



Minnesota Plant Press

The Minnesota Native Plant Society
Newsletter

Volume 13, No. 1

Fall 1993

Upcoming Monthly Meetings

335 Borlaug Hall—7:30-9 PM

October 6. John Moriarity (Hennepin Parks): *Prairie Management in Hennepin Parks—A Brief History of Restoration Effects*. POM: Julia Bohnen, spiderworts (*Tradescantia* spp.)

November 3. Ann Hanchek (UM—Horticulture): *Wild Heritage of Common Garden Plants*; Annual Seed Exchange.

December 1. Dean Hansen (entomologist, wildflower propagation): *Butterfly Habitats: Native Plants in Gardens and Natural Areas*. POM: Diane Hilscher, rattlesnake master (*Eryngium yuccifolium*).

January 5. Mark Leoschke (botanist): *Rust Environment, The Geology and Flora of Fens*; POM: Charles Umbahower, reed canary-grass (*Phalaris arundinacea*)

February 2. Dave McGlaughlin (UM Plant Biology): *Mushrooms and Minnesota Old Growth Forests*; POM: Mark Leoschke, shooting star (*Dodecatheon meadia*)

March 2. Char Bezanson (St. Olaf College, Biology): *School Nature Area Project (SNAP): Outreach to Minnesota Schools*; field trip introduction; annual meeting.

April 6. DNR speaker on recent survey discoveries. POM: Douglas Owens-Pike, bearberry (*Arctostaphylos uva-ursi*)

May 4. Photo contest show; plant sale.

Apparent hybrids between *Erythronium albidum* and *E. propullans* grown from wild seed— Final Report

Thomas Morley

Plants of *Erythronium propullans* Gray bear fruit only occasionally under natural conditions. Banks (1980) found that these plants rarely if ever form seed when pollinated manually by pollen of their own species, but are 20% fertile when pollen of *E. albidum* Nutt. is used. Thus it is thought that the occasional fruits found in the wild must mostly result from cross pollination with *E. albidum*.

The author undertook to test this theory by growing naturally produced seeds taken from wild plants, to see what kind of offspring would result. Ninety-nine seeds were collected over 3 years and were planted in pots at the University of Minnesota Botany Department's St. Paul greenhouse. In an earlier report (Morley 1988), most of the results of this attempt were described; however, only one of the resulting plants had flowered by that time and that plant died after one season; its nature could not be determined with certainty. By 1988, only a single pot remained with living material. Fortunately one of the two plants present bloomed for several successive years and it became possible to determine that it must indeed be a hybrid. The history of the plants in this last pot is outlined below:

1981—14 seeds planted

1982—7 seedlings established

1988—2 non-flowering young plants remain, the rest have died

1989—1 plant flowers; the flower is 9 mm long but remains closed. The leaves are 11 and 24 mm wide. No offshoot is present on the flowering stem. The bulb (a "renewal" bulb, formed within the old one as the latter becomes exhausted) is 12 mm long. 1 non-flowering plant is also present, its leaf 13 mm wide, its bulb 8 mm long.

(continued on page 2, column 1, Morley)

(from Morley, page 1, column 2)

1990—1 plant flowers, the second plant has died. The flower opened but its tepals dropped before the author could measure them. Leaves 11 and 29 mm wide. No offshoot present on flowering stem. Bulb 18 mm long.

1991—plant flowers; tepals 18 mm long when flower is closed, 24 mm long when open, pale violet, turned up to horizontal position. No fruit formed, although the flower was self-pollinated by hand. Leaves 14 and 26 mm wide. *Flowering stem bears an offshoot runner 75 mm long with a bulb 9 mm long and 6 mm thick. Main bulb 35 mm long, 10 mm thick. Both bulbs planted.*

1992—1 plant appears and flowers; tepals pale violet, 22 mm long, fully recurved (tepal attitude varies with the age of the flower). Leaves 14 and 25 mm wide. *No offshoot is present on the flowering stem.* Bulb 25 mm long, 13 x 10 thick.

1993—plant has died.

Since plants of *E. albidum* never bear offshoots from the flowering stem, and plants of *E. propullans* always do, the behavior of this plant can best be explained if it was a hybrid between the two species and produced an offshoot when at its most vigorous state with ideal growing conditions. Apparently when conditions are less than ideal due to environmental change or possibly in this case because the same old soil was mostly used in re-potting, the new bulb, leaves, and tepals may be smaller and there may be no offshoot runner and bulb. Thus the hybrid is flexible in a character which is not flexible in either parent.

The tepal length in the presumed hybrid (22-24 mm) was about what would be expected for such a plant: tepals of *E. propullans* are about 8-18 mm long, those of *E. albidum* 15-36 mm. The flower stalk is similar: 11 cm long for the potted plant when measured in 1992, compared to 3.5-12 cm for *E. propullans* and 6.5-18 cm for *E. albidum*.

Leaf material of the plant in question was sent to Dr. John M. Pleasants of Iowa State University for electrophoretic analysis. He reported that such analysis did indicate some characters of each species to be present; details will be published elsewhere.

Another example of apparent hybridity was pointed out in the 1988 paper, where three non-flowering plants appeared in a pot in which only two were present the year before, indicating that one of the two bulbs had divided. Bulb division never occurs in *E. propullans* but is common in *E. albidum*, and could be expected in a hybrid.

The great losses occurring during germination and growth of the original 99 seeds have left only these two examples to indicate the origin of the seeds, but both point to a hybrid origin.

References cited

- Banks, J.A.** 1980. The reproductive biology of *Erythronium propullans* Gray and sympatric populations of *E. albidum* Nutt. (Liliaceae). Bull. Torrey Bot. Club 107: 181-188.
- Morley, T.** 1988. Observations on colonies and on seedling growth of apparent hybrids between *Erythronium albidum* and *E. propullans*. Phytologia 65: 97-102.

(Thomas Morley is professor emeritus, University of Minnesota, St. Paul Campus)

The Minnesota Native Plant Society

Minnesota Plant Press
Thor Kommedahl, editor

Newsletter of the
Minnesota Native Plant Society

Membership dues are \$10 per year for regular members and includes subscription to the newsletter; dues for students and seniors are \$8, for family \$12, for institutions \$20, and donors \$25. Checks can be made out to: Minnesota Native Plant Society, and sent to: Minnesota Native Plant Society, 220 Biological Sciences Center, 1445 Gortner Avenue, St. Paul, MN 55108.

Three issues are published each year.

MNPS Board of Directors

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Greetings from the Minnesota Native Plant Society Board President

You will notice that I didn't make any reference to the weather in my salutation.

Let me introduce myself. I am Becky Schirber and I have taken over the responsibilities of the president of the MNPS Board as of right now! I came to the MNPS because of my interest in gardening and of course my desire to use native plants in pursuit of that passion.

I wanted you to know my philosophy of organizations such as the Minnesota Native Plant Society. I believe that organizations are only as strong as their individual members. My view is that even though the board is charged with directing the activities of the organization, it is imperative that ideas and action items flow up from the membership as well as down from the board. Going along with this view, members do not need to be on the Board to be active participants in the society. I have no one to quote on this view—which should convince you that I came to this position with no sort of expertise. When I was first elected to the Board a friend asked "Why are you doing that? Do you have a bone to pick?" My response was "No, I believe in community involvement and this is a way for me to educate myself while making a commitment to my community." What I want to say to you is "You too can become involved."

That leads me to the body of this letter: the annual calendar (next column) as well as a listing of the responsibilities in the MNPS and the names of those who have made a commitment to them (see page 4). Listed there are the names of persons who have agreed to be contacts for each of these activities. Please do not hesitate to contact these people if you are interested in making a personal investment in these areas of the Society's work. You will also notice some blank spaces—please contact me at _____ to offer your assistance in these areas. We are especially in need of someone to chair the Symposium Committee. At the last Board Meeting we came up with a wonderful topic for this year's Symposium and great enthusiasm was generated around this activity, but we do need someone to spearhead this endeavor for us.

Just to reiterate membership involvement I thank the following members for their efforts which have made our Society a viable community resource: Pat Ryan, past board member and secretary of the board for 3 years; Don Knutson, past board member, president of the board for 2 years, and updater of our tax free status; Harriet Mason, past treasurer; Catherine Reed, last year's Symposium Chair; Bob Jacobson, past Newsletter Editor; Ray Robison "Minnesota Plant Press" distributor; Diane Hilscher, giver of life to the MNPS display; Rae Montgomery, collector and router of mail (all has been running so much more smoothly since Rae organized this for us!); Marcie O'Conner, keeper of the membership list; Linda Hahn, AV assistance at general meetings; Mary Ann Tucker, for taking around the MNPS display board; and the many people who were speakers, plant-of-the-month presenters at past meetings, and anyone else whose efforts are not written here but who are, nevertheless, not forgotten.

There are so many big and small ways that you can actively participate in the Minnesota Native Plant Society. Don't hesitate to become involved. I am looking forward to working with all of you!

—Becky Schirber, President

Minnesota Native Plant Society Calendar

August

Board Meeting 8/4/93
Organize seed exchange

September

Board Meeting 9/15/93
Publish *Minnesota Plant Press*

October

Board Meeting (Pick Topic for Symposium, Field Trip Schedule) 10/6/93.
General Meeting (Hand out labels for seed exchange) 10/6/93.
Membership fee due.

November

Board Meeting (Nomination Committee convenes) 11/3/93
General Meeting (Seed Exchange) 11/3/93

December

Board Meeting (Firm up Field Trip Schedule) 12/1/93
General Meeting 12/1/93
Articles due for January issue *MPP*

January

Board Meeting 1/5/94
General Meeting 12/1/94
Publish *Minnesota Plant Press*

February

Board Meeting 2/2/94
General Meeting (Announce slate of Board Members) 12/1/93

March

Board Meeting (set plant sale) 3/2/94
General Meeting (Annual Meeting/Election of Board Members) 3/2/94
Articles due for April *Minnesota Plant Press*
Native Plant Symposium 3/19/94

April

Board Meeting 4/6/94
General Meeting 4/6/94

May

Board Meeting 5/4/94
General Meeting (Plant Sale) 5/4/94

Opportunities are available for promoting MNPS activities

Arden Aanestad: Board member; brochure distribution to Nature Centers
Nancy Albrecht: Coordinator of Field Trips
Char Bezanson: Board Member
Chase Cornelius: Board Member, and Newsletter Committee
Linda Hahn: audio-visual arrangements
Diane Hilscher: Board Member, Vice-president; Program Committee; Education and Outreach Committee; Membership Committee; brochure distribution to Nature Centers
Rick Jannett: Board Member and liaison to Conservation Committee
Don Knutson: Membership Committee; Room reservation
Thor Kommedahl: Newsletter editor
Mark Leoschke: Board Member and secretary
Char Menzel: Plant Sale
Rae Montgomery: Membership Committee
Marcie O'Connor: Membership List
Ruth Phipps: Board Member and treasurer
Roy Robison: Board Member; mailing of *Minnesota Plant Press*; Publication Committee
Becky Schirber: Board Member and president
Dave Stevenson: Conservation Committee
May Wright: Seed Exchange
_____: Nomination Committee
_____: Elections Committee
_____: Symposium Committee
—Becky Schirber

Vascular plant distribution can be mapped using QUIKMap

The National Herbarium of Canada (CAN) has been mapping vascular plant distributions on a PC since 1991, using Canadian-developed software QUIKMap with a file and data manager. A digitized map of North America is included. For details, write to Erich Haber, Botany Department, Canadian Museum of Nature, PO Box 3443, Station D, Ottawa, ON, Canada K1P 6P4.

Display Board has been refurbished and is available for use

Society members are welcome to use the newly refurbished display board. Illustrated with beautiful color photos of Minnesota native plants, one side of the 3 x 3 foot board contains information regarding Society events, our newsletter, meetings, and field trips. The other side clarifies the difference between native and non-native plants and discusses plant communities, biomes of Minnesota, and stewardship. It also has a question/answer section with photos to test one's knowledge of nine (interesting!) native plants.

Diane Hilscher designed and completed the board with assistance from many other members. Most slides were generously supplied by Rick Haug, Diane Hilscher, Audrey Engels, and Dianne Plunkett. Slides were sent to the Slideprinter in Denver, Colorado, for prints (excellent results). Board members as well as May Wright, Welby Smith, and Dave and Esther McGlaughlin reviewed and added information to the text. Roy Robison typed the text onto disk and Diane worked with Bob Jacobson to format and print the typed sheets. Bob scanned Vera Wong's original artwork for the Society logo onto disk also. Liz Walton helped with the mounting on foamcore sheets. Many thanks to all who contributed!

Already the board has been put to use by members: Chase Cornelius at the Minnesota Landscape Arboretum and Don Knutson at the Minnesota River Valley National Wildlife Refuge. In addition it was used at the Minnesota State Fair by members of our Society and members of the state horticultural society, and will be used at the Hennepin Park's "Prairie Days" by Diane Hilscher.

All are welcome to show our outstanding display board at events, museums, parties, and schools, provided that there is an attendant, or that it is safely displayed. It is sure to educate, entertain, and inform! To schedule showing of the board, call Don Knutson at

—Diane Hilscher

Ants disperse the sticky *Trillium* seeds.

It's time to renew your membership in MNPS

October is the month to renew your membership in the *Minnesota Native Plant Society*. The year your membership is paid *through* is typed on your address label on the Newsletter. If you became a member of MNPS after 1 April 1993, you are already a paid member for the next year.

You can renew your membership at the October meeting of MNPS, or you can mail your check to MNPS. Membership fees and the mailing address are given in the box on page 2, column 3. The *Minnesota Native Plant Society* appreciates your membership support and your participation!

The Endangered Species Act Amendments of 1993 has been introduced in Congress

The House has introduced a bill by Rep. G. Studds (HR 2043) and the Senate a bill by Sen. M. Baucus (S. 931).

Both bills set deadlines for recovery plan completion with priority given to multi-species plans. Each bill would establish a revolving fund for grants for habitat conservation.

Several bills have been introduced in the House of Representatives that are designed to reduce the jurisdiction of the of the Endangered Species Act.

Reauthorization of the Endangered Species Act is expected in 1994.

—from *AIBS Forum*, Vol. 12, No. 2, 1993

Wild-collected bulbs and wild-flowers treated in new guide

The book, *Gardener's Guide to Plant Conservation*, published by the World Wildlife Fund/TRAFFIC and the Garden Club of America, provides the most up-to-date information on the collecting/propagation status of species of North American wildflowers, bulbs, carnivorous plants, and terrestrial orchids, according to a memo distributed by Faith T. Campbell, of the Natural Resources Defense Council, 17 March 1993.

Minnesota's Native Mistletoe

Don Knutson

Among Minnesota's 1,800 or so native plants, none is more unknown to plant enthusiasts than our native dwarf mistletoe, *Arceuthobium pusillum* Peck. Most Minnesotans are not aware that we have a mistletoe as part of our native flora. Part of the reason for this obscurity is its growing habits; it lives parasitically on the living limbs of black spruce trees. And black spruce trees grow in swamps. So, unless you're inclined to go wading to see rose pogonia (*Pogonia ophioglossoides*) or grass pink (*Calopogon pulchellus*) in bloom, you are not likely to see the black spruce dwarf mistletoe. And even when you do see it, it is difficult to admire it.

It is a small plant, with leafless aerial stems 1-3 centimeters long. It is smaller than the other 20 or so species of dwarf mistletoe that occur naturally in the United States. Like all the dwarf mistletoes, our Minnesota native lives exclusively on conifers. While black spruce is its primary host, it does infect other spruces, Eastern larch and, occasionally, pine trees. It is found from Minnesota on the west, through Wisconsin and Michigan and throughout the New England states as far south as northern New Jersey and Pennsylvania. In Canada, it is found from east-central Saskatchewan (even with the North Dakota-Montana border) to southern Ontario, Quebec, and throughout the Maritime Provinces and Newfoundland.

I want to tell you about the life style of this curious, dicotyledonous plant that lives parasitically on its evergreen host. Maybe I should say two plants, since it is dioecious, that is, each plant is one sex or the other, and the small stems, or shoots, are referred to as either pistillate shoots or staminate shoots.

These shoots bear the flowers in April and May, with extremes from late March to June. The staminate flowers, 2 millimeters in diameter, can be identified at this time by the small pollen sac (anthers) on the top of each of the three petals. The female, or pistillate, flowers are not seen as flowers, but are distinguishable by a tell-tale drop of sugary

fluid over the tiny, recessed flower. It is thought that the pollen grains are carried by insects or wind to the drop of fluid and that later the drop is absorbed down into the female flower, carrying the pollen to the stigma of the female flower. There are normally 5-15 flowers per aerial shoot.

Seeds mature within a fruit in September and October of the same year as pollination. Mistletoe seeds are explosive. As seed approaches maturity in the fall, the fruits, which are shaped somewhat like an avocado, enlarge, fill with fluid and become turgid. At the same time, an abscission zone forms near the stem end of the ripening fruit, and the stem (pedicel) curves down, much like a cherry does. Eventually the abscission zone is weakened so that a slight movement in the wind causes a complete failure at the abscission zone. This causes the fruit case to fall away, allowing the fluid to escape, pushing the seed out to a distance of up to 20 feet. The late Dr. Hawksworth used high speed photography to determine that the mistletoe seeds can travel nearly 60 miles per hour!

The mistletoe seed is a remarkable propagule! To begin with, it has no seed coat, but has, instead, a gelatinous mass of fibrous sticky material, called *viscin* which surrounds the seed. This functions to 'glue' the seed to whatever it strikes in its flight. The hazards to this 'naked' seed are many. Only those seeds that land on live spruce trees have a chance of surviving.

The sticky mistletoe seed, traveling at 60 mph, typically is intercepted by the spruce needles. However, the mistletoe cannot infect needle tissue, but must infect woody twig tissue. To get the mistletoe seed to the twig, the sticky viscin, surrounding the mistletoe seed, has a remarkable quality: as soon as it rains, the viscin absorbs water and loses its adhesive qualities and becomes very slippery.

This allows the seeds to slide down the needles to the woody twig. Later the viscin dries and hardens, holding the seed in its precarious position until the following spring when it will germinate.

During the fall, winter and early spring, the mistletoe seeds are eaten by birds and insects. Those that survive begin germinating in March and April.

In this they are similar to other seeds. They are different, however, in that the emerging root tip does not grow straight down toward the center of the earth. The emerging growing tip—called the radicle—is insensitive to the pull of gravity. But it is sensitive to light and grows away from light and toward the darkest place. The advantage of this is clear for those seeds that are positioned on the bottom of horizontal twigs. As seeds germinate, the radicle tip, ignoring gravity and growing away from light, will grow upwards toward the woody twig.

After contacting the twig, the radicle tip forms a mass of tissue called a holdfast. Within the holdfast tissue, a new growing point forms which penetrates the host twig by a combination of enzymatic action and mechanical force. Like many aspects of mistletoe, this phenomenon is poorly understood.

The invading mistletoe tissue grows through the bark to the ray tissue of the wood. Here the xylem of the mistletoe forms an intimate union with the host xylem. It is this arrangement that is the primary basis for transfer of metabolites from the tree to the parasite.

The mistletoe plant within the twig tissue now branches and grows throughout the inner bark, eventually pushing aerial stems up through the bark, producing flowers and repeating the cycle.

There are many more amazing things to tell you about the black spruce dwarf mistletoe:

- How does mistletoe cause the spruce host to produce 'witches brooms'?

- Why are there stomates on the radicle?

- Why do the seeds have chlorophyll (both chlorophyll a and b)?

- What ecological roles does black spruce mistletoe play in wetlands?

- Does air pollution threaten black spruce dwarf mistletoe?

- Which birds and mammals spread mistletoe seeds?

But let's save these for another story. Meanwhile, please respect one of our smallest, least well-known and most unusual of native Minnesota plants!

Xanthoxylum americanum (prickly ash) is the only member of the citrus (rue) family (Rutaceae) native to Minnesota.

Seed Collection and Storage

Char A. Bezanson
St. Olaf College

Introduction

Sharing seeds of native plants from our gardens or collecting the seeds of wild native plants can be a rewarding endeavor. To collect seeds successfully, the collector must become familiar with the life cycle and natural history of the plant, especially its flowering, fruiting, and germination habits. Some plants self-seed readily as soon as seeds are produced, while other seeds require a long after-ripening period, a winter cold treatment, or other specific conditions. Some plants produce seeds with high germination rates under the appropriate conditions, while some produce seed that seems utterly useless, and refuses to germinate in any quantity under any conditions. Information is available about the requirements of many plants, especially those commonly grown in gardens, but there are many holes in the published literature, which leaves lots of room for experimentation by amateur botanists.

Timing of Collection

Seeds should be collected when they are mature, or nearly so. Part of the maturation process involves drying of the seed: moisture is high in immature seeds (60%) but drops to about 10% as seeds mature. Often, you can tell if a seed is mature by pinching it between thumb and forefinger; if the soft center extrudes from the seed, it is not mature. Once the seed is mature, it can usually not be squashed even by biting it.

Many native plants have dry fruits or seeds which fall from the plant when mature, so timing is critical if seeds are to be recovered. Often, seeds mature sequentially from bottom to top (or *vice versa*) of an inflorescence, so that repeat visits are necessary. In some situations, the entire inflorescence can be collected in a paper bag and the seeds allowed to mature on the plant material.

Processing

Drying. When seeds are collected, their moisture content is usually higher than desirable for good storage. Good air

circulation around freshly collected seeds and use of paper or mesh bags for collection rather than plastic will help prevent spoilage of seeds and assist in drying. Allowing seeds to dry on supporting plant material is also helpful, as the other plant material will tend to draw moisture from the seeds. Moving warm, dry air around the seeds will also lower their moisture content. Remember, however, that seeds are living organisms: avoid drying with high heat if you want viable seeds! For many seeds, temperatures over 100 °F are lethal.

Cleaning and Threshing. When the seeds are mature, it is important to detach seeds from the supporting plant material, and to separate the seeds from this material. The seeds must stay dry if they are to be successfully stored, and material from the inflorescence will tend to retain moisture as well as support decomposers such as fungi and bacteria.

Initial cleaning can be done by screening through hardware cloth or other appropriate material. This will remove large pieces of plant material, but many seeds will then require threshing. Threshing of seeds involves removing fruit and inflorescence material (such as glumes, bracts, pods, and dry fruit parts) by mechanical action. It can be done by pressing between bricks, by bagging the material and walking on it, or by any number of homemade devices involving screens, paddles and washboards. The chaff is then blown or screened away. Parts of this operation can also be done by hand.

Plants with fleshy fruits require a different treatment. For example, elderberry seeds can be collected by whirling the fruits with water in a blender, then spreading out the resulting pulp and hand-picking or screening out the seeds.

Storage

Moisture content and temperature are the two most important variables in successful seed storage. Each 1% reduction in seed moisture content (down to about 6%) doubles seed life. Each 10% reduction in temperature (down to

32 °F) doubles seed life.

Removing moisture from seeds is done by lowering the relative humidity of the surrounding air, which can be done by refrigeration or by desiccation. Refrigerated air is both drier and cooler than room air.

Seeds must equilibrate with 65% relative humidity (or less) for 1-year storage, 45% for 2-3 year storage, and 25% for long-term storage (5-6% seed moisture content).

Dry seeds (<14% moisture) can be stored in the freezer; however seeds must be in moisture-proof containers.

In summary, reasonable storage conditions for several seasons can be provided by storing envelopes of fully mature and dry seeds in heavy zip-lock bags in the refrigerator. Longer storage requires more ideal conditions.

Record Keeping and Labeling

Good record-keeping is important if you want to learn about your plants and develop a working knowledge of techniques that you have found to be successful. If you exchange seeds with others, the following minimum information will be helpful:

Species (scientific and/or common name); habitat (sunny well-drained garden, dry woodland, marsh, etc.); collection site; collection date; collector; storage since collection.

Minnesota Native Plant Society Seed Exchange

The Minnesota Native Plant Society sponsors a seed exchange every autumn. This year the exchange will take place at the November meeting. Seed envelopes with spaces for the appropriate seed data (see above) will be available for pickup at the October meeting for anyone needing them; otherwise, please provide similar information on your own labels. As usual, those who bring seeds to exchange will have first choice of seeds, but the exchange will then be opened up to all members.

Reference

Young, J. A., and Young, C. G. 1986. Collecting, processing and germinating seeds of wildland plants. Portland: Timber Press.

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