NYFA New York Flora Association

Quarterly Newsletter

Spring 2014 Volume 25 Issue 2

New York Flora Association
Address: P.O. Box 122
Albany, NY 12201
Phone: (518)250-6054
Email: editor@nyflora.org
Website: www.nyflora.org
Blog: www.nyfablog.org
Editor: Anne Johnson

Articles Inside:

Editor's Note: Each year, NYFA offers research awards to help fund students conducting botanical research in NY. The 2013 award winners were Rosalie Burdon of Uppsala University and Tiffany Wong of SUNY Fredonia. Summaries of each of their research efforts are included in this issue. The 2014 award winners will be chosen by May 2014, please see nyflora.org for application information.

What's scent got to do with it?

The function of linalool in the native New York flower *Penstemon digitalis*
by Rosalie C.F. Burdon

One of our first reactions to flowers is to smell them, but have you ever questioned why they smell? Smell is one of many signals flowers use to attract pollinators. Knowing how plants communicate to animals such as bees is important. Through communication, animals help plants to survive and reproduce by transferring pollen between plants in return for nectar. Attracting animals by distinct signals and associating the signal with a reward allows them to learn that scent means food. Therefore, they will search and visit plants producing the same signals, transferring pollen as they do so. Scent can be more than an attractant. A floral bouquet released by a plant can be a complex form of communication: it can be made up of over 100 different compounds, each with the potential for each one to attract or deter insects.

I used a native North American species, *Penstemon digitalis* (Figure 1) to investigate the function of one specific scent, linalool, which is not only found in this system, but is also found in more than 60% of flowering plants. My research has also shown that linalool is found within the nectar, giving insects the opportunity to associate scent with reward in this system. Therefore the scent or taste of linalool in *P. digitalis* could act as a floral trait that filters animal visitors, attracting pollinators or repelling antagonists. Previous work has shown selection pressure to increase emissions of the nectar scent compound linalool in *P. digitalis*, yet its function in mediating interactions with both pollinators and antagonists is unknown. I set out to find the answer, finding suitable numbers of plants in meadows in Ithaca, NY.

Figure 1. *Apis mellifera* collecting nectar from *P. digitalis* flowers.

Here, I supplemented plants with a heightened scent of linalool (Figure 2) and tested it's function as an attractant to its main bee pollinator, *Bombus impatiens*, and its repellence function to its nectar robbing ant antagonist *Tapinoma sessile*.

Figure 2. Rosie supplementing *P. digitalis* plants with linalool.

To test bees, I offered a choice between two flowers at any one time; one supplemented with artificially high scented flowers or low scented flowers (Figure 3). The bees fed from both demonstrating that linalool does not repel them.

Figure 3. Bee interviews with supplemented flowers.

The ants on the other hand, offered sugary solution with or without linalool, showed a direct agitated behavioral response to the presence of linalool by fanatically cleaning themselves. This suggests that linalool could be a repellent in this system.

Further research into this highly common floral scent, and specifically its function, will expand on our knowledge of plant-pollinator interactions in general, as well as for New York flora.

Supervisor: Amy Parachnowitsch, Assistant Professor, **Institute:** Uppsala University, Plant Ecology & Evolution
With thanks to **NYFA** for the funding opportunity

THINGS FOUND BOTANIZING

In the last issue, Steve Young contributed an article listing the interesting items that Ted Baim had found during his travels in the woods and fields. A request for members to write in with their own strange finds prompted two reminiscences. Carol Gracie said: My most memorable find occurred while botanizing in an early spring skunk cabbage swamp. I found a half buried, nearly baby-sized doll, lying face up in the mud. It took my breath away when I initially took it for a real baby!

Anne Johnson contributed this strange find: Deep in the roadless and pathless woods in Clinton County I came across a whole locomotive. It was right next to a long, narrow, and apparently bottomless trench in the ground, so I assume it was used to pull ore out many years ago.

If other members have strange finds to report, email them to editor@nyflora.org or mail them to NYFA, Box 122, Albany, NY, 12201.

Bryophytes of the Hoxie Gorge Area

By Norm Trigoboff and Michael Hough

In the summer of 2013, we surveyed the bryophyte flora (mosses, hornworts, and liverworts) of the Hoxie Gorge Nature Preserve, Cortland County, New York. This 169-acre preserve owned by SUNY Cortland consists of forests, fields, and several types of wetlands. The narrow, hemlock-shaded gorge with abundant wet rock faces was particularly rich in bryophytes.

We collected 104 bryophyte species on the SUNY Cortland Hoxie Gorge property (Species List A). These include one hornwort (Division Anthocerophyta), 21 liverworts (Division Marchantiophyta), and 82 mosses (Division Bryophyta). We also collected briefly within the adjacent Hoxie Gorge State Forest, a 2,064 acre parcel in the towns of Freetown and Virgil in Cortland County. The latter search focused on a small hemlock-hardwood peat swamp (Edinger et al., 2002) where 21 additional species were found (Species List B). Nomenclature follows Tropicos (2013).

The college property and the State Forest consist largely of second growth forest that at various times has been farmed, pastured and/or logged. The state forest is still actively logged. The forested areas of Hoxie Gorge Nature Preserve are protected and have been dedicated part of the Old-growth Forest Network (www.oldgrowthforest.net). The two oldest living hemlocks (*Tsuga canadensis*) to date found in the preserve began growing in 1673 and 1674; several others nearby began growing in the 1710's (Taylor & Barclay, 2013).

Keith Bowman (2007) listed 126 bryophyte taxa, including 12 liverworts and 114 mosses, from Clark Reservation State Park, in Onondaga County, about 5 miles south of Syracuse and about 30 miles north of Hoxie Gorge. The most recently published checklist of mosses for New York State included 461 species (Ketchlege, 1980). Cleavitt (2014) estimated that an updated checklist of the state flora would include 617-637 species. This helps put the local numbers in perspective.

Further study of the Hoxie Gorge area should yield more bryophyte taxa, though Clark Reservation should prove ultimately to have a greater number. The abundant limestone at Clark Reservation favors a high diversity of bryophytes compared to the neutral siltstone that underlies the Hoxie Gorge area. Norm recalls, perhaps correctly, Ed Ketchledge saying that he found 120 species of moss at Clark Reservation and remarking on the high variety there. Nevertheless, for the moment at least, "Hoxie" is leading in the liverwort and hornwort divisions and merely lagging by one in the total number of documented bryophyte species. We hope some friendly rivalry will promote bryological knowledge in this part of New York State.

David Barclay informs us that all of the bedrock in the Hoxie Gorge area is Devonian. The nearby hills are covered mostly in glacial till that generally varies from 1 to 25 feet in thickness (Miller, 1996). Although the surficial sediments at Hoxie have not been described, Dr. Barclay has observed areas of thicker surficial sediments along the axis of the gorge consisting of glacial till; glacilacustrine clays, silts, sands; and alluvium.

We found *Pohlia melanodon*, an S2 species (Cleavitt et al. 2006), on a steep, eroding clay bank at the Hoxie Gorge Nature Preserve. Including Hoxie Gorge, we know of 9 sites for it in Central New York, including 3 steep, eroding woodland banks, 1 roadside, 1 parking lot edge and 1 building drip line. An "S2" ranking means rare – occurring at 6 to 20 sites in the state, or demonstrably vulnerable. We think *P. melanodon* is under-collected rather than rare.

Several studies have been done on the fungi, lichens, and vascular plants of Hoxie Gorge. This was the first survey of its bryophytes. Except for four *Sphagnum* spp. in Cornell's Bailey Hortorium (BH), vouchers for all species have been deposited in the SUNY Cortland Herbarium. Soon, these will be publicly accessible through the CORT Herbarium website (https://webapp.cortland.edu/herbarium). When combined

with vouchered records of vascular plants, including several new species found while looking for bryophytes, 547 plant taxa are confirmed for the Hoxie Gorge area, which includes some of the surrounding DEC-managed state land. This diversity highlights the value of the property for research and nature study.

We thank David Barclay (Geology Department, SUNY Cortland) and Anna Stalter (Cornell's Bailey Hortorium) for providing information and suggestions, Keith Bowman for reviewing a draft of this paper, and Gopi Labranch for help with transportation. This project was supported by the Cortland College Foundation.

Works Cited

Bowman, K. 2007. The mosses and liverworts of Clark Reservation. New York Flora Association Newsletter 18(1): 1-6.

Cleavitt, N.L., S.A. Williams, & N.G. Slack. 2006. Updating the rare moss list for New York State: Ecological community and species-centered approaches. Final report for the Biodiversity Research Institute. New York State Museum. Albany, NY. 46 pp.

Cleavitt, N. n.d. How many bryophytes are there in New York and are any of them rare. Finger Lakes Native Plant Society Website. Accessed 2 Feb 2014. http://www.fingerlakesnativeplantsociety.org/bryophytes/NY_rare_bryos_Cleavitt.htm

Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, & A.M. Olivero (editors). 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Ketchledge, E.H. 1980. Revised checklist of the mosses of New York State. New York State Museum Publication 440.

Miller, T.S. 1996. Thickness of unconsolidated deposits in the Towns of Solon and Taylor, Cortland County, New York: U.S. Geological Survey Water-Resources Investigations Report 98-4197.

Taylor, D. & Barclay, D. 2013. Personal communication.

Tropicos. 2013. Botanical information system at the Missouri Botanical Garden. Accessed 11 Dec 2013 http://www.tropicos.org

Further Reading

http://www.oldgrowthforest.net/dedicated-forests-state/ny-courtland-county-hoxie-gorge-nature-preserve/
http://www.dec.ny.gov/lands/37052.html
http://www2.cortland.edu/off-campus/outdoor-education-facilities/hoxie-gorge/
http://www.dec.ny.gov/animals/29396.html

SPECIES LIST A

HORNWORTS (ANTHOCEROPHYTA)

Phaeoceros laevis (L.) Prosk.

LIVERWORTS (MARCHANTIOPHYTA)

Aneura pinguis (L.) Dumort.
Bazzania trilobata (L.) Gray
Calypogeia fissa (L.) Raddi (?)
Cephalozia lunulifolia (Dumort.) Dumort. (?)
Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dumort.
Cololejeunea biddlecomiae (Austin ex Pearson) A. Evans
Conocephalum conicum (L.) Underw.
Frullania eboracensis Gottsche
Geocalyx graveolens (Schrad.) Nees
Lepidozia reptans (L.) Dumort.
Liochlaena lanceolata Nees
Lophocolea cuspidata (Nees) Limpr.
Lophocolea heterophylla (Schrad.) Dumort.
Metzgeria conjugata Lindb.
Nowellia curvifolia (Dicks.) Mitt.
Pellia epiphylla (L.) Corda
Plagiochila asplenioides (L.) Dumort.
Porella platyphylla (L.) Pfeiff.
Ptilidium pulcherrimum (Weber) Hampe
Radula complanata (L.) Dumort.
Scapania nemorea (L.) Grolle

MOSSES (BRYOPHYTA)

Amblystegium serpens (Hedw.) Schimp.
Amblystegium varium (Hedw.) Lindb.
Anomodon attenuatus (Hedw.) Huebener
Anomodon rostratus (Hedw.) Schimp.
Anomodon rugelii (Müll. Hal.) Keissl.
Atrichum angustatum (Brid.) Bruch & Schimp.
Atrichum undulatum (Hedw.) P. Beauv.
Bartramia pomiformis Hedw.
Brachythecium acuminatum (Hedw.) Austin
Brachythecium oxycladon (Brid.) A. Jaeger
Brachythecium plumosum (Hedw.) Schimp.
Brachythecium reflexum (Starke) Schimp.
Brachythecium salebrosum (Hoffm. ex F. Weber & D. Mohr) Schimp.
Brotherella recurvans (Michx.) M. Fleisch.

Bryhnia graminicolor (Brid.) Grout
Bryhnia novae-angliae (Sull. & Lesq.) Grout
Bryum argenteum Hedw.
Bryum capillare Hedw.
Callicladium haldanianum (Grev.) H.A. Crum
Campylium chrysophyllum (Brid.) Lange
Campylium hispidulum (Brid.) Mitt.
Ceratodon purpureus (Hedw.) Brid.
Climacium sp.
Dicranella heteromalla (Hedw.) Schimp.
Dicranum flagellare Hedw.
Dicranum fulvum Hook.
Dicranum montanum Hedw.
Dicranum polysetum Sw.
Dicranum scoparium Hedw.
Dicranum viride (Sull. & Lesq.) Lindb.
Didymodon fallax (Hedw.) R.H. Zander
Diphyscium foliosum (Hedw.) D. Mohr
Entodon cladorrhizans (Hedw.) Müll. Hal.
Eurhynchium riparioides (Hedw.) P.W. Richards
Fissidens adianthoides Hedw.
Fissidens bryoides Hedw.
Fissidens taxifolius Hedw.
Herzogiella striatella (Brid.) Z. Iwats.
Homalia trichomanoides (Hedw.) Schimp.
Hygroamblystegium tenax (Hedw.) Jenn. var. *tenax*
Hygrohypnum luridum (Hedw.) Jenn.
Hylocomium brevirostre (Brid.) Schimp.
Hypnum cupressiforme Hedw.
Hypnum imponens Hedw.
Hypnum lindbergii Mitt.
Hypnum pallescens (Hedw.) P. Beauv.
Leskea polycarpa Hedw.
Leskeella nervosa (Brid.) Loeske
Leucobryum glaucum (Hedw.) Ångstr.
Leucodon andrewsianus (H.A. Crum & L.E. Anderson) W.D. Reese & L.E. Anderson
Mnium sp.
Myurella sibirica (Müll. Hal.) Reimers
Orthotrichum sordidum Sull. & Lesq.
Orthotrichum stellatum Brid.
Philonotis fontana (Hedw.) Brid.
Physcomitrium pyriforme (Hedw.) Hampe
Plagiomnium ciliare (Müll. Hal.) T.J. Kop.
Plagiomnium cuspidatum (Hedw.) T.J. Kop.
Plagiomnium medium (Bruch & Schimp.) T.J. Kop.
Plagiothecium curvifolium Schlieph. ex Limpr.
Plagiothecium laetum Schimp.
Platygyrium repens (Brid.) Schimp.
Pleurozium schreberi (Willd. ex Brid.) Mitt.
Pogonatum pensilvanicum (Bartram ex Hedw.) P. Beauv.
Pohlia melanodon (Brid.) A.J. Shaw
Pohlia nutans (Hedw.) Lindb.
Polytrichum commune Hedw.
Polytrichum juniperinum Hedw.
Polytrichum ohioense Renauld & Cardot
Pseudotaxiphyllum elegans (Brid.) Z. Iwats.
Pylaisia polyantha (Hedw.) Schimp.
Rauiella scita (P. Beauv.) Reimers
Rhizomnium punctatum (Hedw.) T.J. Kop.
Rhynchostegium serrulatum (Hedw.) A. Jaeger
Sphagnum fimbriatum Wilson (BH)
Sphagnum girgensohnii Russow (BH)
Sphagnum palustre L. (BH)
Sphagnum subtile (Russow) Warnst. (BH)
Tetraphis pellucida Hedw.
Thamnobryum alleghaniense (Müll. Hal.) Nieuwl.
Thuidium delicatulum (Hedw.) Schimp.
Ulota crispa (Hedw.) Brid.

SPECIES LIST B

HORNWORTS
Anthoceros sp.

MOSSES (BRYOPHYTA)
Amblystegium varium (Hedw.) Lindb.
Aulacomnium palustre (Hedw.) Schwägr.
Brachythecium populeum (Hedw.) Schimp.
Brachythecium rivulare Schimp. (?)
Calliergon cordifolium (Hedw.) Kindb.
Calliergon giganteum (Schimp.) Kindb.
Climacium dendroides (Hedw.) F. Weber & D. Mohr
Ctenidium malacodes Mitt.
Eurhynchium hians (Hedw.) Sande Lac.
Eurhynchium pulchellum (Hedw.) Jenn.
Helodium blandowii (F. Weber & D. Mohr) Warnst.
Hypnum pratense (Rabenh.) Koch ex Spruce.
Odontoschisma denudatum (Nees) Dumort.
Plagiothecium denticulatum (Hedw.) Schimp.
Ptilium crista-castrensis (Hedw.) De Not.
Rhodobryum ontariense (Kindb.) Kindb.
Rhytidiadelphus squarrosus (Hedw.) Warnst.
Rhytidiadelphus triquetrus (Hedw.) Warnst.
Riccardia multifida (L.) A. Gray
Sphagnum fimbriatum Wilson
Sphagnum girgensohnii Russow
Sphagnum henryense Warnst.
Sphagnum russowii Warnst.
Sphagnum squarrosum Crome
Sphagnum subtile (Russow) Warnst.

SUNY-Fredonia's Bioblitz at the College Lodge in Western New York

The SUNY-Fredonia College Lodge Nature Preserve is located in rural Chautauqua County and is surrounded by 200 acres of forest on the divide between the Mississippi and St. Lawrence watersheds. Originally purchased by students in 1939, the land was heavily forested and includes areas of "original maple and hemlock", which are now very rare in Chautauqua County and throughout western New York. There are a variety of habitat types within the preserve, and numerous wetlands, creeks and several ponds are present, further diversifying the resource.

Recently, the Faculty Student Association (FSA), an agency that manages the lodge and surrounding land, initiated a biological inventory of the natural resources on the property in an effort to better manage the land and plan for future uses. The inventory is being managed and conducted by the Roger Tory Peterson Institute. An important element of the inventory is a Bioblitz that will take place on July 18th and 19th 2014. The Bioblitz will include surveys for all taxonomic groups. NYFA members are encouraged to participate by joining botanical forays (bryologists and lichenologists are especially needed) and participating in surveys of other taxa. Experts in every taxonomic group are needed to lead forays.

Contact Twan Leenders (tleenders@rtpi.org) or Jonathan Titus (titus@fredonia.edu) for more information. Official sponsors of the Bioblitz include SUNY-Fredonia, Roger Tory Peterson Institute, Jamestown Community College, and the Nature Sanctuary Society of New York.

The College Lodge Nature Preserve includes at least seven upland forest types including New York State old growth and a variety of wetland communities.

Plants Included in Proposed Invasive Species Regulations

By Joseph M. McMullen

Invasive species (both plants and animals) are a concern to anyone interested in protecting the environment. Species from zebra mussel (*Dreissena polymorpha*) to round goby (*Neogobius melanostomus*), and common reed grass (*Phragmites australis*) to garlic mustard (*Alliaria petiolata*) displace native species, lower habitat value, and disrupt the ecosystems of the state.

Many such species, particularly introduced pest species, can also have a significant impact on our economy. Eurasian boars (*Sus scrofa*) destroy farmer's crops, water chestnut (*Trapa natans*) limits the use of waterways, and who hasn't seen a story in the past six months on the destructive potential and timber losses from emerald ash borer (*Agrilus planipennis*).

On October 23, 2013 the New York State Department of Environmental Conservation proposed to amend a portion of the environmental regulations (6NYCRR) by promulgating a new section (Part 575) pertaining to invasive species. A 60 day comment period on the proposed ruling followed the notice, which included four public hearings across the state. After all comments are reviewed, any necessary changes will be made and the final regulations will be published in the State Register. The final regulations will become effective six months following this publication date.

The proposed regulations include animals (terrestrial and aquatic invertebrates and vertebrates), fungi, algae, and vascular plants. There are two categories of listings: Prohibited Invasive Species and Regulated Invasive Species.

Prohibited invasive species is the more restrictive category, and is defined as those species that pose a clear risk to the state's economy, ecology, and/or human health. Under the proposed regulations, it would be illegal to "*knowingly possess with the intent to sell import, purchase, transport or introduce any prohibited invasive species*". Plants proposed to be included as prohibited invasive species are listed in Table 1.

Regulated invasive species are those that have the **potential** to have similar detrimental effects as prohibited species. Under the proposed regulations, you could legally possess or sell a regulated invasive species, but you could not knowingly introduce it into a "free living state". A free living state is defined as any public lands or waters or areas connected to such public areas. The list of proposed regulated invasive plant species is presented in Table 2.

Detailed information on the proposed regulations can be found at http://www.dec.ny.gov/regulations/93848.html.

Table 1. Proposed Prohibited Invasive Plant Species

Scientific Name	Common Name
Acer pseudoplatanus	Sycamore Maple
Achyranthes japonica	Japanese Chaff Flower
Alliaria petiolata	Garlic Mustard
Ampelopsis brevipedunculata	Porcelain Berry
Anthriscus sylvestris	Wild Chervil
Aralia elata	Japanese Angelica Tree
Artemisia vulgaris	Mugwort
Arthraxon hispidus	Small Carpgrass
Berberis thunbergii	Japanese Barberry
Brachypodium sylvaticum	Slender False Brome
Cabomba caroliniana	Fanwort
Cardamine impatiens	Narrowleaf Bittercress
Celastrus orbiculatus	Oriental Bittersweet
Centaurea stoebe (*C. biebersteinii, C. diffusa, C. maculosa misapplied, C. x psammogena*)	Spotted Knapweed

Cirsium arvense (*C. setosum, C. incanum, Serratula arvensis*)	Canada Thistle
Cynanchum louiseae (*C. nigrum, Vincetoxicum nigrum*)	Black Swallow-wort
Cynanchum rossicum (*C. medium, Vincetoxicum medium, V. rossicum*)	Pale Swallow-wort
Dioscorea polystachya (*D. batatas*)	Chinese Yam
Dipsacus laciniatus	Cut-leaf Teasel
Egeria densa	Brazilian Waterweed
Elaeagnus umbellata	Autumn Olive
Euphorbia cyparissias	Cypress Spurge
Euphorbia esula	Leafy Spurge
Ficaria verna (*Ranunculus ficaria*)	Lesser Celandine
Frangula alnus (*Rhamnus frangula*)	Smooth Buckthorn
Glyceria maxima	Reed Manna Grass
Heracleum mantegazzianum	Giant Hogweed
Humulus japonicus	Japanese Hops
Hydrilla verticillata	Hydrilla, Water Thyme
Hydrocharis morus-ranae	Frogbit
Imperata cylindrica (I. arundinacea, Lagurus cylindricus)	Cogon Grass
Iris pseudacorus	Yellow Iris
Lepidium latifolium	Broad-leaved Pepper-grass
Lespedeza cuneata	Chinese Lespedeza
Ligustrium obtusifolium	Border Privet
Lonicera japonica	Japanese Honeysuckle
Lonicera maackii	Amur Honeysuckle
Lonicera morrowii	Morrow's Honeysuckle
Lonicera tatarica	Tartarian Honeysuckle
Lonicera x bella	Fly Honeysuckle
Ludwigia hexapetala (L. grandiflora)	Uruguayan Prim. Willow
Ludwigia peploides	Floating Primrose Willow
Lysimachia vulgaris	Garden Loosestrife
Lythrum salicaria	Purple Loosestrife
Microstegium vimineum	Japanese Stilt Grass
Murdannia keisak	Marsh Dewflower
Myriophyllum aquaticum	Parrot-feather
Myriophyllum heterophyllum	Broadleaf Water-milfoil
Myriophyllum x pinnatum	Broadleaf Water-milfoil Hybrid
Myriophyllum spicatum	Eurasian Water-milfoil
Nymphoides peltata	Yellow Floating Heart
Oplismenus hirtellus	Wavyleaf Basketgrass
Persicaria perfoliata (Polygonum perfoliatum)	Mile-a-minute Weed
Phellodendron amurense	Amur Cork Tree
Phragmites australis	Common Reed Grass
Phyllostachys aurea	Golden Bamboo
Phyllostachys aureosulcata	Yellow Groove Bamboo
Potamogeton crispus	Curly Pondweed
Pueraria montana	Kudzu
Reynoutria japonica (Fallopia japonica, Polygonum cuspidatum)	Japanese Knotweed
Reynoutria sachalinensis (Fallopia sachalinensis, Polygonum sachalinensis)	Giant Knotweed
Reynoutria x bohemica (Fallopia x bohemica, Polygonum x bohemica)	Bohemian Knotweed
Rhamnus cathartica	Common Buckthorn
Rosa multiflora	Multiflora Rose
Rubus phoenicolasius	Wineberry
Salix atrocinerea	Gray Florist's Willow
Silphium perfoliatum	Cup-plant
Trapa natans	Water Chestnut
Vitex rotundifolia	Beach Vitex

Table 2. Proposed Regulated Invasive Plant Species

Scientific Name	Common Name
Acer platanoides	Norway Maple
Clematis terniflora	Japanese Virgin's Bower
Euonymus alatus	Burning Bush
Euonymus fortunei	Winter Creeper
Miscanthus sinensis	Chinese Silver Grass
Robinia pseudoacacia	Black Locust

Cynanchum rossicum pods and climbing habit. Photo by Fran Lawlor

Nancy Eldblom holding one end of a very long Phragmites australis rhizome, illustrating the plants ability to "travel".

Photomorphogenic Effects of UV-B Radiation and α-Tocopherol Treatment on *Brassica rapa*

by Tiffany Marie Wong

Antioxidants are naturally occurring molecules that balance cellular activity by neutralizing oxidants formed during metabolism. Plant antioxidants may offer protection against pathogens and oxidative stress and serve as important defense mechanisms during increased levels of UV-B radiation in the atmosphere. As plants become more vulnerable to photooxidation from excessive UV-B exposure, they need to adapt or alleviate stress in order to survive. Antioxidants may provide useful information in understanding plant repair and mechanisms that allow the plant to adapt in different environments.

My thesis research, "Photomorphogenic effects of UV-B radiation and α-tocopherol on *Brassica rapa*", has revealed that antioxidants are contributing to plant development under photooxidative stress. Prolonged exposure to UV-B radiation (280-320 nm) inhibits growth and development of aquatic and terrestrial organisms. Sessile organisms, such as plants, may become sensitive to high-energy photons that cause molecules within the cell to alter their structure and become reactive oxygen species, commonly known as free radicals. Free radicals are very reactive and can cause damage to DNA. Antioxidants can stabilize free radicals so that they are no longer dangerous to an organism. α-Tocopherol, vitamin E, is a naturally occurring hydrophobic molecule that is stored in the phospholipid bilayer that may be useful for plants under oxidative stress.

After several unsuccessful trials with native species I began my research using UV-B radiation on the domesticated species, *Spinacia oleracea* (spinach) and *Ipomoea purpurea* (morning glory) which were successful for a preliminary trial. My hypothesis was, *S. oleracea* and *I. purpurea* will not grow as well under high UV-B exposure as plants grown under low UV-B exposure. Plants were grown in an environmental chamber in a three-tiered rack system. Each rack contained both *S. oleracea* and *I. purpurea* that received either no UV, low UV, or high UV exposure. UV-B fluorescent light (280-315 nm) and photosynthetically active radiation (PAR, 400-700 nm) sources were suspended above each rack. After the first four hours of the photoperiod, plants were irradiated with UV-B for six hours with continuous PAR in a total 14 hour photoperiod.

After the agricultural plants were harvested and a few days spent on troubleshooting, I decided to use a model organism that has naturalized in the wild, *Brassica rapa*. *Brassica rapa* is very active in the spring and in the atmosphere UV-B radiation is at peak concentration during this time. *Brassica rapa* plants were subjected to varying levels of UV-B radiation and treated with α-tocopherol. The hypothesis: *B. rapa* will develop efficiently when treated with an external application of α-tocopherol under UV-B exposure. The experiment consisted of the same three tiered rack system containing two strains (wild type and yellow-green recessive mutant deficient in chlorophyll) of *B. rapa* with either no UV, low UV, or high UV exposure. Plants received a treatment of either α-tocopherol (diluted in ethanol and water) or diluted ethanol in water only. Measurements were taken to determine chlorophyll content, stem height, leaf surface area, flower and seed count, and total biomass.

The trial experiment with the agricultural plants showed that *I. purpurea* exposed to no UV were taller and had greater number of leaves than plants exposed to high UV. The biomass of the *I. purpurea* also showed that plants receiving no UV had greater mass than plants exposed to low or high UV. However, *I. purpurea* had no difference in chlorophyll content when exposed to no or low UV. Conversely, *S. oleracea* exposed to no UV were taller than low or high UV but the number of leaves was significantly greater under low UV exposure. The total biomass and chlorophyll content of *S. oleracea* under low UV was also greater than no UV or high UV.

Preliminary results show that *B. rapa* under high UV and receiving α-tocopherol treatment grew taller than plants with no α-tocopherol treatment. In addition, *B. rapa* strain and α-tocopherol interact with each other and with UV-B in influencing plant development. Preliminary analysis indicate that *B. rapa* strain and UV-B radiation have a significant interaction on height. A combination of dependent variables, UV-B + α-tocopherol treatment and *B. rapa* strain + α-tocopherol treatment, also suggest a significant effect on height. However, it remains unclear as to how *B. rapa* uses the α-tocopherol when given externally. It appears that the α-tocopherol treatment on plants may have promoted repair such that the plants were able to grow rather than senesce, despite the presence of high UV-B radiation. Furthermore, investigation is necessary to understand how plants that are receiving α-tocopherol treatment can use the antioxidant and where plants uptake the antioxidant via roots or absorbed by the leaves.

Future plans involve using an *Asteraceae* species such as *Echinacea purpurea*, purple coneflower. The goal of this experiment is to gain a greater understanding of increased UV-B if the ozone layer is compromised. Plants have very complex repair and defense mechanisms that are currently being researched. Additionally, it is important to examine how plants evolve to adapt to environmental changes.

Acknowledgements:
I would like to thank my graduate adviser, Jonathan Titus and my committee members, William Brown and Wayne Yunghans. I am grateful for the help from my assistants, Shane Murphy and Kaitlyn Crossan. I greatly appreciate the construction and technical assistance of John Stack.
This project was supported by: New York Flora Association, Joseph C. and Jane E. Falcone Endowment Fund, Constantine Barker Memorial Fund, Yunghans-Dieter Research Award, and the SUNY Fredonia Biology Endowment Fund.

NOTES OF BOTANICAL INTEREST

Sullivan County Bioblitz

Don Hamilton, Chief of Resource Management, Upper Delaware Scenic and Recreational River, National Park Service sent notice of an upcoming bioblitz in Sullivan County. The 2014 UPDE Bioblitz Planning Committee has finally been able to get a formal Use Agreement signed by Delaware Highlands Conservancy, a local land trust, co-sponsor/financial sponsor/insurer of the event, and the Boy Scouts of America, Greater New York Councils, for use of their property on the NY side for the 2014 Upper Delaware Bioblitz on June 28-29. Their 12,000 acre property includes nearly 3/4 mile of Delaware riverfront, the Ten Mile River (a 2nd-3rd order tributary), lakes (one of which has freshwater jellyfish in it, from what I'm told), wetlands, significant forested acreage, and some open meadow areas.

Our challenge now will be gathering as good a team of lead scientists and team members as we had last year, to make up the 9 teams involved in finding, identifying, and highlighting the rich biodiversity of this area. We have commitments from some of the team leaders from last year, but are still in need of others (particularly botany and bryology). We were fortunate to have the participation of folks such as Dr. Ann Rhoads (Univ. of Pennsylvania), Sarah Chamberlain (Penn State), and Dr. Rich Horwitz of the Academy

of Natural Sciences for the PA-side bioblitz last year. We are in need of more NYS volunteers this year, though of course, PA and other resources are certainly welcome too. There may be opportunities for inexpensive or gratis lodging at the camp as well, and some meals, as was the case last year, will be covered.

For info on last year's UPDE Bioblitz, and plans for 2014 see: http://www.upperdelawarebioblitz.com/ or contact Don Hamilton at (570) 729-7842 or don_hamilton@nps.gov (http://nps.gov/upde)

Kansas Native Plant Society Newsletter

The Kansas Native Plant Society (KNPS) offers electronic distribution of the KNPS Newsletter to all native plant societies in the United States and to regional organizations with missions complementary to that of KNPS. The latest issue of the KNPS newsletter is available at:
http://www.kansasnativeplantsociety.org/newsletter_current.php.
Our home page is http://www.kansasnativeplantsociety.org/
You can become a paying member of KNPS and receive the printed newsletter at
http://www.kansasnativeplantsociety.org/membership.php
The mission of the Kansas Native Plant Society (KNPS) is to encourage awareness and appreciation of the native plants of Kansas in their habitats and in our landscapes by promoting education, stewardship, and scientific knowledge.

Plant Societies in the US

Steve Young reports that this website http://www.wildflower.org/organizations/ can be used to look up all plant societies in the US. He also recommends the website: http://goorchids.northamericanorchidcenter.org

Rare Plants in New England

Joe McMullen reports that for those interested, the latest issue of Rhodora (Oct-Dec 2013, issued February 2014) is designated solely to The New England Plant Conservation Program's regional rare plant list, *Flora Conservanda*. It is a very thorough list of the rare species in all the NE states, including the definitions used for the different rarity categories used in each state

iMapInvasives Training

iMapInvasives is the online mapping system used to track invasive species threatening New York State's environmental resources. All interested groups, including land and water managers, agricultural practitioners, citizen scientists, and educators, are encouraged to help keep the map up-to-date and accurate by reporting invasive species locations. Participants will also learn how to analyze the maps and data and use the system to document their management efforts. Training is required to enter data, and the NY Natural Heritage Program will be offering free sessions throughout the state this spring. In addition to data entry training, invasive species identification sessions will be offered. Visit www.nyimapinvasives.org for schedule details and registration, and contact imapinvasives@nynhp.org with general questions.

Adirondack Area News

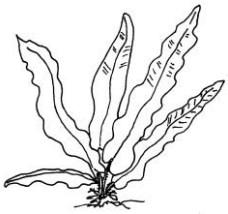
Shingle Shanty Preserve and Research Station will be hosting a 3-day intensive field course, "Wetland and Aquatic Plants of the Adirondacks" on August 11 - 13 this year. It will be taught by Dr. Michael Burgess, a systematic botanist and Amelanchier expert at SUNY Plattsburgh. It is open to all levels of experience and education. Details are at http://www.shingleshanty.org/education.html. Please contact Stephen Langdon, Project Manager, 33 Cliff Road, Saranac Lake, NY, 12983, (518) 891-2193 or (518) 593-5723 (cell) for registration or more information.

Michael Burgess, Department of Biological Science at SUNY Plattsburgh reports that an iNaturalist project, titled ADK Flora Project, has been set-up and is running. It may be viewed at: http://www.inaturalist.org/projects/adk-flora-project
The goal of the project is to document the occurrence and distribution of plants species in the Adirondack Park. Anyone can join iNaturalist and contribute to the project.

Citizen-scientist volunteers are needed to help with a long-term monitoring program to detect changes in Adirondack wetlands in response to climate change. Volunteers will focus on three taxa likely to be sensitive to climate shifts: wetland plants, amphibians, and birds. More details of the project including the dates and location of training can be found at: http://www.esf.edu/aic/citizenscience.htm. Please contact Dave Patrick, Director of the Center for Adirondack Biodiversity (dpatrick@paulsmiths.edu) for further details.

What's On Our Website and Blog?

Check them out at www.nyflora.org and www.nyfablog.org



Don't forget:

Our Annual Meeting is May 17th.
Save the Date!
Food, Fun and a walk at Clark Reservation

If you receive the newsletter on paper PLEASE consider receiving the NYFA newsletter electronically in .pdf format in order to cut down on our operating expenses and to minimize resource use.

It is easy to switch!

Just send an e-mail to:
membership@nyfa.org and put "NYFA electronic newsletter" in the subject line. We appreciate your efforts to save paper, money, and time by receiving your newsletter electronically. An electronic membership has the added advantage of delivery before paper copies are sent out, clickable links, and full color photographs. To date, more than 75% of our members receive the newsletter electronically. In the future, we hope to convert most of our members to the electronic newsletter format. Don't be left out!

Do you have a photograph, article, poem, or notice that you would like to share with other NYFA members? We are always looking for interesting contributions for our newsletter and blog. Please send your contributions and suggestions to: editor@nyflora.org
We would also like to know what articles are the most interesting to you about our flora. We like feedback!

Field Trips and Workshops for 2014

10 May (Saturday). 11 am - 2 pm. FIELD TRIP: **Spring Wild Flowers of Poke-O-Moonshine (Essex County)**. Led by Michael Burgess. *Joint with Adirondack Botanical Society.*

17 May (Saturday). 10 am - 3 pm. **ANNUAL NYFA MEETING AND FIELD TRIP: Clark Reservation State Park (Onondaga County)**. Led by Don Leopold and Joe McMullen.

31 May (Saturday). WORKSHOP: **Wild Herbal and Medicinal Plants of the North Country (Clinton County)**. Led by Michael Burgess. *Co-sponsored by SUNY Plattsburgh.*

7 - 8 June (Saturday-Sunday). WORKSHOP: **Adirondack Mosses and Liverworts (Franklin County)**. Led by Sean Robinson. *Joint with Adirondack Botanical Society. Co-sponsored by Paul Smith's College.*

10 - 12 June (Tuesday – Thursday). WORKSHOP: **Sedges (Cortland County)**. Led by Tony Reznicek. *Co-sponsored by SUNY Cortland.*

14 June (Saturday). FIELD TRIP: **Catskill Flora (Delaware County)**. Led by Rich Ring.

21 June (Saturday). FIELD TRIP: **Mountain Flora of the Jay Range (Essex County)**. Led by Michael Burgess. *Joint with Adirondack Botanical Society*

12 July (Saturday). FIELD TRIP: **Allenberg Bog (Cattaraugus County)**. Led by Joanne Schlegel and Ed Fuchs. *Joint with Niagara Frontier Botanical Society.*

2 August (Saturday), 10 am to 1 pm. FIELD TRIP: **Whiteface Mountain (Essex County)**. Led by Steve Young. *Joint with Adirondack Botanical Society.*

9 - 10 August (Saturday and Sunday). FIELD TRIP: **Indian River Lakes Conservancy (Jefferson and St. Lawrence Counties)**. Led by Anne Johnson and Steven Daniel.

5 - 7 September (Friday - Sunday). WORKSHOP: **Aquatic Plants of the Lake Ontario Coastal Plain (Oswego County)**. Led by Eric and Barre Hellquist. *Co-sponsored by Rice Creek Field Station, SUNY Oswego.*

13 Sept (Saturday). 9 am - 1 pm. WORKSHOP: **BARK - Get to Know Your Trees. (Onondaga County)**. Led by Michael Wojtech. *Held at Beaver Lake Nature Center.*

21 September (Sunday). 10 am – 3 pm. FIELD TRIP: **Botany by Bike - Glens Falls to Lake George. (Warren County)**. Led by Steve Young. *Joint with Adirondack Botanical Society.*

For more detail on each trip, see our website: http://www.nyflora.org/field-trips-and-workshops/

Also, check out the calendar on the NYFA website for plant events throughout the state.

The New York Flora Association Board of Directors Nominees 2014

In accordance with the Organization and Bylaws of the New York Flora Association, the Nominations Committee submits the following new nominees for the New York Flora Association Board of Directors Class of 2014. Terms are for three years. They would replace Aissa Feldmann and Priscilla Titus whose terms have expired.

Molly Marquand ____

Molly is the coordinator of the Catskill Regional Invasive Species Partnership and founder of the Catskill Native Plant Society. She received her Bachelor's Degree in ecology from Bates College in Maine and a Master's Degree in Taxonomy and Conservation of Plant Diversity, graduating magna cum-laude, from The University of Reading in England. Previously she was a vegetation surveyor and researcher at the Greenbelt Native Plant Center on Staten Island, a field botanist and vegetation surveyor on the entitation team at the NYC Parks Department, Natural Resources Group, a conservation fellow at the New England Wildflower Society where she assisted with coordinating NEWFS volunteer run rare plant monitoring surveys, and a private estate gardener.

Dr. Sean Robinson ____

Sean is an assistant professor of botany and general biology at SUNY Oneonta. Besides his teaching duties his research interests include plant reproduction and dispersal, especially bryophyte dispersal using population genetics and field and laboratory experiments. He also studies vegetation dynamics on the Adirondack alpine summits. He received his Bachelor's Degree in anthropology from Hartwick College, a Master's Degree in ecology from SUNY ESF and a PhD. in biology from the University at Albany.

Vote for one or both of the candidates on this ballot by emailing your choices to nyflora1@gmail.com. Write "NYFA Board Nominees 2014" in the subject line. Emails should be received by May 16, 2014.

If you do not have access to email and would like vote by paper you can send in this page of the newsletter with your vote to NYFA Board Nominees, Box 122, Albany, NY 12201. Votes should be postmarked by May 10, 2014.

NEW YORK FLORA ASSOCIATION MEMBERSHIP FORM 2014
We are a 501C3 Tax Deductible Organization!

Annual Membership dues:
_____ New $20 Make checks payable to the **New York Flora Association**
_____ Renewal $20 per year
_____ New Student Members Free the First Year. School: _____
_____ Additional donation to support NYFA efforts like botany presentation awards and small grants.
_____ **Total** $

Name:_____

Address:_____

Address:_____ County:_____

City: _____ State: _____Zip Code:_____

How would you like to receive your newsletter and other correspondence?

Electronic _____ Please enter your email address here: _____
Paper _____

We are only accepting credit card payments through PayPal at this time. If you would like to use a credit card, please use the link on our website: http://www.nyflora.org/join-make-a-donation/

Mail this form to: NY Flora Association, PO Box 122, Albany, NY 12201-0122
Thank you for supporting NYFA and the flora of New York State

NY Flora Association
PO Box 122
Albany, NY 12201-0122