NYFA Newsletter

New York Flora Association - New York State Museum Institute
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Musk Mallow (*Malva moschata* L.)

By Knowlton C. Foote, Ph.D. (kfoote1@twcny.rr.com)


Foto: Anna-Lena Anderberg

Musk Mallow is an attractive wildflower with either pink or white flowers found in the northeastern United States and adjacent Canada. It is found in fields and along our roadsides from mid-June to late October. It is best seen in June before it is over-topped by surrounding vegetation. However, this species is still somewhat of a mystery to us. Few significant studies have been done on Musk Mallow in the past 20 years. One reason, it is not an agricultural pest and therefore its biology has not been studied to learn how to control it.

NAME AND CLASSIFICATION

Musk mallow is known botanically as *Malva moschata*, the binomial name given it by Swedish botanist Carolus Linnaeus in l753. The genus *Malva* contains seven species in the northeastern United States (Gleason and Cronquist l991). Mitchell and Tucker (l997) list six species as occurring in New York State. *Malva*, in turn, belongs to the Malvaceae, the Mallow family.

The generic name, *Malva*, is derived from the Greek "malache" or "moloche," meaning soft referring to either the soft, downy leaves or to the soothing gelatinous properties of the roots of some species which have been used in cough syrups (Fernald l950). The specific name, *moschata*, means musky and refers to the scent of the foliage.

Family Malvaceae is often referred to as the "cheesewheel" family because the arrangement of the seeds in the ovary resembles a cheesewheel (see Fig. 1 l). An important member in Malvaceae is cotton (*Gossypium hirsutum*). The long seed hairs of the seeds make our familiar cotton fabrics. And from Marsh Mallow (*Althaea officinalis*), a European species found scattered throughout the Northeast, came marshmallows. Its roots, when mashed and boiled, produce a thick, pleasant tasting, slippery liquid with a high mucilage content. This liquid was then cooked down to thicken it and sugar added to produce marshmallow candy. Today marsh-mallows are no longer made from marshmallow roots but are made up of corn syrup, sugar, gelatin, starch and artificial flavors among other ingredients. Another species in the Mallow family is Velvetleaf (*Abutilon theophrasti*) which has a leaf texture as smooth as a baby's skin and a most interesting flower and fruit structure. Another familiar species is the wide-bloom, stately Hollyhock, *Alcea rosea*, found in our fields and gardens.

Inside this issue:


Variegated Skunk Cabbage by Steve Young

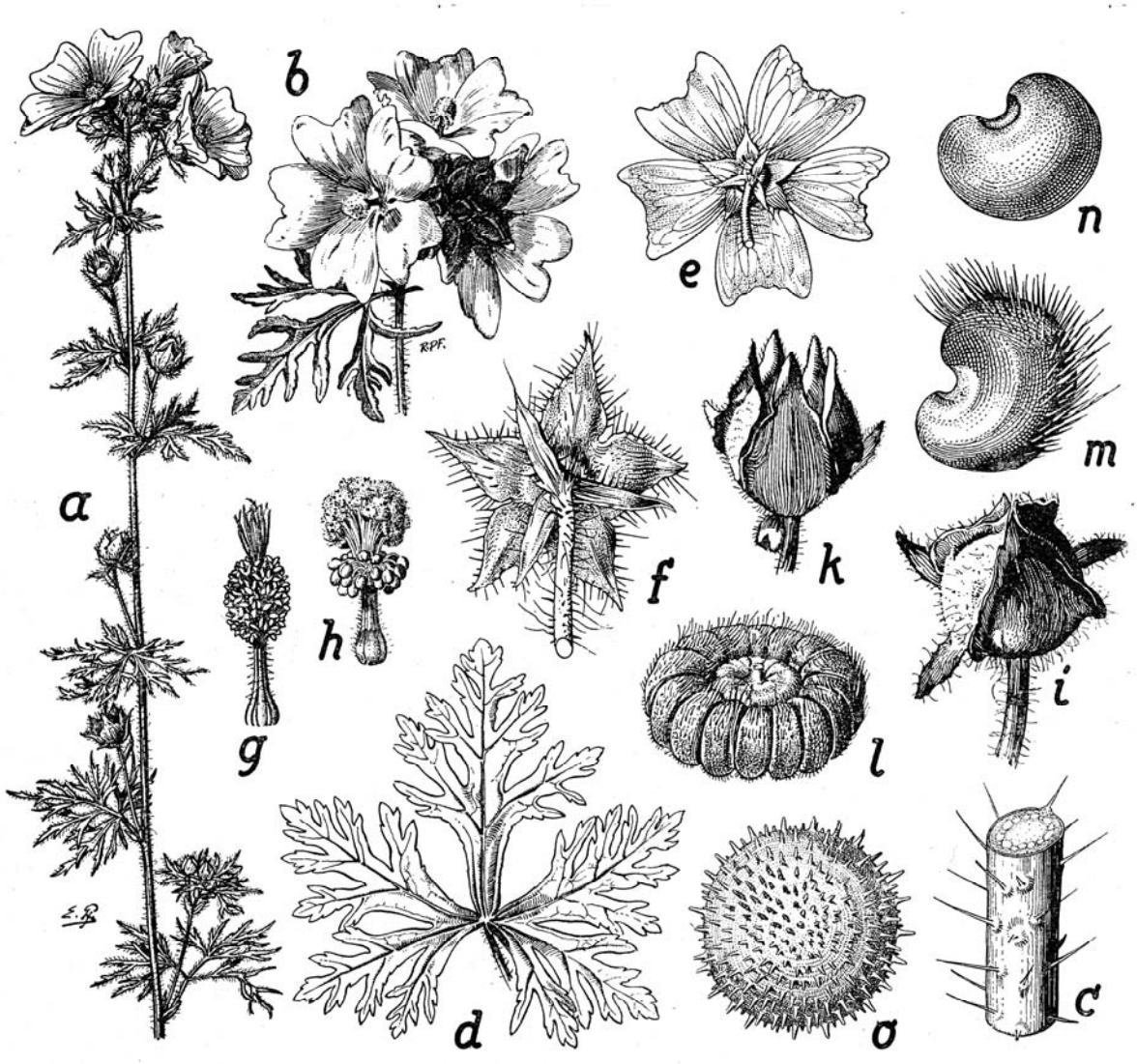

Figure 1. Musk Mallow. a) plant in bloom b) a flower cluster c) stem segment d) an upper foliage leaf e) underneath flower showing sepals f) underneath sepals showing outer calyx g) staminal column with anthers open, styles just beginning to emerge h) staminal column with styles emerging, anthers now empty i) fruit forming, sepals have closed in l) the fruit, a schizocarp m) an invidivual section of schizocarp - a mericarp n) a seed from inside a mericarp o) a pollen grain. From Hegi 1906-1931, vol. 5 (480).

ARRIVAL IN NORTH AMERICA

Musk Mallow, because of its attractive flower clusters, was used in ornamental gardens in Europe. It was brought from Europe and planted in gardens here in the United States early in the first half of the l9th century. From the gardens it spread to the countryside and has now become firmly established i.e. naturalized. John Torrey, the author of the first flora of New York State in 1843, made no mention of it as occurring in New York State. However, by 1848, Asa Gray of Harvard described it "being occasionally spontaneous around gardens in Massachusetts." It was first reported in eastern Canada by l862 (Rousseau l968).

RANGE AND HABITAT

Musk Mallow grows well on dry sites and in gravelly clay soils (Wiegand and Eames l925). It also thrives well in rich moist soils. It is not a plant that tolerates shade. As such we see it along our roadsides, even railways (Judd l974), where these conditions often exist. It is primarily found in our northern states. It ranges from Quebec and Nova Scotia to British Columbia south to Virginia and Missouri (Gleason and Cronquist l991).

DESCRIPTION

Musk Mallow is an herbaceous perennial. It flowers from late June to October when frosts begin with peak flowering between late June and mid-July. A plant often has multiple stems i.e. cespitose. I have seen plants with 17 stems. It is polycarpic in that it flowers and produces seeds each year for as many as 10 years if not longer. It grows from 2 to 7.5 dm tall. A plant has two quite different types of leaves. The basal leaves have petioles up to 17 cm long, are roundish, nearly entire and 1 to 3 cm in diameter. The upper stem leaves, however, have shorter petioles, are 8 to 10 cm in diameter, and are moderately to deeply lobed i.e. palmatifid (Fig. 1d). The flowers are positioned 1 to 3 dm above the dense display of leaves where pollinators can easily see them. There are 3 to 6 flower buds at each lower node and up to two dozen at the top end of the plant (Fig. 1a). The buds before opening are twisted. In mid-summer a plant usually has at least 3 to 5 blooms open at one time. I saw one luxuriant plant in a field in early July with 75 flowers in bloom.

Each flower has 5 petals and 5 sepals (Fig. 1e). Beneath the 5 sepals are 3 considerably smaller narrow leaves called bractlets which are 3 to 4 cm in length and form an outer calyx called the epicalyx (Fig. 1f). These bractlets are glabrous. There are two otherwise identical varieties, one with pink flowers (*Malva moschata* var. *rosea*) and one with white flowers (*Malva moschata* var. *alba*) with both plants usually found in equal numbers. However, areas with plants of just one color or the other are often seen. Each saucer shaped flower is between 3.5 and 4.5 cm in diameter, each petal 2.0 to 2.5 cm long with a distinct notch in the middle of the outer edge. Both white and pink petals have 5 to 7 prominent veins that run the length of each petal and enhances the beauty of the bloom, particularly the pink ones. The stamens are numerous, 50 to 60, and are united by their filaments into a 5 mm long tube which sheaths the styles. This staminal tube formed by the filaments is characteristic of mallow species and is known as being monadelphous. Growing up through this tube are 13 to 16 styles (Figs. 1g, h). The elongated stigmatic surface is about the same size as the style and is found on the inside of each flattened style and contains small hairs that capture pollen grains. Each style leads to one carpel in the ovary. The 13 to 16 carpels form the wheel-of-cheese shaped fruit known as a schizocarp (Fig. 1 l). This same type of fruit is seen in larger dimension in Hollyhock (*Alcea rosea*) and to a lesser extent in Common Mallow (*Malva neglecta*). At maturity each carpel, called a mericarp (Fig. 1m), looks like a wedge in the wheel and splits apart from the others for dispersal. Each mericarp contains one small hard indehiscent seed called a nutlet (Fig. 1n).

The root system is mainly a deep taproot with a few side roots. The main woody taproot of one robust plant with 12 stems was 3 cm thick at the root crown and 50 cm in length. The root crown is the perennating organ from which next years shoot buds develop in late fall. The chromosome number is 2n = 42 (Goldblatt l985).

FLORAL BIOLOGY

The pattern of flowering in both the white and pink flowers of Musk Mallow involves the coordinated growth and development of the petals, sepals, anthers, stigmas and styles. Each flower is dichogamous i.e. the stamens and pistils mature at different times that avoids self-pollination within a flower. Flowering is also distinctly protandrous in that the anthers open before the styles are receptive. A bud opens generally over a two-day period. Once open, the blooms last 2 to 2 ½ days. Flowering begins with the opening of 40 to 60 pink kidney-shaped (i.e. reniform) anthers which are clustered around the center of the flower. If the flower opens in the morning, the anthers open over the next 5 to 7 hours.

If the flower opens in the afternoon, the anthers start to open and then finish the opening the following morning. Each anther releases 60 to 70 sticky, round, white pollen grains (Fig. 1 o).

The anthers open first at the top of the staminal column and then progress downwards. With the anthers opening before the styles have emerged from the staminal tube, self-pollination is initially prevented. Interestingly, Hollyhock and Common Mallow anthers start to open at the bottom and progress upwards. Each anther is one-celled and opens along a single lengthwise slit and then turns completely inside out, releasing pollen grains to pollinators. Each flower has the potential to release at least 2400 pollen grains.

Only after all the anthers have opened do the pinkish style branches, which have been enclosed within the staminal column, elongate and grow up and above the staminal column and thus away from the open anthers. Each style (with the stigmatic surface on the inside) grows upwards 3 to 4 mm and then outwards another 4 to 5 mm. The stigmatic surface is now facing upwards in the direction from which pollinators come. Collectively the styles arrange themselves above the anthers like the shape of the spokes of an umbrella. By now the flower is in its female phase which may last another 15 to 20 hours. Finally, in some flowers a few of the styles now recurve further back into the nest of anthers thus permitting self-pollination in the same flower (i.e. autogamy) which would be important to isolated plants in producing seeds. This phase may last for up to an additional 24 hours, and is enhanced when the flower ages since the petals fold back inward and press the stigmas into the anthers. By then each stigmatic surface has on it sometimes none, but usually one to three dozen pollen grains from one source or another.

DOES AUTOGAMY REALLY OCCUR?

As just discussed above**,** Musk Mallow flowers have the mechanism for each flower to self-pollinate at the end of the flower's life. But how much autogamy actually occurs in this species? It appears very little for several reasons. First, most styles don't reflex backwards into the anthers. Second, for those few styles that do, the stigmatic surface remains to the outside and usually not twisted around into the anthers where any remaining pollen is. Finally, 1½ to 2 days have elapsed since the pollen was released. The pollen viability of insect-pollinated species rarely exceeds one day (Richards l986).

However, usually a plant has both male-phase flowers and female-phase flowers on it at the same time. Therefore it is quite possible for a pollinator to transfer pollen from one flower to another flower on the same plant resulting in seed production. This type of pollination between flowers on the same plant is known as geitonogamy and is quite important since seeds are being produced even if they are genetically identical to the parent plant. In Musk Mallow most likely considerable geitonogamy occurs.

SEED FORMATION

After the petals have folded in, the 5 sepals now also fold back in to provide a basket-like structure to protect the developing seeds (Figs. 1 i,k). After 7 to 10 days, the green sepals turn brown. After another 2 to 3 weeks, the sepals become skeletonized similar to leaves decaying in the fall. The sepals as a result are weakened. The mature mericarps each with one seed are then released into this sepal basket for dispersal. One or two of the sepals splits from the others creating a gap for the mericarps to escape. The mericarps are kidney-shaped (Fig. 1m) and only 3 mm in length with minute hairs on their back side.

POLLINATORS

In addition to providing pollen, nectar is secreted at the base of the flower in-between the petals. The entrance to each of the 5 nectaries is filled with whitish hairs to reduce evaporation of nectar and to discourage small insects from being nectar thieves i.e. consuming the nectar without transferring pollen. The slight musky scent of the foliage may also help attract insects. The nectar consists primarily of fructose and glucose (Percival l961). William Judd (l974) of the University of Western Ontario observed a wide range of insect species visiting Musk Mallow. Observed pollinators included a leaf hopper, 23 bugs, 5 beetles, 4 moths and butterflies, 13 flies, and 30 species of bees. Most common visitors were the honeybee, *Apis mellifera*, and the European Skipper, *Thymelicus lineola*. Robert Dirig of the Bailey Hortorium Herbarium at Cornell has also observed the Cabbage White butterfly (*Pieris rapae*) nectaring on Musk Mallow.

POLLINATION

When a bee enters a flower, it often positions itself directly on top of the staminal column while searching for pollen. The ventral side of the bee's abdomen is then in direct contact with the stigmas if they are out. Pollen already present on the underside of the insect obtained from other flowers could now be transferred to the stigmatic surface.

Other times a bee lands on the inside of the corolla heading for the nectaries at the base of the flower. Depending on its size, the bee first touches the staminal column and possibly the overarching stigmas if present. The insect makes contact with the anthers where it picks up more pollen if it is still present. Honeybees make no distinction between the white and pink flowers going from flowers on a pink plant to an adjacent white-flowered plant and vice versa.

CONCLUSION:

There are many questions about Musk Mallow that could use further study. Is Musk Mallow capable of self-pollination? Is it capable of apomixis? Is nectar production coordinated with either the male or female phase? Does parthenocarpy occur in carpels when fertilization is unsuccessful? When and under what conditions do seeds germinate? What is the lifespan of the seeds in the soil? These are some of the interesting questions that remain to be answered for this attractive species that belongs in our flower gardens as well as our roadsides.

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NEW YORK'S EXPLOITABLY VULNERABLE PLANT SPECIES LIST - A NEED FOR A DEFINITION CHANGE

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New York has a Protected Plant Law – Environmental Conservation Law § 9-1503, and associated regulations under 6 NYCRR Part 193.3. The law protects certain plant species, which are currently listed in four categories: endangered, threatened, rare, and exploitably vulnerable. I like the law. I even like the categories and I agree with most of the species listed in the regulations under these categories. I like the definitions used for endangered, threatened, and rare species. They are fine. I hate the definition for exploitably vulnerable species. In a kind botanical world, this definition would be politely described as abysmal. It should be changed. Let me explain why. I will start at the beginning.

In 1974, New York passed the New York Protected Plant Act. It stated that ***"no one may knowingly pick, pluck, sever, remove or carry away, without the consent of the owner thereof, any protected plant".*** It was a piece of milestone legislation that protected the removal of certain plants from a landowner's property without their permission. It protected landowner rights and recognized that plants are the property of the landowner. A common legal right carried through to today - where the plants belong to the landowner; while animals, on the other hand, belong to the state. Why? Because our laws are based on English law, where the landowner owns the plants, but the animals are owned by the King. That is why the state (king) can regulate the taking of animals, but not the taking of plants on one's own property.

The 1974 Protected Plant Act established two things: 1) the list of plant species protected under the Act and 2) the legal penalty for taking a protected plant or plant part from someone's property without their permission.

Let me address the latter penalty item first. The penalty established in 1974 was a $25 fine for the taking of a protected plant or plant part from a landowner's property without their permission. Setting a monetary value for each protected plant was a good idea, and a $25 fine in 1974 was very appropriate. Unfortunately, although the categories of protected plants under the original Act have been significantly changed, and the list of plants under these categories were changed a few times, the monetary fine of $25 has never been changed. The $25 fine established in 1974 is still the same today in 2006, 32 years later. A reasonable person might suggest that the penalty be increased after 32 years. A penalty of $50 for the removal or harm to each protected plant would be more appropriate today.

The plants listed in the original 1974 Protected Plant Act were in just one collective category of "*Protected Plants"*. At that time there was little understanding of rarity categories. As a matter of fact, the species list developed under the original Act had little to do with rarity. Those listed were showy species (including all native orchids, cardinal flower, Trilliums, etc.), species collected for landscaping and Christmas decorations (all native ferns but three, all clubmosses, flowering dogwood, winterberry holly, etc.), and other species that were subject to indiscriminate collecting (bloodroot, bayberry, sundews, trailing arbutus). Of course, within these collective categories there are endangered, threatened, and rare species. But, the original list targeted showy species. Essentially no aquatic species were included and no nondescript species, like grasses, sedges, or rushes. Today's Act includes over 150 species in these latter groups alone.

Dick Mitchell and Chuck Sheviak described the original list very well in their 1981 publication *Rare Plants of New York* (Mitchell and Sheviak 1981). They did propose a list of true rarities in this publication, but their comment on the original list was as follows.

> *The list should not be mistaken for a rare plant list, though some rarities are protected by it. Rather, it lists wild flowers and other plants (such as Dogwood, Azaleas and Trilliums) which are frequently gathered indiscriminately for flower arrangements, cultivation, or for momentary pleasure, and are then discarded. It was intended to discourage the gathering of plants on State and private land without permission.*

In 1989, subsequent to Dick's 1981 publication, the Protected Plant Law was changed. The law itself was changed by slightly modifying the taking clause and recognizing not just one collective category of Protected Plants, but different categories of rarity. For the first time, the law and associated regulations (6 NYCRR 193.3) defined protected plants in four categories: endangered, threatened, rare, and exploitably vulnerable. It was a very appropriate change.

The 1989 change to the law established definitions for each of the categories, with the definitions for endangered, threatened, and rare species generally following the New York Natural Heritage Program's rarity classes of S1, S2, and S3, respectively. The problem that the change to the law faced was what to do with the plant list developed in the original 1974 Protected Plant Act. They didn't want to abandon it, but it really wasn't a list of species that would fit in any of these rarity categories. So, they kept the original list intact and developed a new category – **Exploitably Vulnerable**. And, they developed a brand new definition to go with it.

Exploitably Vulnerable plants were (and are) defined as: "***native plants likely to become threatened in the near future throughout all or a significant portion of their ranges within the state if causal factors continue unchecked".*** This definition is the root of the problem. Except for a few rarities in the exploitably vulnerable list (which are duplicately listed in one of the other rarity lists), essentially none of these species are ***"likely to become threatened in the near future throughout all or a significant portion of their ranges within the state".*** In fact, many of the species listed are among the most common species in the state.

In the public sector, where I work, the exploitably vulnerable list creates great confusion. Well-intentioned individuals often exclaim that such species will be affected by a project, and that this effect is an unacceptable significant impact. They point to the definition of these exploitably vulnerable species and emphasize the importance of these species based on that definition. They force meaningless conditions on projects by promoting measures to protect these common species. Last year, butterfly weed (*Asclepias tuberosa*) was singled out for protection on a project. Butterfly weed is a pretty plant, with a showy orange-colored flower, but the species is common. It often is found along roadways and other open, disturbed habitat; it is not a species that deserves specific avoidance measures.

So how do we convince these individuals that these are common species that should not really be defined as those **"likely to become threatened in the near future"?** Simple, we change the definition of exploitably vulnerable species to appropriately reflect the status of the species listed under this definition. We correct an error carried through from the original Act. We change the law.

Over the past several years, I have presented this problem to the New York State Department of Environmental Conservation, Department of Lands and Forests, who maintain the state's protected plants law and regulations. They agree with my concerns. But, they indicate that the original definitions listed in the Act are part of the law, not part of the regulations like the species listed under each category. Their position is that the change is appropriate, but the law is difficult to change.

In the past couple years, I have raised this issue during the annual rare plant review meeting sponsored by the Natural Heritage Program. We have discussed many solutions, including completely changing the numerous species listed as exploitably vulnerable to just a handful of species that are truly exploitably vulnerable as defined.

My conclusion after all this discussion is that there is nothing wrong with the species listed as exploitably vulnerable. These species are vulnerable to exploitation from private property, and the Act protects landowner from the taking of these species without their permission. This protection is a very appropriate function of the Act. The problem is that individuals confuse species listed as exploitably vulnerable with rare species. It gets back to the erroneous definition.

So, to solve this disparity between the definition of exploitably vulnerable plants and the species listed under this category, I propose a new definition. My proposed definition for **exploitably vulnerable** is: **those species that are subject to collection, removal, or harm on a landowner's property without their permission.**

I considered expanding the definition to make a reference to rarity (like, ***"which includes some rarities, although most species are common"***), but I think it is best to stay completely away from any inference to rarity. These are simply species subject to exploitation without landowner's permission. The definition should be left at that.

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.

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SUNY ESF will host a **Native Plant Conference June 27-29** in partnership with Oswego BOCES. Our website has some preliminary information (soon to be finalized) with more program details.
http://www.esf.edu/outreach/nativeplants/program.htm

We have opportunities to become a sponsor or to have a tabletop display as well.

We are excited about the workshops, field trips and program as a whole. Please contact Maureen Wakefield, Continuing Education Coordinator, directly at 315-470-6888.

MOSS AND FERN FIELD TRIP TO CLARK RESERVATION

Saturday, June 17th

We will meet at 8:30 AM and split the day with a lunch break. The plan is to look at bryophytes (mosses) in the morning and the ferns in the afternoon. Hart's Tongue fern is a federally-listed species and the park contains about 88% of the known US population. **Norm Trigoboff** of the Fingers Lakes Native Plant Society and **Keith Bowman** a masters candidate at SUNY-ESF who is studying the bryophytes at Clark Reservation with **Dr. Robin Kimmerer** will lead the morning portion of the field trip. **Bernie Carr** will lead the afternoon portion. This is a joint field trip sponsored by the NY Flora Association and the Fingers Lakes Native Plant Society.

Please pass this email to your colleagues who may be interested in attending. Please let me know if you plan to attend.

Bernie Carr, TES, berncall@alltel.net, W 315 695-7228, H 315 469-9379

CAREX IDENTIFICATION WORKSHOP WITH TONY REZNICEK

June 29-30 (Thursday-Friday)

Tony Reznicek will lead a NYFA-sponsored sedge workshop on June 29-30 at the Rice Creek Field Station (SUNY-Oswego). If you are interested, the cost is $135 for NYFA members/students and $175 for non-members if payment is received by June 16th and $150 members/students and $200 non-members if payment received after June 16th. This fee includes a group dinner on Thursday and various handouts. Lodging and other meal fees are the responsibility of each person. Participation is limited to the first twenty registrants.

Please feel free to share this information with any other interested individuals. Contact Troy Weldy for info: tweldy@tnc.org.

Many thanks to Ed Frantz for organizing this workshop and Andy Nelson for allowing us access to SUNY-Oswego's Rice Creek Field Station.