Minnesota Plant Press

The Minnesota Native Plant Society
Newsletter

Volume 15, Number 3 **Spring 1996**

Upcoming Meetings

Minnesota Valley National Wildlife Refuge
Visitor Center, 3815 East 80th Street
Bloomington, MN 55425-1600 612-335-2323

6:00 PM—Board Meeting, Room B
6:30-7 PM—Socializing, Room A
7-8 PM—Regular Meeting, Auditorium
8-9 PM—Refreshments, Room A
9 PM— Doors close sharply at 9 PM

April 4—David Augustine, *Effect of Deer Browse in the Big Woods;*
Plant of the Month: Bill Capman, *Silphium*
April 17–Garden Committee 6:30 PM (see p 2)
May 2—Plant Sale and Slide Show
May 11—MNPS Symposium (see p. 4)
Spring Field Trips (see page 3 for dates)
Deadline for Summer Issue is June 15, 1996.

NEW BOARD MEMBERS ELECTED

At the MNPS meeting on March 7, 1996, three new members were elected to the Board, to take office in the fall. They are Dave Crawford, Lisa Mueller, and Gary Perrault. Going off the Board are Arden Aanestad, Nancy Albrecht, and Esther McLaughlin. We congratulate the new members and thank the outgoing members for their excellent service to MNPS!

To pool rides to the **Minnesota Valley National Wildlife Refuge**, please call—well in advance— Grace Gray who will coordinate pooling

Minnesota's Native Mayapple: the Plant Alkaloid Answer to Cancer

Elizabeth M. Frieders

Humans used plants for medicinal purposes long before recorded history. We know this from observation only: ancient cave paintings of shamans holding plants, and a 60,000 year old Neanderthal man buried with some medicinal plants. Dating to the 16th century BCE, the Egyptian Ebers Papyrus refers to 700 drugs and is thought to be one of the earliest medical texts. Many of the earliest Chinese, Hebrew, Sanskrit and Greek documents were treatises on herbal plants. In the past, whole plants, plant parts, or raw plant extracts were used in remedies. But in the 1800s, chemists began to characterize the active compounds in medicinal plants and found that they usually belong to one of three chemical groups: glycosides, oils and alkaloids.

Alkaloids are a diverse group of natural plant compounds containing carbon, nitrogen, hydrogen, and sometimes oxygen, in a ring structure. More than 3000 alkaloids have been isolated from nearly 4000 plant species. Most of the plants that produce alkaloids are herbaceous dicots; few gymnosperms or monocots produce them. It is thought that up to 2000 more alkaloids remain undetected in the plant world. Plants synthesize alkaloids through a complicated series of metabolic pathways that starts with photosynthesis. In some plants, alkaloids are systemic, while in other plants, alkaloids are sequestered in specific organs or tissues. Little is known about the role that alkaloids play in plants, but some proposed functions include: 1) growth regulation; 2) pH balance in the plant; 3) protection against herbivory, parasitism or infection; 4) a means of nitrogen storage in the plant; 5) substrates for plant-derived mimics of animal or insect pheromones (for example, pollinator attraction); or 6) waste products that have no function. It is possible that alkaloids have multiple functions in plants, many of which we have yet to understand.

Humans have found numerous uses for plant alkaloids, from medicinal (purgatives, pain relievers, tranquilizers, stimulants, muscle paralyzers) to agricultural (pesticides and herbicides), to romantic (aphrodisiacs), and of course, to narcotic. Some common examples of plant alkaloids include caffeine, cocaine, nicotine, ephedrine, strychnine, morphine, codeine, quinine, and atropine

*(continued on page 6 **Mayapple**)*

MNPS Adopted Garden Group at MVNWR Center

Classroom Garden adopted.—On Monday, March 11, 1996, with rather short notice, a small group of MNPS members and staff from the Minnesota Valley National Wildlife Refuge (MVNWR) met to begin planning the two gardens that MNPS is adopting on the MVNWR grounds. We have agreed to adopt the Classroom Garden, which lends itself to woodland plantings, and the Prairie ID Garden just outside the main entrance to the Visitor Center. The woodland garden will require more evaluation than the prairie garden throughout the coming growing season In addition, most people who signed up as interested in working on the gardens listed both gardens as areas of interest. Since it looks like the tasks will be spread out over the next 2 years, we decided to organize ourselves as one "garden group" instead of splitting up into a prairie group and a woodland group.

The next planning meeting of the garden group is scheduled for Wednesday, April 17, at 6:30 PM. Come to the door near the classrooms. We will be meeting with Mike Marxen, Fish and Wildlife Service Landscape Architect, and with other Refuge staff. All MNPS members interested in the garden projects are welcome. *–Char A. Bezanson*

Design.—Important design components used by the design team include:

- Insect and animal habitats
- A *Through the Seasons* approach for visual interest, blooming cycles, and, visitor and student use.
- Site specific microclimates, moisture and drainage requirements, soil type and modifications, solar aspects
- Underground wiring (electric or cable)
- Commitment to maintaining quality

Areas considered.—Area 1–ID Garden. Existing plants include mostly native grasses, and volunteer trees and forbs.The design team will consider woodland edge plants and prairie grasses.

Area 2–Classroom Garden. Existing plants are ferns, a few forbs, and mostly unknown plants. A woodland wild flower aspect will be created.

Assessment is needed. Volunteers are needed for planning, design, plant ID, plant salvage, soil sampling, plant donation, planting, and maintenance.

Schedule

Spring 1996: Plant ID and salvage, soil testing, design.

Summer 1996: Plant ID and salvage, removal of unwanted species, soil amendment, composting.

Fall 1996: Acquire and install plants, weed removal, modify design.

Spring 1997: Plant additional plants.

Summer 1997: Watch for invasive plants, remove or relocate plants if needed.

These plans are subject to change, depending on circumstances. *–Gary Perrault*

MNPS Financial Report for 1995

Assets on hand 1 January 1995	$ 6141.12
Income during 1995	5959.53
Total cash	12100.65
Expenses during 1995	5965.51
Assets on hand 31 December	6166.83
Checking account balance 31 Dec 95	1892.64
Income	
Membership	$ 3713.00
Donations	211.00
Symposium	966.00
Wildflower booklets	9.00
Plant sale	492.50
Hennepin Parks	512.00
State Fair	25.00
Bank interest	31.03
Total income	**$ 5959.53**
Expenses	
Printing & copies	$ 1955.04
Postage	1058.52
Speakers & writers	650.00
Symposium	233.63
Refreshments	213.26
Supplies	64.80
Paid services	579.35
Advertising	133.14
State Fair expense	10.00
Phone calls	19.09
Arboretum donation	200.00
Hennepin Parks	488.48
MN Valley Int. Association	300.00
Memorial (May Wright)	60.20
Total expenses	**$ 5965.51**
CD TCF due April 1996	$1129.14
CD TCF due July 1996	$2500.00
CD TCF due December 1996	$645.05

—Ruth Phipps, Treasurer

The Minnesota Native Plant Society

Minnesota Plant Press
Thor Kommedahl, editor

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. Make checks payable to: Minnesota Native Plant Society, and sent to: Minnesota Native Plant Society, 220 Biological Sciences Center, 1445 Gortner Avenue, St. Paul, MN 55108.

Four issues are published each year.

The Minnesota Native Plant Society is a tax-exempt 501 c3 organization as determined by the US Internal Revenue Service.

Spring Field Trips 1996

Early Spring Trips

April 20 and **21**, Sibley State Park, early wildflowers, 3-4 PM. Vehicle needed; contact the park at (612) 354-2055.

April 20, 24, and **May 1**, Nerstrand Big Woods State Park, warblers and wildflowers; 7:30-9:45 AM; register by calling *The Nature Conservancy* at (612) 331-0767.

April 28, Nerstrand Big Woods State Park, Picnic shelter, spring flowers; 1-3 PM, Char Bezanson, leader;

May 4

•Frontenac State Park, spring woodland wildflower walk, 10 AM; Preregistration required with small fee. Contact Lake City Community Education Department at (612) 345-2850, or Frontenac State Park at (612) 345-3401.

•Whitewater State Park, morel mushrooms and wildflowers; 1-3 PM; bring transportation to drive to activity site; for details, contact the park at (507) 932-3007.

May 4 and **5,** Sibley State Park, woodland wildflowers, 2:30-4 PM; for details, call the park at (612) 354-2055

May 11

• Sakatah Lake State Park, 10 AM, Blooming Edges Wildflower Walk; no reservations needed; for details, contact the park at (507) 362-4438.

•Wild River State Park, spring wildflowers in the St. Croix valley, 1-3 PM; Dave Crawford, leader; meet at picnic shelter; a bag lunch is suggested; for details, contact the park at (612) 583-2925.

May 18, St. Croix State Park, wildflower watercolors, 10-11 AM; meet at visitor center to car pool to Sand Creek; for details, contact park at (612) 384-6615, or 384-6591.

May 19, Rice Lake State Park, wildflower walk, 1 PM; no reservations; for details, contact park at (507) 455-5871.

May 25, Whitewater State Park, yellow lady's-slipper walk, 1-3 PM; bring transportation to drive from visitor center to the trail head; for details, contact park at (507) 932-3007.

June 1, Wild River State Park, exploration of a managed oak savanna and early season prairie wildflowers, 1-3 PM; Dave Crawford, leader; meet at interpretive center—an alternative indoor walk will replace walk if weather is inclement; wear appropriate clothing and tick repellent on shoes, socks, and cuffs; for details, contact park at (612) 583-2925.

June 15, Nerstrand Big Woods State Park, Outside In Tour, 10-11:30 AM. The future of Nerstrand Big Woods State Park relies on land use in the neighborhood. Join the tour to see the park from the "outside in". See the glacial outwash valley of Prairie Creek, restoration work to "close the canopy", fragmentation of habitats, and the edge effects in the Big Woods. Preregister at

Late spring and early summer

June 22, River Terrace Prairie Scientific and Natural Area, Cannon Falls, 7 AM. Ellen Fuge, leader. Bike the Cannon Trail from Cannon Falls to Red Wing with a stop halfway at trail-side rest area for a tour of the River Terrace Prairie SNA. This is a 25 mile, downriver trip on paved abandoned railroad grade along the river. The SNA protects the only gravel prairie in Goodhue County, with one of the largest populations of kittentails in Minnesota. Expect a short climb. Have breakfast at a local cafe, rides start at 8 AM. Lunch in Red Wing. Either pedal back or shuttle. Group size is limited to 12 people. Bring food and beverage; maps provided. Contact Ellen at

June 29, Prairie Moon Nursery Tour, 1-5 PM (Winona Area). Join a tour at this nursery on native transplant and seed production gardens, diverse restoration plantings, and landscape projects using native species. There will be an optional hike (moderately difficult) to the top of a nearby goat prairie. For details, directions, and reservations, contact the nursery at (507) 452-1362.

—prepared by Nancy Albrecht

For all trips to state parks, a vehicle permit will be required. Bring handbooks, lenses, camera, and other outdoor equipment to facilitate study and enjoyment of the trip.—NA

Wetlands in Your Backyard

To celebrate National Wetlands Month, explore and learn about wetlands with landscape architect Sherri Buss and aquatic plant specialist Mike Halverson at Maplewood Nature Center, Tuesday, May 7, 7-9 PM. Topics will include:

•Characteristics of a healthy wetland habitat

•Benefits of wetlands for wildlife, water quality, and aesthetics

•Resources available to enhance neighborhood wetlands through planting and other habitat improvements

•Identification of common wetland plants

To register for this *free* program, please contact Janet Grew Hayman, Naturalist, at the Maplewood Nature Center, (612) 738-9383, or 436-7621.

Minnesota Botany—An International Exhibition of Photography

Exhibitions will be held at the Minnesota Native Plant Society meeting, Thursday, May 2, 1996, at 7 PM and at the Minnesota Nature Photography Club meeting on Thursday, May 16, 1996, at 6:30 PM. Both meetings will be held at the Minnesota Valley National Wildlife Refuge Center.

The subject matter includes flowering plants, fungi, lichens, mosses, ferns, habitats, and fossil plants. Entry forms for submitting slides for judging can be obtained from Marilyn or Warren Gladitsch or send slides, entry fee, name and address, and slide titles to Minnesota Botany, 2110 Watson Avenue, St. Paul, MN 55116.

Judging will take place on Saturday, April 20, at St. George's Episcopal Church, 5224 Minnetonka Blvd., St. Louis Park, from 9 AM to mid-afternoon. All are invited to attend the judging.

MNPS Display Board Use

All members are welcome to show our display board at events, museums, and schools, if an attendant is present or it is safely displayed. This 3 by 5 foot, 2-sided board holds information on the Society, native plants, and stewardship. Call Don Knutson at

E-mail in the Directory

Marcie O'Connor keeps and updates the mailing list for MNPS. In the Directory for fall 1996, E-mail addresses can be included. Please send your E-mail address to Marcie at: marcie@haven.com if you want your E-mail address to be included in the Directory.

The Spring Symposium on Deciduous Forests is May 11

The annual MNPS Spring Symposium wll be held Saturday, May 11, 1996, at the Minnesota Valley National Wildlife Refuge (MVNWR). It will focus on Minnesota's deciduous forest ecosystems and plants. An interesting program of speakers and gardening discussions is planned—look for a brochure in your mail sometime in early April. Two MVNWR gardens which the MNPS has "adopted" will be a featured aspect of this year's symposium, as several members with gardening expertise share their knowledge of cultivating woodland (and other) native plants in afternoon workshops. Plan to bring your lunch, learn about our broadleaf forests, discuss gardening, and explore the refuge grounds afterwards.—*Esther G. McLaughlin*

DNR seeks volunteers

The Scientific and Natural Areas Program of the Minnesota Department of Natural Resources (DNR) seeks volunteers to help preserve some of Minnesota's rare natural features. Undisturbed remnants of the state's original prairies, peatlands, forests, wetlands, geologic features, and rare plants and animals are targets of this program.

Workdays are held at four sites—St. Croix savanna, Lost Valley Prairie, Wolfield Woods, and Falls Creeks—from April through October. All workdays are on Saturday, from 10 AM to 2 PM. Activities include firebreak maintenance, planting of seedlings, removing exotic weeds, and collecting seed for restoration projects.

If interested, call the volunteer office at DNR: (612) 297-1449. Detailed information about the sites, volunteer information, workday schedules and an application form will be provided.

—Judy Lively, Volunteer Coordinator, DNR Scientific and Natural Areas Program, 500 Lafayette Road, St. Paul, MN 55155.

Reed Canary Grass

Charles E. Umbanhowar Jr.

Reed canary grass (*Phalaris arundinacea* L.) is an all too common inhabitant of Minnesota wetlands and marshes, and can form dense clumps excluding all other species except for a scattered nettle or two.

Reed canary grass is native to temperate regions of North America, Europe, and Asia. It is a cool season grass 3 to 6 feet tall. The inflorescence is about 3 to 7 inches long and is relatively thin (0.5 to ~2 inches); the width of the inflorescence varies with the wetness of the environment. The wide (0.25-0.75 inch) blade of reed canary grass juts out at a sharp angle to a length of 3 to 16 inches, and a large membrane-like ligule (0.25 inches tall) is present where the sheath and blade meet. Large rhizomes enable rapid spread to form dense patches several yards in diameter.

Agronomists have long been interested in reed canary grass as a forage crop and have developed cultivars palatable to animals. This grass has great tolerance to grazing and regrows rapidly to produce as much as 4 to 8 tons of dry matter per acre in one year. This rapid growth rate makes it useful to stabilize banks after road construction. Reed canary grass is an effective nutrient filter and can remove large amounts of nitrate nitrogen, as reported in New Zealand.

Because of these characteristics, this species is a significant threat to shallow-water wetlands; floating mats were reported in Connecticut. It is unclear why it invades only certain wetlands, although nutrient runoff from uplands may affect the plant's ability to absorb nitrogen and other nutrients. Other agronomic factors may be involved.

Reed canary grass can be flooded out or killed with broad-spectrum herbicides (Rodeo or Pondmaster) applied annually in June. Burning and herbicides have been undertaken as a last resort; however this combination may stimulate seed germination to reduce the size of the seed bank. See references on page 9 for more information.

Factors affecting biological recovery of wetlands restorations

Susan M. Galatowitsch

Benefits of restoring wetlands

Public interest in restoring wetlands stems from a belated recognition of the benefits of wetlands in the landscape, including their importance for improving water quality, reducing flood flows, and providing wildlife habitat (2). Unfortunately, restored wetlands have not been shown to provide functions, such as maintenance of diversity, improvement of water quality, and habitat for wildlife, normally associated with natural wetlands (20). Revegetation of hydrophytic vegetation is essential for restored wetlands to function as natural wetlands, for example, denitrification occurs at the greatest rates when emergent plant litter is present to provide a microbial colonizing surface. Emergent vegetation such as bulrushes and cattails quickly reestablish themselves without planting and resemble plantings of natural wetlands within a few years, in many wetlands (8, 9, 17). However, the margins of restored prairie wetlands lack sedge meadow vegetation present in natural wetlands (4). Instead the periphery of restored marshes is dominated by mudflat annuals. Wetland functions of restored wetlands associated with emergent vegetation, such as nitrate reduction in surface waters, may be comparable to natural wetlands relatively rapidly, whereas, other functions may be impaired because of lack of revegetation.The lack of sedge meadow revegetation, for example, was shown to limit use of yellow throats, sedge wrens, and rails in restored prairie potholes (3). Also, lack of perennial vegetation on the edge of restored wetlands will likely increase sediment amounts and sediment-borne agricultural chemicals (phosphorus and pesticides) received by the basin.

Natural restoration

Many restored wetlands are allowed to become recolonized naturally because it is thought that natural plant dispersal and establishment will adequately revegetate them (10). Seedbanks of wetland basins drained for more than 15-20 years contain few species, mostly restricted to mudflat annuals and a few emergent perennials (19). Similarly, the seedbank compositions of restored basins—all drained for 25 to 70 years—in my study (5) were found to be depauperate and not concordant with existing vegetation on the sites. Submersed aquatic species such as *Potamogeton* species, for example, do not tolerate desiccation (12), and, therefore, must recolonize the restored basins from immigrant propagules. Sedge meadow and wet prairie perennials were not found in the seedbanks of natural or restored wetlands. Because these species inhabit stable environments, they may lack persistent seedbanks, unlike mudflat annuals and emergent perennials that must tolerate periodic drying and flooding (18). Assuming that seedbanks are not persistent in wet prairie and sedge meadow species, plants must rely on dispersal for recolonization.

Limitations to natural recolonization

Others also have found limitations to natural recolonization. On the basis of a survey of the floristics of ponds created between 25 and 250 years earlier, Godwin (6) concluded that land barriers slow the dispersal of wetland vegetation considerably. Similarly, land barriers to dispersal were implicated in patterns of colonization in Dutch polders: the number of species decreased with distance from propagule source (7, 14). Dispersive characteristcs of species affected their rates of colonization. Wind-dispersed species such as *Senecio congestus* and *Typha latifolia* colonized new polders in the Netherlands more rapidly than water-dispersed species such as *Scirpus maritimus*. Reinartz and Warne (16) also found that distance to the nearest seed source had a particularly strong effect on the number of native wetland species present in restored wetlands in Wisconsin. Moller and Rordam (11) reported ten fewer species in ponds within an area with an average interbasin distance of 1040 meters than in another with an average distance of 435 meters.

Dispersal rates

Nearly all studies, including those just described, identifying land barriers to dispersal as a limitation to wetland colonization do so by inference from vegetation patterns and not by direct measurements of dispersal. Archibold and Thompson (1) attempted to measure dispersal rates in a limestone quarry in New South Wales, Australia, by putting out trays of sterilized soil for 6 months. No native species were detected in their samples, causing them to recommend deliberate planting. Long-term data on dispersal rates in fragmented landscapes is also lacking for wetland systems. However, studies on a woodland plant, dog's-mercury (*Mercuralis perennis*) suggest that land barriers can be impervious. Although secondary forests and hedgerows occur throughout the range of *M. perennis*, only 35 populations have colonized wetlands from 119 ancient forest populations within the last 300 years (15). Half of the new populations are likely to have spread vegetatively from nearby source woodlands. So, a new population becomes dispersed from source areas by seed to establish populations less than once every 15 years, on the average.

Cited References

1 Archibold OW, Thompson S. 1984. Natural seed input as a factor in the reclamation of limestone quarry wastes at

(continued page 9 **Wetlands***)*

(continued from page 1)

(in fact, most compounds ending with -ine). Many over-the-counter pain relievers and allergy or cold tablets contain at least one plant. I found it interesting to locate alkaloids on the ingredient labels of my household pharmacy. What plant products are hiding in your own medicine chest?

Modern medicine has put plant alkaloids to an extremely wide range of uses. And not surprisingly, remedies to one of the most feared diseases of the modern era, cancer, are being sought in the plant world as well. In the 1940s, two plant alkaloids with cancer-fighting abilities were found by accident in the rosy periwinkle. Since then, scientists have actively sought plants that have been used by folk healers or shamans. Six of the 66 anticancer drugs approved in the United States are derived from plants: one from the Pacific yew, three from the rosy periwinkle, and two from Minnesota's native plant, the mayapple.

The mayapple (*Podophyllum peltatum*, Berberidaceae) is an herbaceous plant found in moist woods to clearings, on well-drained soil. It ranges from Quebec to Minnesota, Texas, and Florida. In Minnesota, the mayapple is restricted to the southeast corner of the state. As its name suggests, the mayapple flowers in early spring and begins to set fruit in May. The small edible fruits are lemon-shaped and are yellowish in color (so why mayapple and not maylemon, I ask?).

References to the mayapple and its medicinal compounds have been in the scientific literature for more than 250 years. This medicinal knowledge of the mayapple was acquired from various Native American groups, who used the plant for centuries as both a medicine and a poison. In the mayapple, the alkaloids, or podophyllotoxins, are produced in the leaves and stems and stored in abundance in the rhizome. Native Americans gathered the rhizome in the fall, then dried and crushed it to a powder. In 1835, a medicinal resin called podophyllin was produced by extracting the alkaloids in the rhizome with alcohol. Unfortunately, not long after the widespread use of podophyllin, numerous problems were associated with its consumption: severe gastrointestinal interactions, mild cardiovascular effects, and liver and kidney damage. Podophyllin resin fell into the "If it don't kill ya, it'll cure ya" drug category! The active ingredients of podophyllin resin are podophyllotoxins. Podophyllotoxins are called aliphatic alkaloids—functionally and structurally similar to alkaloids, with multiple rings, but lacking nitrogen (hence the lack of an -ine name ending). Many plant-derived anticancer agents, such as the podophyllotoxins, the vinca alkaloids, colchicine (an anticancer alkaloid from the autumn crocus, still in the testing stage), and taxol (the anticancer compound from Pacific yew), affect cell division in numerous ways. Therefore, they are good targets for cancerous cells, which have lost the ability to regulate the frequency of cell division, and undergo nuclear division frequently. Unfortunately, the side effects of podophyllotoxins are more intense than those of the podophyllin resin, and they have not been approved as anticancer drugs in the United States.

Since the late 1800s, numerous synthetic and semisynthetic variations of the podophyllotoxins, called epipodophyllotoxins (the words keep getting longer,don't they!), have been created and tested for anticancer effectiveness, with the hopes of finding drugs less poisonous to the patient. The most active, and yet somewhat safe, of these are etoposide (or VP 16-213) and teniposide (or VM-26); both are now approved drugs in the United States. These epipodophyllotoxins show a highly significant activity against non-Hodgkin's lymphomas, leukemias, small cell lung cancer, and germ cell malignancies, such as testicular cancer. Teniposide also shows definite activity against brain tumors and childhood leukemias. Epipodophyllotoxins also affect cell division, but in a manner unlike that of other plant-derived alkaloids.

Medical researchers have begun a race against time to isolate and purify plant-derived alkaloids from plants used in folk remedies—before the plants become extinct. But in doing so, they have found that some isolated compounds are not as effective as the plant extract, or sometimes, as in the case of the podophyllotoxins, are too toxic to use. It is thought that the natural alkaloid-containing plant extracts may be more effective and less harmful to humans because they contain impurities that may lessen the toxicity of the alkaloids and render them more effective at treating cancer. With further studies, it is possible that the podophyllotoxins, or the raw podophyllin resin extract may become usable anticancer drugs in the future. (References are listed on page 9, col. 1)

Elizabeth M. Frieders is a doctoral candidate in the Department of Plant Biology, University of Minnesota, St. Paul.

Cooper's milkvetch (*Astragalus neglectus*) is a native Midwestern legume in Minnesota's prairie-forest transition zone, reports Nancy Sather, botanist in the Minnesota Natural Heritage and Nongame Research Program. More than 100 locations have been found in a band from central Marshall County to northern Becker County, usually in disturbed areas. The DNR is preparing a status report on this species for the winter of 1996-1997, and seeks information on locations south and east of the known areas. Please report sightings and locations to Nancy Sather, DNR Box 7, 500 Lafayette Road, St. Paul, MN 55155-4007; (612) 297-4963; E-mail:nancy.sather@dnr.state.mn.us

10,000 Years and 50 Miles A Minnesota Odyssey

John R. Tester

A small increase in the average annual temperature in the northern hemisphere, 3 to 6° F, resulted in the end of glaciation in North America. A similar change can be observed in a 50-mile east-west transect in northwestern Minnesota today. This transect extends westward from Itasca State Park into Mahnomen County. Precipitation change in this transect is believed to be due to the influence of the Alexandria Glacial Moraine on local weather patterns.

To a large extent, climate determines the vegetation that exists in a given location. Climate and vegetation both influence the distribution and abundance of animals.

Ecosystems in Minnesota have changed markedly during the 10,000 years since glaciation, as shown by pollen deposited in wetlands and lakes. The first trees to become established following the retreat of the continental glaciers were probably spruce, fir, and tamarack. These conifers were adapted to a cool, wet climate. This climate changed, and a warm, dry period lasting several thousand years occurred in central North America about 4,000 to 8,000 years ago. Savanna and prairie ecosystems replaced the conifer forests and covered northern Minnesota as far east as Duluth. About 2,000 years ago, the climate again changed, becoming more cool and wet. Northern coniferous and deciduous forests, such as are present today, replaced the savannas and prairies in most of northern Minnesota.

Some models of global climate change predict that the increase in average annual temperature in central North America by 2050 may be far greater than 3 to 6° F. Such an increase would likely cause a reduction in soil moisture. These changes in the physical environment would have marked impacts on the distribution and abundance of plants and animals.

This is a summary of a talk given by John Tester, at the February 1, 1996, meeting of the Minnesota Native Plant Society. Dr. Tester is in the Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul.

Greening the Great River Park: Community Restoration in St. Paul's Mississippi River Valley

Andy Sudbrock

For much of this century the city of St. Paul has taken it for granted its most significant historic and natural resource, the

Mississippi River. With current efforts to revive the downtown riverfront district, St. Paul citizens are reconnecting with the river and are working to restore extirpated native plant communities to the river valley and surrounding uplands. Hundreds of volunteers, including planters, designers, ecologists, and public and private landowners, are cooperating to restore floodplain forest, northern deciduous forest, oak savanna, and native prairie within 2,000 acres of urban matrix. The Great River Park's planting boundaries extend from the High Bridge near Lilydale Regional Park downriver to the Holman Field Airport, and include the entire river valley from bluff to bluff.

Greening project volunteers are planting native trees, shrubs, and prairies on privately owned office and industrial land as well as on publicly owned parks and right-of-ways. Ninety-one of 93 private landowners have signed agreements to work with us and allow planting to take place on their property. In 1995, 750 volunteers planted 2,848 native trees and shrubs in the Great River Park. Our goal is to restore a healthy and diverse urban ecosystem by planting 25,000 trees and shrubs and restoring more than 160 acres of prairie.

The 1996 spring planting will take place on April 27. In addition to volunteer planters, we need knowledgeable people to supervise planting teams. Our Planting Team Leader training seminar will be held April 6. Members of the Minnesota Native Plant Society are encouraged to share their expertise on native plants and landscapes by joining us as Planting Team Leaders. For details and to register as a volunteer planter or Team Leader, call Kathy Dougherty

---

Andy Sudbrock is an ecological restoration consultant to Greening the Great River Park and owner of Applied Ecology Native Landscape Restoration

Biology of Tussock Sedge

Charles E. Umbanhowar Jr.

Tussock sedge (*Carex stricta* Lam.) is a perennial, monoecious, anemophilous native sedge and is the dominant species in many shallow-water wetlands from Minnesota to Virginia, and Texas to Canada. That first sentence is a mouthful so let's take it a little bit at a time. Tussock means clump or tuft and refers to the growth habit of the plant. Tussocks may grow 1-2 feet tall, 1-2 feet in diameter and are topped with dense growths of long (1-2 feet), thin (< 0.25 inch wide), dark-green leaves that are w-shaped in cross section. You may have tripped over some of these tussocks some time when tromping in a wetland! If you look closely at the leaves, you will see that they originate in groups of 2-3 from individual tillers on the surface of the tussock. These tillers are probably genetically identical and belong to the same plant. New tillers are produced each year. They accumulate as they die and windborne soil may also be trapped between them. As new tillers are produced they grow on top of the remains of the old tillers and trapped soil and so increase the height of the tussock.

Anemophilous means that the flowers are wind-pollinated and monoecious means that plants produce separate male and female flowers. These flowers are very small (1-5 mm long), brownish and lack sepals and petals. The pistil (carpel) of the female flowers is surrounded by a little sack termed a perigynium. Male and female flowers are present within each inflorescence and arranged on 4-5 lax "branches" termed inflorescence units. The top "branch" always bears male flowers (100-200), the lowest female flowers (200-300) and the intermediates some combination of male and female flowers. Where male and female flowers occur on the same branch, the males are always closer to the branch tip, paralleling the distribution for the plant as a whole.

We don't know how the plant "decides" how many male and female flowers to produce. In many species, larger (or taller) plants produce more female flowers and there is evidence to suggest that female flowers and fruits that follow pollination and fertilization are more "expensive" than male flowers. On average, tussock sedges produce more female flowers than male flowers but there is no obvious relation between the size of the tussock and the proportion of male to female flowers.

Ferns and other species grow on *Carex stricta* tussocks; duckweeds and other plants grow in small pools between the separate tussocks. *Carex stricta* and many other plant species that grow with it do not survive in deep-water wetlands where one frequently finds cattails. While some restorationists are propagating *Carex stricta,* it will take probably many years to recreate the large tussocks present in many shallow wetlands, and it will take even more time and large amounts of money to add the species that grow on tussocks. This makes protection of shallow-water wetlands even more important, and it is why we should not assume that all wetlands or wetland plants are created equal.

References

Kerans K. 1990. The restoration business: Country Wetland Nursery Ltd.,Restoration and management Notes 8(1):29-31

Standley LA. 1989. Taxonomic revision of the *Carex stricta* (Cyperaceae) complex in eastern North America. Can J Bot 67: 1-14.

Endangered species list

Lori Biederman is creating a list of references to plants on the endangered species list. If you have any sources, especially unique ones, please contact Lori by E-mail: bied0011@gold.tc.umn.edu, or call . A copy of the list, or a portion of it, can be requested from *Lori Beiderman.*

Plant Lore

What is columbine?
Columbine is a perennial in the buttercup family whose Latin name is *Aquilegia canadensis.*

How did it get these names?
Aquilegia is thought by some botanists to mean "eagle", referring to the flower spurs that resemble the eagle's talons. The common name columbine comes from *columba*, which means "dove", referring to the five petals (spurs) that resemble five doves drinking at a dish.

Why are columbines popular spring flowers?
This Minnesota native plant grows wild in nearly all counties in the state and also grows well in gardens. Even after flowering, the fruits are attractive in design and beauty. Their abundant, bright red and yellow flowers are attractive to early arriving humming birds.

Why are humming birds attracted to columbines?
The flower is suspended upside down with male and female parts hanging out. Each of the five petals is shaped like a cone and is called a spur, the tips of which hold nectar. The red-colored petals attract the birds; in fact, columbines probably evolved to be pollinated by humming birds.

Are insects attracted to columbines?
Yes, bees visit flowers but they can't reach the nectar at the ends of the long tubes, so they poke a hole into the spur and sip the nectar. Also, leaf miners bore tunnels in leaves, especially in new leaves produced late in the season.

Are there any medicinal uses?
Native Americans crush seeds and use the paste for headaches, as a perfume, as an astringent, as a diuretic and to relieve pain. Seeds have been rubbed into the hair to control lice. Roots have been chewed or made into a tea for diarrhea and for stomach troubles.

Minnesota's Native Mayapple
(continued from page 6)

References

[Anonymous]. 1993. Physician's Desk reference. 47th ed. Montvale (NJ): Med Econ Data.

Devita Jr VT. Hellman S, Rosenberg SA, editor. 1993. Cancer: principles and practises of oncology, 4th ed. Philadelphia: Lippincott.

Huxley A. 1992. Green inheritance. New York: Four Walls Four Windows.

Jardine I. 1980. Podophyllins. In: Cassady JM, Douros JD, editors. Anticancer agents based on natural product models. New York: Acad Pr.

Kelly MG, Hartwell JL. 1954.The biological effects and the chemical composition of podophyllotoxin. A review. J Nat Cancer Inst 14: 967-1010.

Levetin E, McMahon K. Plants and society. Dubuque (IA): Wm Brown.

Lewington A. 1990. Plants for people. New York: Oxford Univ Pr.

Ownbey GB, Morley T. 1991. Vascular plants of Minnesota: A checklist and atlas. Minneapolis (MN): Univ Minn Pr.

Reader's Digest. 1986. Magic and medicine of plants. Pleasantville (NY): Reader's Digest.

Salisbury FB, Ross, CW. 1985. Plant physiology. 3rd ed. Belmont (CA): Wadsworth.

Simpson BB, Ogorzaly MC. 1995. Economic botany: Plants in our world. 2nd ed. New York: McGraw-Hill.

Ting IP. 1982. Plant physiology.Reading (MA): Addison-Wesley.

Reed Canary Grass (see page 4)

Apfelbaum SI, Sams CE. 1987. Ecology and control of reed canary grass. Nat Areas J 7:69-74.

Lynford M. 1993. Reed canary grass control tested (Minnesota). Restoration Management Notes 11: 169.

Preuninger J, Umbanhowar CE Jr. 1994. Effects of burning, cutting, and spraying on reed canary grass studied. Restoration Management Notes 12: 207.

Wetlands *(continued from page 5)*

at Marulan, New South Wales, Australia. Appl Geogr (Sevenoaks) 4: 201-14.

2 Conservation Foundation. 1988. Protecting America's wetlands: An action agenda final report of the National Wetlands Policy Forum. Washington, DC.

3 Delphey PJ, Dinsmore JJ. 1993. Breeding bird communities of recently restored and natural prairie potholes. Wetlands 13(3): 200-206.

4 Galatowitsch SM, van der Valk AG. 1995. Natural revegetation during the restoration of wetlands in the southern prairie pothole region of North America. In: Wheeler BD, Shaw SS, Foyt WJ, Robertson RA, editors. Restoration of temperate wetlands. Chichester (England): J Wiley. p 129-42.

5 Galatowitsch SM, van der Valk AG. 1996. The vegetation of restored prairie wetlands. Ecol Appl 6:102-12.

6 Godwin H. 1923. Dispersal of pond floras. J Ecol 11: 160-64.

7 Joenje W. 1978. Plant colonization and succession on embanked sand flats. [DPhil thesis]. Groenigen: Rijksuniversiteit.

8 LaGrange TG, Dinsmore JJ. 1989. Plant and animal community responses to restored Iowa wetlands. Prairie Nat 21: 39-48.

9 Madsen CR. 1988. Wetland restoration in western Minnesota. In: Zelazney J, Feierabenc JJ, editors. Proceedings: Increasing our wetland resources. Washington, DC.

10 Mitsch WJ, Cronk JK. 1992. Creation and restoration of wetlands: some design considerations for ecological engineering. Adv Soil Sci 17: 217-59.

11 Moller TR, Rordam CP. 1985. Species numbers of vascular plants in relation to area, isolation, and age of ponds in Denmark. Oikos 45: 8-16.

12 Muenscher WC. 1936. The germination of seeds of *Potamogeton*. Ann Bot 50: 805-21.

13 National Research Council. 1992. The restoration of aquatic ecosystems: Science, technology, and public policy. Washington (DC): Nat Acad Pr.

14 Nip-van der Voort J, Hengeveld R, Haeck J. 1979. Immigration rates of plant succession in three Dutch polders. J Biogeogr 6: 301-08.

15 Peterken GF, Game M. 1981. Historical factors affecting the distribution of *Mercurialis perennis* in central Lincolnshire. J Ecol 69: 781-96.

16 Reinartz JA, Warne EL. 1993. Development of vegetation in small created wetlands in southeastern Wisconsin. Wetlands 13 (3): 153-64.

17 Sewell RW, Higgins KF. 1991. Floral and faunal colonization of restored wetlands in west-central Minnesota and northeastern South Dakota. In: Webb JF, editor. Proceedings of the eighteenth annual conference on wetlands restoration and creation. Tampa: Hillsborough Community College. p 108-33.

18 Thompson L. 1992. The functional ecology of seed banks. In: Fenner M, editor. The ecology of the regeneration of plant communities. Wallingford (UK): CAB Int. p 231-58.

19 Weinhold CE, van der Valk AG. 1989.The impact of duration of drainage on the seed banks of northern prairie wetlands. Can J Bot 67: 1878-84.

20 Zedler JB, Weller MW. 1989. Overview and future directions. In: Kusler JA, Kentula ME, editors. Wetland creation and restoration: The status of the science, Volume 1.Corvallis (OR): US Environmental Protection Agency, US EPA/7600/3-89/038. p 465-73.

This is a summary of a talk to the MNPS by Dr. S.M. Galatowitsch, University of Minnesota, Departments of Horticultural Science and Landscape Ecology, St. Paul, on March 7, 1996.

Minnesota Native Plant Society
University of Minnesota
220 Biological Sciences Center
St. Paul MN 55108