesota are pollinated by mosquitoes, these insects step over the tiny flowers of Bog Adder's-Mouth like they weren't even there. The leaves of this orchid produce tiny foliar embryos or vegetative propagules at their tips. These propagules fall off when they mature. There are 3 extant and 2 extinct sites for this plant in north central Minnesota.

Our main February speaker was Diane Plunkett, former president of the Minnesota Nature Photo Club. Diane began by reminiscing about the first MNPS meeting in 1982. It was -14F with a wind chill of -27F and 76 inches of snow were on the ground. Evelyn Moyle gave a talk that night about Minnesota wild flowers which must have been greatly appreciated by the shivering audience.

For her presentation, Diane provided us with a list of Minnesota orchids and referenced some books about orchids including *Orchids of the Western Great Lakes Region* by Fred Case. She also reminded us that virtually all orchids purchased from a nursery are taken from the wild. Orchids are almost impossible to grow from seed. One of the reasons they are so difficult to grow and establish is that they are dependent on a symbiotic relationship with soil fungi called mycorrhizal fungi. She suggested that orchids should never be moved from their habitat unless the area is to be destroyed by construction or development.

Hawaii has only 3 native orchids, Alaska 36 and Minnesota has 45 native orchids. Of these, Diane showed us many beautiful slides of orchid blooms and some of the dried seed pods. Her slides included: putty root, dragon's mouth, grass pink, calypso orchid, bracted orchid, spotted coral root, striped coral root, northern coral root, pink lady slipper, ram's head lady slipper (the smallest lady slipper), large yellow lady slipper, small yellow lady slipper, small white lady slipper, showy lady slipper (our state flower), downy rattlesnake plantain, lesser rattlesnake plantain, tall white bog orchid, tall green orchid, small purple fringed orchid, large round leaved orchid, large tway blade, lesser tway blade, heart leaved tway blade, small round leaved orchid, showy orchis, rose pogonia, and lady's tresses.

Diane's presentation was light, bright and humorous. As a finale, she gathered the MNPS charter members in attendance and took their picture for posterity (shown on next page).



From left, back row: Welby Smith, Dr. Gerald Ownbey, John Masengarb & Dianne Plunkett. Front row: May Wright, Evelyn Moyle & Chris Soutter.

March 4, 1992 - Our March speaker was Bob Djupstrom, from the Minnesota DNR's Scientific and Natural Areas (SNA) Program. He discussed the history, current status, and future goals of the SNA Program in Minnesota. A summary of his remarks follow.

Scientific and Natural Areas enjoy the highest degree of protection of any state-owned lands. The program was established by legislation in 1969, and the first land was set aside in 1972. SNAs are set aside primarily to protect the resource, and can be used for scientific research, as well as for nature observation, interpretation and photography. Hunting, trapping, camping, picnicking, logging, and other potentially disruptive activities are generally prohibited in SNAs.

SNAs are set aside to protect distinctive natural elements, including rare plants, plant communities, geological features, and peat landforms. Before 1979, these areas were identified by nomination of an advisory committee and the public. Since 1979, there has been heavy reliance on the Minnesota Natural Heritage Program's database for rare element identification.

There are currently 92 SNAs, consisting of 164,000 acres. Over 146,000 of these acres were added to the SNA program by the recent peatland legislation. It is estimated that Minnesota will need 500 natural areas to protect multiple examples of rare features within the various regions of the state: 200 in the prairie biome, 135 in the deciduous forest biome and 165 in the coniferous forest biome. In 1985, meeting this need was identified as the 100 year goal for the SNA program.

There are many obstacles to protecting the areas that will need to be set aside if these goals are to be met. On the average, approximately \$200,000 per year has been available in the past for land acquisition, but especially in the urban areas, a single site may cost more than this. Because of the level of protection, interests such as the lumber industry are opposed to SNA designation. Old growth forest, for example, is defined as forest that has been undisturbed for at least 120 years, and which is dominated by long-lived tree species. There is very little of this type of forest left in Minnesota: most old-growth red and white pine is located within the boundaries of Itasca State Park. Lobbying by the lumber industry is currently aimed at SNAs so that these large trees can be harvested. One strategy currently being pursued by lobbyists is to complicate and restrict the entire SNA designation process, thereby preventing many other natural elements from being

protected as well. The SNA Program purpose is to preserve and protect Minnesota's rare and endangered resources for future generations.

April 1, 1992 - Plant-of-the-Month: Barb Delaney, Plant Ecologist with the Minnesota Natural Heritage Program, increased our knowledge and appreciation of Minnesota's state flower, the showy lady slipper, *Cypripedium reginae*. Barb's presentation was based on the 1943 paper published in the American Journal of Botany by John T. Curtis describing seedling development of the showy lady slipper.

From seeds that are less than 1 mm long, the seedling grows only 5 mm the first year after germination. After 4 years, the leaves of the orchid seedling are only about 5 cm long. Reproductive maturity is attained only after 14 to 16 years. Even though the seed capsule from a single flower may contain 10,000 to 30,000 seeds, very few reach maturity. Curtis found that seedlings greater than four years old were extremely rare. Growing and propagating these plants is extremely difficult. The showy lady slipper is dependent upon its association with endotrophic fungi called mycorrhizae. These fungi dissolve organic matter in the soil releasing the nutrients which are in turn utilized by the orchids.

Curtis stated in his classic paper that little is known about the natural conditions under which the showy lady slipper thrives. Much needs to be learned in order for us to properly manage the habitat which supports these orchids and if necessary in the future, to resort to artificial propagation. These fragile and sensitive plants should not be removed from their habitat.

Our main speaker was Jan Jansson titled his talk, "Minnesota Mosses." Mosses are placed in the group of plants called "Bryophytes." Although they are typically referred to as non-vascular plants, some of the more primitive mosses have vestigial vascular tissues. These tissues are made up of hydroid cells which act like the xylem in "classical" vascular plants. Mosses that do not have such tissues have a more simple structure and are therefore more evolutionarily advanced.

The mosses have two distinct visible generations in their life cycle: the gametophyte (1N or haploid) is the green leafy stage that we associate with the familiar mats and carpets of mosses. The sporophyte stage (2N or diploid) grows attached to and is parasitic on the gametophyte. The sporophyte is the result of sexual reproduction; the joining of an egg and sperm (or gametes) produced by the gametophyte. The egg is formed in the female reproductive structure called the archegonium. The sperm is formed in the male reproductive structure, the antheridium. Usually water (dew or rain) carries the sperm to the egg. When the sporophyte matures, it forms a capsule in which spores are produced. Upon release from the capsule, the spores that land on a suitable substrate germinate and grow into the gametophyte. And so it goes, 'round and 'round!

There are many different growth forms among the various species of moss. The growth form is closely related to the habitat in which a particular species of moss grows. "Tufts" have a more upright structure and are found on fairly stable substrate. "Mats" branch profusely, are a flatter form and are tightly adhered to the substrate. "Carpets" are a lawn of upright plants with spreading branches. Sphagnum moss is an example of a carpet forming growth form. "Wefts" are like mats and have profuse branches, but they are easily separated from the substrate on which they grow. They are not in contact with the soil but are draped over it. They obtain nutrients from the leachate dripping from the trees overhead.

Less common growth forms are "dendroid", "aquatic", "epiphyte", and those that grow on dung. "Dendroid" forms look like a little tree. They have a subterranean rhizoid or root-like structure and an upright stalk on which there are bunches of secondary branches. "Aquatic"

growth forms grow in water. Epiphytes are common in the tropics and on the west coast where they can be found forming big balls and masses on Sitka spruce. Those forms of mosses that grow on dung are very specific (i.e. one moss only grows on moose dung and another will only grow on owl pellets). These have co-evolved with the specific dung and some produce a smell like the dung which attracts insects which in turn ensure propagation of the moss.

Sphagnum moss is an important moss in Minnesota. It is the primary moss that forms the vast peatlands of our state. Its apical cell or growing point is indeterminate. In other words, the older parts of the plant can die and the tip continues to grow. Because of the acidic conditions in which this plant lives, the dead parts of the plant do not decay. Consequently, large hummocks are formed. Some of these hummocks are about 1,000 years old.

Sphagnum and the peat it forms store more carbon than any other plant. Because of the ability to lock up carbon the peatlands are as important as tropical rain forests in slowing global warming.

Other Activities & News

The Nature Printing Workshop - August 23-28, 1992, Hackensack, MN. The Nature Printing Society has 125 members, ranging from professional Gytaku artists in Japan to a man in Germany who has the worlds largest private collection of historical nature prints. The NPS workshop will be held at Deep Portage in Hackensack, MN, August 23-28. The workshop is limited to 50. Reservations will be accepted on a first come, first serve basis, with a deposit due in April. Cost will be approximately.. \$375.00. For more information, contact:

Sonja Larsen

White Pine Symposium September 16-18, 1992 - History, Ecology, Policy and Management Duluth, MN (Duluth Entertainment Center-DECC). The symposium will deal with the white pine as a tree, an ecotype, an economic resource and an aesthetic resource. The audience will be natural resource professionals, researchers, policy makers, and some special interest groups. People are invited to display poster or exhibits at the symposium. If you have any questions, please call Steve Simmer at

Lyndale Park Gardeners Open House June 20, 1992 from 11-2:00 PM. Lyndale Park Rock Garden, northeast shore of Lake Harriet. An event to acquaint gardeners with the various plant societies, garden clubs and related organizations that are available in the metropolitan area. The Hennepin County Master Gardener Mobile Horticulture Center will also be participating that day and be on hand to help answer gardeners questions about their plants and possible pest problems.

Ozone May Be Slowing the Growth Of Aspen

Dr. Richard Dickson and Jay Hutchinson (612) 649-5275

February 20, 1992. As the amount of ozone in the atmosphere increases, the rate at which aspen trees grow declines, according to scientists at the Forest Service's North Central Forest Experiment Station, in Rhinelander, Wisconsin.

Scientists at the School of Forestry and Wood Products, Michigan Technological University, and Forestry Sciences Laboratory, Rhinelander, found that individual aspen trees respond differently to ozone stress. One surprising finding of their research is that the greater the average ozone concentration at localities where aspens were collected for the study, the less the injury caused by the ozone, although climate plays a role as well. This finding supports the hypothesis that the levels of ozone may be eliminating ozone-sensitive aspen from forests, causing the species to undergo natural selection for ozone tolerance in several locations across the country.

The Environmental Protection Agency will use the research results to determine if ozone pollution standards are acceptable for forest health. The research also helps explain current damage in aspen forests and will help scientist predict what the future response of forests will be in th event of global warming and increasing ozone pollution. For more information contact:

FOREST SERVICE NEWS
North Central Forest Experiment Station
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Note From The Editor - My apologies for the tardiness of the newsletter, things just kept coming in the mail and I didn't seem to be able to say no to putting them into the "Press". I also ran into a number of computer difficulties and the field season started at work, keeping me away from my computer and printing facilities.

Have a great summer!!!

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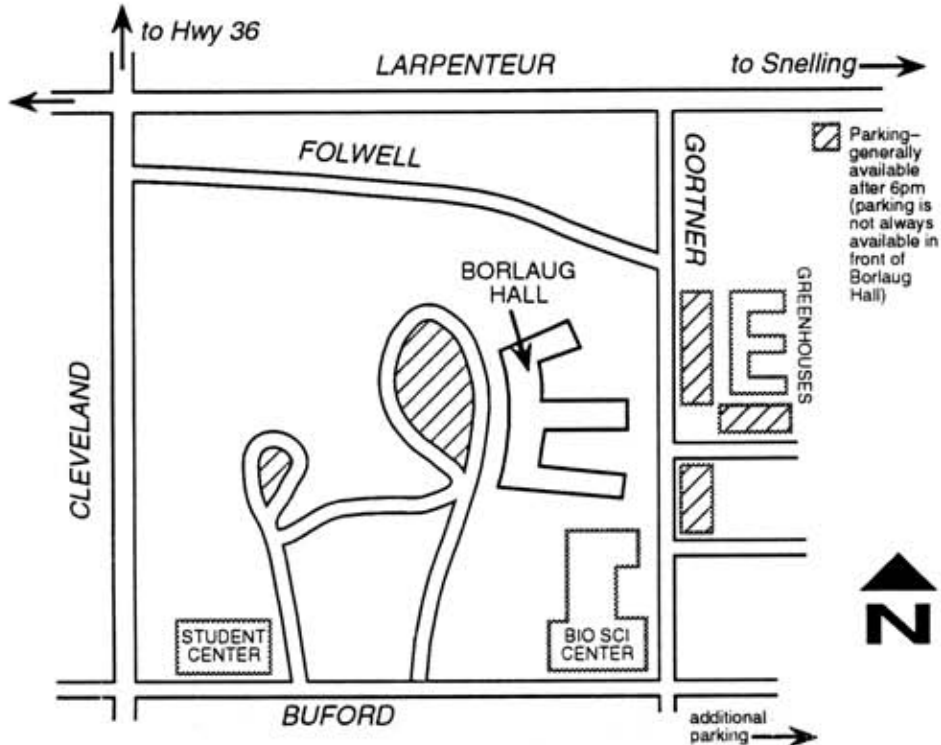
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