NYFA Newsletter

New York Flora Association - New York State Museum Institute

Steve Young, Editor

Correspondence and dues to NYFA, 3140 CEC, Albany, NY 12230 **Dues $20/Year**

Vol. 16 No. 1 Spring, 2005 email: young@nynhp.org website: www.nyflora.org

Vascular Flora of the Moose River Plains, Adirondack Mountains, New York

Brian and Eileen Keelan, Rochester, NY

As 1994 drew to a close, we pondered what sort of new project we could start during the next field season. We wanted something that would complement our fairly extensive travels around North America, during which we learned a bit about the natural history of a wide range of habitats and locations, but did not have the opportunity to delve deeply into any single area. It seemed to us that the ideal project would involve learning lots of new things while still having sporting and recreational aspects. It should further provide an excuse for spending many nights camped in quiet places and many days canoeing and hiking in beautiful tracts of native habitat. We decided to work on improving our botanical identification and collecting skills by thoroughly surveying a section of Adirondack wilderness, with the intent of compiling a reasonably complete annotated checklist. Our attention quickly focused on the Moose River Plains and vicinity, an area centered about 7 miles southeast of Inlet, where we had been birding a number of times, finding boreal species such as gray jay, black-backed woodpecker, boreal chickadee, and yellow-bellied flycatcher. This area offered a reasonable variety of habitats that were accessible via a nice network of gravel roads, hiking trails, and more or less navigable waters. A particular bonus was that the over one hundred isolated, free, primitive car-camping sites scattered through the area would allow us to stay right in the study location, wherever happened to be convenient, with great flexibility.

Helldiver Bog: This lovely kettle bog, ringed by *Larix laricina* and *Picea mariana*, is north of Helldiver Pond, in the heart of the Moose River Plains.

We did some checking up and found that the area had not been explored much botanically: the NYS herbarium in Albany had just a few specimens from the Moose River Plains; Jerry Jenkins had spent several days there in 1989 with Forest Ranger Gary Lee searching for rarities [1]; and Michael Kudish mentioned it in passing in his *Adirondack Upland Flora* [2], although it fell outside the area of his survey. So, the choice of location seemed propitious, and that winter we set about preparing for the project. We defined the study area using 2 x 2 kilometer blocks based on the Universal Transverse Mercator grid, and decided to keep a separate plant list for each block, forcing us to practice identifications continually and giving us a more quantitative understanding of the abundances of each species. The

Inside this issue:

Oakwood Cemetery List 4

Chicory 4

Valcour Trip 8

Salix workshop 8

BULLETIN!

The new NYFA Plant Atlas will be unveiled **June 20th.** Visit the NYFA website then to query your favorite New York plants.

Nineteen species of orchids have been found in the study area, although ten of them are known from only one or two stations, such as this *Cypripedium reginae*.

final set of 50 contiguous blocks (200 square kilometers, about the size of a 10-mile diameter circle) avoided settled areas, and contained no paved roads. The blocks varied quite widely in accessibility, but all could be reached on a long day trip by some combination of driving, paddling, hiking, or, in one case, extensive wading. The elevation of the study area varied from 550 meters (1800 feet) along the Moose River to 900 meters (2950 feet).

Herman Forest at SUNY Geneseo gave us advice on plant collecting equipment and mounting techniques, which Eileen practiced over the winter. Our intent, in which we ultimately succeeded, was to document every species on our checklist with a specimen. We obtained the needed topographic maps and botanical references; and bought a vasculum, archival mounting stock and glue, press materials, and a GPS (a genuine novelty back then). The most important acquisition, which waited a year, was a stereoscopic microscope. Brian wrote software for processing specimen information, generating labels and forms, printing reports, tabulating statistics, and so on. The last piece fell in place when we were granted a temporary revocable permit from the DEC to collect plant specimens on the state land; this was renewed annually for the duration of the study.

During our first field season (1995), we spent 19 days in the study area, mostly working along the roadsides to orient ourselves and quickly obtain specimens of as many of the commoner species as possible. We collected a total of 346 specimens, which Eileen mounted at a rapid pace in between weekends to free up enough press materials for the next foray. Over the course of a long and enjoyable winter, Brian pored over these specimens, eventually identifying just over 300 species. This set the pattern for subsequent winters, which usually culminated with a trip to the NYS herbarium at the Albany Museum, where Dick Mitchell and Chuck Sheviak graciously hosted us. There was so much to collect that first year that we did not attempt to take duplicate specimens for NYS, but in subsequent years, documenting species not mapped in the Vouchered Atlas [3] for Hamilton or Herkimer Counties became a significant activity. Our second through fourth years involved even more days in the field, with higher percentages of time on longer forays into more remote areas, and greater concentration on microhabitats of particular interest. By the end of the third year, we had reached most accessible areas and had sampled nearly all the major habitat types at least once, so we anticipated a decrease in the rate of new species in subsequent years.

In our fourth year, 1998, there was indeed a slight slowdown, with 57 new species in 36 days of work (1.6 species per day), bringing the total to 494 species. However, the more dramatic change occurred after this point; in the last two years of work combined, we found only half as many (28) new taxa in about the same time (35 days, 0.8 species/day). Our final total at the end of the study, in 2000, was 522 species. Assuming a continued geometric progression, with the discovery rate halving every 35 days in the field, leads to the prediction that another 28 species would be found with infinite continued fieldwork. We therefore estimate the true flora to be about 550 species, of which we found approximately 95%. In total, we collected 987 specimens, excluding duplicates, in 146 field days. In addition, we donated to NYS 138 specimens from Hamilton County and 63 specimens from Herkimer County, which corresponded to increases in the county lists of 21% and 8%, respectively, based on the hardcopy Vouchered Atlas [3].

It took a lot of organizational skill to handle the complexity of maintaining 50 separate block lists and collecting specimens for new study taxa and for species undocumented in Hamilton and Herkimer Counties. We maintained a substantial target list of species that required particular attention, often because during the preceding winter, Brian determined that a better specimen was needed for definitive identification (for example, a fruiting specimen of something collected in flower). One particularly frenetic day, after pursuing a number of targets, Eileen directed us to yet another location. Upon arrival, Brian could no longer remember the target species or requirements, so he asked, “Remind me again, why are we doing this?” Eileen took the question a bit more existentially than intended, and started to explain, “Well, see, we thought this project would be fun …”

But, in fact, we found the fieldwork to be both absorbing and addictive. One time we spent most of the day paddling on a stretch of the Moose River with languorous oxbows, which harbored a fine collection of aquatics. When a beaver, a typically crepuscular creature, swam slowly by our canoe, we realized that dusk was falling, and we had been paddling downstream for over 7 hours! We suddenly were hungry and tired, and faced a paddle of indeterminate length back upstream in the dark. But the unhurried pace of our descent became clear when we made it back to the takeout in only 30 minutes! Eileen remarked upon this as a dramatic example of the law of diminishing returns.

Of the 522 species we recorded in this southwest Adirondack location, 443 (85%) are considered native in the current New York State checklist [4]. This total is close to the approximately 456 native species reported by Kudish [2] for a much larger (60-mile diameter) circle in the northern Adirondacks, which reaches down to 1000 feet elevation. Lewis Cutler's masters thesis [5] lists approximately 487 native species in the Cranberry Lake watershed, in the northwest Adirondacks, which has an area and elevation range fairly similar to that of our study area. The majority of the study area is second growth forest with the following tree species found in at least 75% of the 2x2-km blocks: *Acer saccharum*, *A. rubrum*, *A. pensylvanicum*, *Betula alleghaniensis*, *Sorbus americanus*, *Picea rubens*, *Abies balsamea*, *Larix laricina*, and *Pinus strobus*. There are also a variety of more open terrestrial habitats, including beaver meadows, sandy plains, and exposed cliffs. The area is quite rich in aquatic habitats, including acidic lakes, rivers, streams, and stillwaters; sandy shores; marshes; deciduous swamps; and a few small bogs (perhaps more accurately called poor fens). One feature of interest in this largely acidic area (with gneissic or granitic bedrock) is occasional outcrops of marble, most of which lie along an arc across the northern part of the study area. These outcrops, along with the calcareous soils derived from them, and the circumneutral areas where

One of the most delightful aspects of the Moose River Plains, especially under coniferous forests, is the abundance of boreal ground covers such as *Dalibarda repens* (shown here), *Gaultheria hispidula*, *Cornus canadensis*, and *Linnaea borealis*.

they merge into the acidic surroundings, harbor approximately 40 species not found elsewhere in the study area, including many pteridophytes, as discussed in our earlier article on the fern flora of this area [6]. Many of these species are not obligate calciphiles in general, but apparently cannot tolerate the acidic substrates that predominate in the area.

As expected for a part of the very extensive and relatively undisturbed Adirondack uplands, the study area did not yield an extensive suite of rare species. Nonetheless, 33 reports of 10 species of rarity S3 (watch list) or greater were made to the New York Natural Heritage Program. These species were: *Myriophyllum farwellii* (2 occurrences), *Solidago simplex* ssp. *randii* (2), *Salix pyrifolia* (3), *Potamogeton confervoides* (7), *Calamagrostis pickeringii* (2), *Carex cryptolepis* (3), *Utricularia geminiscapa* (9), *Aster* (*Oclemena*) *nemoralis* (1), *Aster* (*Symphyotrichum*) *ontarionis* (2), and *Panicum* (*Dichanthelium*) *boreale* (2). *Myriophyllum farwellii* was classified as S1S2 (critically imperiled to imperiled) at the time of our study, but has since been upgraded to S2. *Salix pyrifolia* has likewise been upgraded from S2S3 to S3 since the study. *Solidago simplex* ssp. *randii* is classified as S2, and the remaining 7 species are listed as S3.

Some miscellaneous statistics may be of interest. As expected, the best-represented genus in our study was *Carex*, with 40 species. *Aster* (sensu lato) fell far behind at 14 species and *Solidago* and *Platanthera* followed with 11 and 9 species, respectively. The most prolific 2x2-km block of the 50, in the Lost Ponds area, yielded 288 species, or 55% of the total list. The next highest block, at Mitchell Ponds, lagged substantially at 224 species; five other blocks broke 200. The average block produced 129 species, and the high, remote, and nearly trailless Sly Pond block took last place with 70 species. *Betula alleghaniensis*, *Picea rubens*, and *Dryopteris intermedia* were found in all 50 blocks, whereas 99 species were found in only a single block. The Lost Ponds block had 23 species found nowhere else, more than three times higher than the closest competitor. Outside of the plant realm, we recorded 16 species of mammals in the study area, including least weasel, northern flying squirrel, moose, black bear, and coyote, and enjoyed many other animals, such as northern water snake, wood frog, and luna and rosy maple moths.

Our complete checklist, with annotations of abundance, habitat, flowering periods, and specific sites of occurrence, is posted on the NYFA website at the URL:
http://nyflora.org/checklists/Moose_River.htm

References

[1] Jerry Jenkins, A *Summary of Botanical Survey Work in the Western Adirondacks, July–October 1989, with Notes on Rare Species and Plant Communities*, a report to the New York Natural Heritage Program.
[2] Michael Kudish, Adirondack *Upland Flora: An Ecological Perspective*, The Chauncy Press, Saranac, New York, 1992.
[3] New York Flora Association, *Preliminary Vouchered Atlas of New York State Flora*, The New York State Museum, Albany, New York, 1990. The updated, on-line version is available at nyflora.org, but the earlier version is referenced here to reflect the information available during our study.
[4] R. S. Mitchell and G. C. Tucker, *Revised Checklist of New York State Plants, Edition II*. In *Microsoft Word*™, 332 pp. Distributed in CD-ROM format. New York State Museum, Albany, New York, 2000.
[5] Lewis Cutler, *Studies of the Flora and Vegetation of the Cranberry Lake Watershed*, MS thesis, State University College of Environmental Science at Syracuse University, New York, 1975.
[6] Brian and Eileen Keelan, A *New Fern Hot Spot in a Cool Clime*, New York Flora Association Newsletter, April 1997.

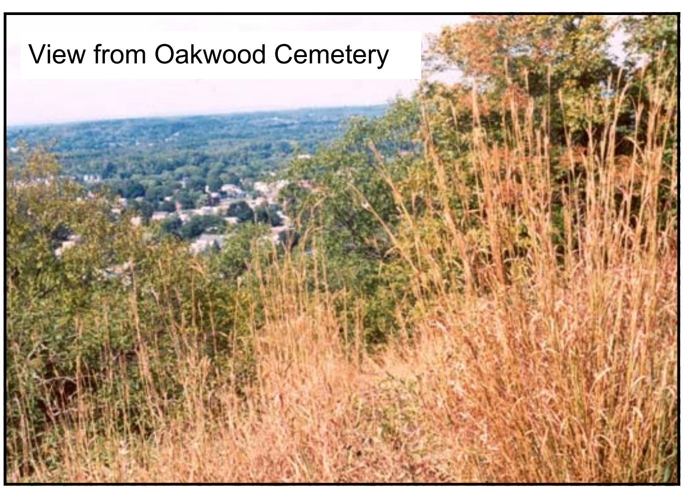
Botanical and Ecological Resources of Oakwood Cemetery, Troy, New York

By Warren F. Broderick
(Lansingburgh, NY: privately published, 2002)
The checklist section of this publication is now available at the nyflora.org website.

Oakwood Cemetery (also referred to as "Oakwood") is one of the most botanically and ecologically diverse localities in Rensselaer County. Within the cemetery boundaries are grassy exposed rocky ridges with almost prairie-like conditions; deep shale ravines cut by cascading streams and bordered by steep cliffs; and Appalachian oak-hickory, maple-basswood rich mesic, and beech-maple mesic forest natural communities. There are also significant patches of shale cliff and talus community and shale talus slope woodland. A rocky headwater stream is found here as well, and small but important patches of rocky summit grassland and pitch pine-oak-heath rocky summit.

The cemetery contains some disjunct populations of more western or southern species that are generally not found in this part of the state, or plants found at the eastern or northern limits of their natural range. Twelve state-listed rare, threatened or endangered native plants, and even a greater number of county-rare plants, have been found at Oakwood. In addition, in the century and a half since ornamentals were first planted in the landscaped rural cemetery, a number of unusual garden escapes have become naturalized in both lawns and wild areas.

In the 331.5 acres that comprise Oakwood Cemetery, one specimen of every vascular plant taxon encountered was collected as part of this project. These 628 specimens were pressed by collectors and some were mounted at the New York State Museum, where the specimens were accessioned into the Museum's Herbarium. Information on each specimen has been maintained in database format. Locations of collections were noted and mapped using a Geographic Information System (GIS). The list is now available in the checklist section of the nyflora.org website.


View from Oakwood Cemetery

Chicory (*Cichorium intybus* L.)

By Knowlton Foote (kfoote@twcny.rr.com)

One of the most common roadside wildflowers in New York in July and August, with attractive sky-blue flowers, is an immigrant from Europe and has a long history as a benefactor to humans. This is Chicory. If I must choose a favorite wildflower, it would be Chicory.

Name and classification
Indicative of its long history, Chicory has some 41 common names worldwide (Holm *et al.* l997). Some of these names are Chickory, Succory, and Cichorie. In France it was known as "La Chicoree sauvage" or wild chicory. In Germany, "Der Wegewart" or watcher of the roads (Darlington l863). This species was given its scientific name, ***Cichorium intybus*,** by Carolus Linnaeus in l753. The generic name, *Cichorium,* appeared before the birth of Christ when it was known as "Kichora" or "Kichoreia." To ancient Arabian and Egyptian physicians, it was known as "Chicouryeh" and later as "Chicourey" (LeStrange l977). The specific name, *intybus*, comes from the Latin "intubus" meaning wild (Smith l972). This species is a member of the Asteraceae (Composite) family.

History and Entrance into North America
The origin of Chicory was probably Eastern Mediterranean (Steiner l983). It was used by the Romans as a vegetable, particularly the root. The leaves were used for salads and it was said to be "much superior" to those of Dandelion (Johnson and Hardwick 1862). The first mention of its cultivation in Germany was 1616 and in England 1686 (Hedrick l9l9). In North America Chicory most likely had multiple introductions as a garden flower, a crop plant and as a seed contaminant in the l8th century. One of those bringing Chicory to North America was Massachusetts governor James Bowdoin sometime between l785 and 1786. He brought it from Holland where it was considered a desirable salad green (Kains l898).

Habitat and range
This wildflower grows on roadsides, in pastures, waste places in cities, even in our lawns - areas with loamy to clay soils. It does well in acid soils (Frankton and Mulligan l970) and is seen along roadsides in great numbers in New York, where almost xeric conditions exist and competition from other overtopping plants is minimal. Roadsides characterized with small soil clods and rocks favor its germination and seedling success (Smith and Capelle l992). Chicory is found throughout northeastern North America and eastern Canada. Scattered sightings have been seen as far as the Pacific Ocean (USDA l971). It is now found worldwide throughout the North Temperate Zone.

Description
Chicory for the most part is a short-lived perennial herbaceous species, but can also be biennial. It has a well developed tap root the length of which depends on the nature of the soil. In clay or rocky soils of central New York, it may be only 6 to 8 inches long and up to one inch thick with twists and turns. In

deep loamy soils its length can easily be 12 to 15 inches. The stem is stiff, hollow and typically 2 to 4 feet tall. In a loamy pasture with abundant moisture and nutrients, it may be 6 feet high. The color of the stem is green indicating some photosynthetic activity. Older plants can have up to 13 stems from the same taproot i.e. it is cespitose. Stems along with their branches support small field birds such as goldfinches, black-cap chickadees and sparrows as they forage for seeds. The size and shape of its leaves vary with the position on the stem. The basal leaves are considerably larger and form a rosette which performs most of the photosynthesis for the plant. These rosette leaves are shaped like Dandelion leaves (runcinate), have a milky juice, a petiole, and overall are 4 to 8 inches long. In the upper part of the plant, the leaves are much reduced both in number and size, which reduces water loss by transpiration. The petiole is eliminated and the ½ to 1 inch long leaves clasp the stem.

Three to five flower buds are located in each axil of the small leaves in the upper stem. Only one bud opens per day per axil. Each flower, technically a flower head or capitulum, is sky blue and lasts for only one day. After opening early in the morning to produce a flower silver-dollar in diameter, the bloom fades by 1 to 2 PM during mid summer days never to open again. The length of the flowering period, however, depends on the temperature. On 90 degree days the flowers fade by 11 AM; on cool fall days as in October, they remain open even after dark. Generally 100 to 150 buds are on a plant and only a small number (1-5) open each day so that a plant has sufficient buds to be in flower most of the season. Cichan (l979) observed some large plants in New Jersey with as many as 25 flowers open daily. One robust plant with two stems had 55 blooms open one day. Chicory begins to flower early to mid-June as if to celebrate the beginning of summer. June 8th is the earliest flowering date I have recorded for it in central New York. Some plants complete their flowering by the end of July while others continue even to early November, even after one to two moderate frosts. It is a hardy wildflower.

The blue flowers fade during the day to become almost white. However, plants with just pure white flowers are occasionally found, and also even scarcer plants with just pink flowers (Revel l992). N.M. Grier (l9l9) reported a ratio of 410 blue: 2 pink: 1 white plants in a Virginia field. In central New York, the pink variety is even scarcer. I will see only 1 to 2 pink plants an entire summer along with several dozen whites and literally tens of thousands of blues. In studies with cultivated varieties of Chicory done at the New York Botanical Garden, Arlow B. Stout (l9l7) showed the blue form to be genetically dominant to the white form.

Life cycle
This species begins its spring growth from buds on the crown of an established perennial tap root and from over wintering seeds. Seeds may also germinate the same season they are formed to produce a seedling which develops a small taproot and rosette the first season and flowers the second season. It wouldn't be surprising with further research to find under adverse conditions that a rosette may require more than two seasons to develop sufficient root reserves to support flower and seed production.

Floral biology
A flower (i.e. flowerhead or capitulum) contains only a few florets as far as composite flowers go - in this case 15 to 20 florets. The number of florets in a flower is easily determined by counting the petals – each floret has a single petal. The large blue strap-shaped petal, often called a ray ligule, has five small tips at its end each 1 ½ mm long. The petal is actually five petals that have fused together throughout its evolutionary history. Likewise, the sepals have been extensively modified and reduced throughout the ages to become an almost nonexistent ring of scales seen on top of the seed. Each floret also has 5 stamens and one pistil. The blue florets are bundled underneath by two series of leaf-like bracts called phyllaries: an outer series of around 8 bracts and an inner series of around 5 more bracts the same size. Collectively these two series form the important "involucre" of the flower that protects the bud and provides a cup for the seeds. The bracts are sparsely covered by colorless hairs (called trichomes) located along the margin and the mid-vein, which are larger than those seen on the petals, some of which have red to brownish enlarged tips. These hairs may be important in attracting ants thus keeping them out of the flower and devouring pollen (Meeuse l961).

The stamens in each floret form an elaborate tube 4-5 mm in length. The 5 anthers of the stamens are fused together by the edges to form the tube. The anther tube in turn surrounds the two style branches of the pistil. The style branches are covered with small white hairs which point upwards. As the style grows up through the tube, the hairs sweep out the white pollen grains which have just been released from the anthers.

The life of a flower
The following is a description of the life of a single Chicory flower - a life that was to last only one day**.** Its opening involves a coordinated movement of a number of floral parts. The life of a flower was followed on July 1 in a clay field in LaFayette, New York. The day was clear with a temperature of 47 degrees F at 5:23 AM climbing to a high of 74 degrees F by 2:25 PM. The first movement of the flower was the elongation of the petals of the florets the night before so that by midnight 1 to 2 mm of deep blue petal color could be seen emerging beyond the green bracts of the bud. Elongation continued up to 6:30 AM with 1 cm of petal now visible. The first rays of the sun reached our bud by 6:14 AM.

Next the bud began opening as each petal lengthened and began to bend backwards exposing the blue anther tube in the center of the flower. Collectively, our flower was seen to contain 19 florets, each floret with a ray petal to the outside, an anther tube in the center. The center of the flower is whitish possibly to serve as a nectar guide to assist pollinators in locating nectar and pollen.

By 7:20 AM all the petals were now fully expanded to reveal a round flower about 4 cm wide. The first of 19 styles began to emerge from their anther tubes. As the styles emerged, pollen was swept out of the anthers by hairs on the stylar brush. By 7:41 the first of the emerged styles began to split into two making two stigmatic surfaces now available for pollination. By 7:51 AM the first insect visited the flower, a bumblebee. This bumblebee went from one flower to another covering 14 flowers on 6 different plants in a couple of minutes without visiting a different species. By noon the temperature had risen to 71 degrees F and the flower began to show signs of withering. By 2:25 PM the once blue ray petals were now quite whitish and were closing back in. Of significant importance, each stylar branch had recoiled backwards 1 1/2 revolutions. The stigmatic surface was in contact with its own pollen grains remaining on the stylar brush. Self-pollination (called autogamy) was now physically possible allowing seed production in case pollinators were absent. Since the florets are congested in the flower, some recoiled stigmatic surfaces also made contact with style brushes of nearby florets. Examination at the end of the day showed that each of the two stigmatic surfaces had one to two dozen white pollen grains on it which may be from the same floret, the same flower, the same plant, a far away plant, or even a different species.

Identification of floral pigments

The blue pigment has been identified as an anthocyanin pigment named delphinidin glycoside or cyanidin-3-glucoside (Timberlake *et al.* l971). Proctor and Creasy (l969) monitored the blue floral pigment over a day's time. These two researchers isolated the enzyme system that decolored the pigment. Recently, four more complex anthocyanins and a quinic acid derivative have also been identified in Chicory (Norbeak *et al.* 2002).

More on floral biology

Fertility characteristics in field populations were revealed in publications by Chican (l979, l983) and Cichan and Palser (l982). When the flowers on one plant were crossed with flowers of another clone 2.5 km away, seeds were produced by all the flowers, showing that Chicory is a definite outcrosser (i.e.xenogamous). Pollen grains germinated almost immediately and grew down through the style at a rate of 16 mm/hr reaching the ovule in less than an hour. When the flowers were pollinated with flowers from the same plant (i.e. geitonogamous), 75% of the plants produced some seed, but the seed numbers were small. In these self-pollinated plants, microscopic examination showed that pollen tubes had developed and that sexual union did occur between the egg and sperm, but not always resulting in an embryo.

Experiments were done to see if flowers produced seeds asexually by parthenogenesis (Cichan and Palser l982). Just prior to flower opening, the styles and stigmas of florets were removed with a pair of forceps so that sexual reproduction by self-pollination was prevented. No seeds were produced in any florets indicating that parthenogenesis does not occur in this species.

From the above information, it appears that Chicory is primarily a self-pollinator –a floret receives most of its pollen via pollinators from another floret within the flower, another flower on the same plant and from nearby plants of the same clone. And automatic self-pollination of a floret may occur at the end of the day's flowering period when the styles recoil 1 ½ revolutions bringing the stigmatic surfaces in contact with the pollen grains remaining on its stylar brush. This phenomenon was first reported in Chicory by Paul Knuth in l908. The genetic makeup of these seeds will be identical, but it does give the plant some seed production. Only a small percentage of seeds it appears comes from cross pollination with distant plants which have a different genetic makeup.

Pollinators

Chicory is popular with various species of bumblebees (*Bombus*) and the honeybee (*Apis mellifera*). Flower provide both pollen and nectar. Insects need nectar for energy and pollen for protein for both adult and brood development**.** The floral tube which contains the nectar is only 3 mm deep so that short-tongues insects can readily suck it up. Also, the blue color is very attractive to bees (Kevan l978). Chicory has a strong reflectance in both the ultraviolet and blue regions which are two of the three primary colors seen by insects (Mulligan and Kevan l973).

Observed pollinators include the following bees: sweat bees (*Halictus ligatus, H. confusus)*, several species of *Dialictus*; and the green bee (*Augochlorella striata*) in the Ithaca, New York area (Ginsberg l979). The following bees were seen in the Ottawa area: two bumblebees(*Bombus affinis, B. fervidus)*; the small carpenter bee (*Ceratina calcarata***)**, the sweat bee (*Evylaeus foxii***)**, and a fly *Toxomerus marginatus* (Mulligan and Kevin l973). Robert Dirig of the Bailey Hortorium Herbarium at Cornell has observed the following butterflies and skippers nectaring on Chicory in New York: European Skipper (*Thymelieus lineola*), Peck's Skipper (*Polites peckius*), Cabbage White (*Pieris rapae*), Aphrodite Fritillary (*Speyeria aphrodite*), Clouded Sulphur (*Colias philodice*), and the Silver-spotted Skipper (*Epargyreus clarus*).

Seed production

What appears to be a seed of Chicory is actually a fruit known as an achene. In Cichory as well as in all Asteraceae species, each seed is enclosed by a thin papery wall forming the achene. Achenes, however, are often referred to as "seeds" although not technically correct. Mature seeds are produced within two weeks after pollination (Cichan and Palser l986). Each flower has the potential to produce 15 to 20 seeds. A plant producing 100 to 150 flowers can produce 1500 to 3000 seeds. Stevens (l957) reported a large plant in Wisconsin having 4600 seeds produced throughout the season. Chicory is thus a large seed producer when you consider the number of seeds produced per plant and the numerous plants in a field. However, only a small percentage of this potential is ever realized because of lack of pollination, predation by birds, insects, and microbes, and parthenocarpy which is discussed below.

The seeds are small (2-4 mm long) and weigh 0.8 to 1.5 mg or

302,000 to 567,000 seeds per pound (Stevens l957). They have only rudimentary scales on top of the seed so that dispersal by wind does not occur. They remain in the cup-shaped structure formed by the leaf-like involucre, but not for long. They are catapulted from the plant when a stem is hit by human or an animal such as dog or rabbit. Birds such as chickadees, goldfinches, and sparrows are hearty eaters of Chicory seeds and may be long-distant disperser of the seeds. As a result most seed of a flower is soon dispersed within a couple weeks after fertilization.

False seeds (parthenocarpy)
Not all achenes contain seeds! In these achenes, which look like normal achenes with seed, the walls of the fruits develop along with some internal structures, but no embryo is formed - a process called parthenocarpy. In parthenocarpy fertilization of the ovules does not take place, yet the fruit wall is stimulated in some manner to grow and appear to be a normal size. Of the 15 to 19 potential seeds for each Chicory flower, a large percentage of them may be parthenocarpic. Cichan (l979) observed that these sterile achenes develop only if at least one normal embryo-containing achene is present in a flower. Cichan speculated that a plant hormone is produced by fertile florets in the flower and diffuses to adjoining non-fertilized florets. The ovary walls of these non-fertilized florets then develop and to appear like normal achenes.

Economic importance
A discussion of Chicory would not be complete without mentioning its historical importance as a food and medicine. Chicory root was harvested, dried, ground up, and blended with regular coffee. The cultivar of Chicory used for coffee has been selectively bred to produce a root considerably larger than that of the wild plants: 12 to 15 inches in length and 4 inches in width at the top (Bailey l947). Coffee drinking became popular in the Mideast in the 16th century and had spread to Europe by the middle of the 17th century. Because of conflicts in Europe that made coffee either unavailable or scarce, Chicory became firmly established as a popular coffee substitute. Significant importation to the United States began in the l9th century with about 3 1/2 million pounds being imported from Europe in l869 alone (Steiner l983). Most of the Chicory went to the South, which suffered coffee shortages during the Civil War. F.P. Porcher, a South Carolina coffee merchant, said in l893 (Fernald *et al.* l958):

"we can afford to sell, and do sell a finer coffee when mixed with chiccory than we can sell in its pure state at the same price; and the superiority of the coffee in conjunction with the fulness of the chiccory, in our opinion, decidedly gives greater satisfaction to the public."

Chicory enjoys a modicum of popularity today, particularly in the South, particularly New Orleans. Dried and ground roasted root can be purchased in central New York for 79 cents an ounce. As a coffee adulterant it also has the advantage (to some) of having the flavor of coffee but being caffeine free.
More interesting information on Chicory coffee can be obtained by searching the internet for "chicory coffee."

Another use for Chicory still popular today in Europe is as a winter salad green. For this purpose there exists many cultivars, particularly Witloof or Belgium Chicory and Barbe du Capucin. Both types of greens are produced by digging up the taproots in the fall and placing them in a warmish darkened cellar. By slightly differing methods, the taproots are induced to produce either white leaves (Barbe du Capucin) or more of a white solid head as in Witloof (Bailey l947). In New York grocery stores you may also purchase red heads of radicchio which is another tasty cultivar of Chicory.

Medicinally the root is still sometimes prescribed for its tonic, laxative, and diuretic properties (Mitch 1993). The roots are boiled in water and then taken to reduce jaundice, liver troubles, gout, and rheumatic complaints. The syrup of succory makes an excellent laxative for children today (Le Strange l977). Presently, for all its various uses, most Chicory is grown in Europe especially France, Belgium, Hungary, Poland, and Russia (Steiner l983).

With all these uses of Chicory - for salads, as a beverage, and as a medicine, it soon became a field crop in America. Chicory was cultivated in Pennsylvania late in the l8th century (Kains l898) and even up to the 1940s in Michigan (Steiner l983). From the fields and gardens, this plant then escaped to our countryside and became naturalized leading to the vistas of blue we see along our highways today.

Conclusion.
Chicory is well adapted to our New York roadsides and fields. But it is a species, however, that we need to learn more about. Considerable work has been done on the economically important cultivars such as Witloof both in Europe and United States. But more work like that of Dr. Michael Cichan is needed to better understand and appreciate this wildflower. – length of life cycle, seed germination characteristics, longevity of seeds in soil, longevity of pollen grains, importance of self-pollination, the function of the parthenocarpic achenes, and role of birds in dispersing its seeds. Unfortunately, Dr. Cichan was killed along with his wife and son in a plane crash in 1987. He had just presented a paper at an AIBS meeting at Ohio State and was flying back to Arizona State where he was a promising botanist. His daughter was the only survivor of the crash that took 154 lives.

Chicory beautifies New York's roadsides and fields in summer. And in the words of Erich Steiner (l983), *"as we drive through the countryside catching glimpses of this wildflower, it is well to remember that this species is not merely a weed, but an economic plant which has had some influence on the political, social, and economic history of man since ancient times."*

Editor's note: The bibliography for this article will be printed in the next newsletter.

New York Flora Association Membership Form

Your membership expires at the end of year listed on your address. Please keep your dues up to date.

Annual Membership dues: _____ Renewal $20 _____ New Student Members Free the First Year
Additional donation to support NYFA's efforts $_______ **Total** $_______

Name: ____

Address: ____

Address: ____

City: ____

State: ______________ Zip Code: ____________________

Make checks payable to the **New York Flora Association** and mail to:

NY Flora Association
3140 CEC
Albany, NY 12230

YOU KNOW YOU'RE AN AMATEUR BOTANIST IF:

YOU SCROUNGE CARDBOARD BOXES FROM APPLIANCE STORES TO CUT UP FOR DRYERS.
Sent in by Nancy Eldblom. **[send more to syoung@nynhp.org]**

Editor's apology: The first two articles of the last newsletter were cut short by one sentence during conversion for printing. The correct version will be posted on our website in the future.

FIELD TRIP TO VALCOUR ISLAND

Friday, June 3rd

We have arranged for a boat to transport us onto the island to see the many interesting species found on Valcour Island, including various orchids and rare species. This trip is always a highlight. Space is limited so please reserve early by contacting Troy Weldy (troy@gtweldy.com).

SALIX IDENTIFICATION WORKSHOP WITH GEORGE ARGUS

June 10-12 (Friday-Sunday)

NYFA is continuing its annual educational workshop. This 3-day workshop will be held at Clarkson University in St. Lawrence County on June 10-12. Dr. George Argus (Curator Emeritus, Canadian Museum of Nature), the renowned Salix expert and author to various FNA treatments, will lead the workshop. Each workshop participant will be provided the Guide to the Salix of New England and New York, Guide to Interactive Identification of Salix, IntKey software for Salix, and other helpful handouts to assist with Salix identification. The workshop will include both lab and field exercises. Dissecting scopes and study material will be provided, but participants are encouraged to bring their own study materials and specimens. The workshop costs are $75 for NYFA members and students, and $100 for non-members. This does not include lodging or meals. The workshop is limited to 15 participants, so please reserve early by contacting Troy Weldy (troy@gtweldy.com).

This workshop is set to begin Friday evening with an overview of Salix and discussion of our plans for the rest of the weekend. On Saturday, we will start as early as possible. Saturday will include some time in the field and a long evening in the lab. During the Saturday evening session, participants will have the opportunity to key any specimens they wish to bring. Sunday we will spend the day in the field studying Salix and applying our newly learned skills. Many thanks go out to Anne Johnson of St. Lawrence County for organizing this workshop.