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Indian Pipe

Marilandica

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Letter from the President

Dear Members,

What are the biggest immediate threats to Maryland's native plants? My answer is development, deer, and invasive species. I put development first because it hits with a quadruple whammy – obliterating plants, creating habitat for deer, introducing invasive species, and altering water flow. We can't reverse development once it's occurred. But could we manage to reduce the state's deer population? As we've learned from programs and meetings with deer specialists at the state and county levels, it's a very tough challenge. It may require a radical solution. But I'm asking all our members to please do your part to educate your friends, relatives, government officials—anyone who will listen—about the devastation deer are wreaking on our natural areas. Of course you can also mention Lyme disease and auto accidents and damage to gardens and landscapes.

And last but not least, if you're a land owner, please consider permitting deer hunting on your land. Hunting is a valuable tool in managing your own property, in addition to being a public service. The Department of Natural Resources can help. For information, see www.dnr.state.md.us/wildlife/Hunt_Trap/deer/deer_management/deermgmt.asp.

~ Kirsten Johnson

INDIAN PIPE

INDIAN PIPE, CORPSE PLANT

Monotropa uniflora, L.

Heath Family (Ericaceae)

"Fourteen years ago, it was in the early part of July, I went woodcock shooting with two friends near Hackensack, NJ and while taking some luncheon in a beech grove ... found a large patch of ground literally covered with Monotropa uniflora in full bloom ... It covered a space some five feet wide by nine feet long, a beautiful sight of snow-white stems and nodding flowers. Being in need of some just then, I proceeded to fill my game-bag, and to the question, what was it used for, answered, 'good for sore eyes ...'." - Richard E. Kunze. 1878. Monotropa uniflora, L., Botanical Gazette 3:54.



Hard to believe that this small pale life-form, mistaken at first glance for some sort of fungus, belongs in the same family with the majestic rosebay rhododendron. But it's a plant and it's a heath. Indian pipe lacks chlorophyll and therefore does not produce nutrients by photosynthesis as green plants do. Instead, it gets its mineral and carbon nutrients from mycorrhizal fungi that exist in a mutualistic association with the roots of trees. The tree provides the fungi with carbohydrates; the fungi provide the tree with water and minerals that the tree cannot absorb alone. The Indian pipe 'steals' its nutrients from the fungi—not directly from the tree—and it apparently provides no reciprocal benefit. The correct term for plants of this kind is 'mycoheterotroph,' not 'parasite or saprophyte.'

Over the years, *M. uniflora* has been variously placed in three different families: Heath (Ericaceae), Wintergreen (Pyrolaceae), and Indian Pipe (Monotropaceae). The most recent evidence, which includes DNA analysis, places it squarely within the Heath Family.*

Sadly, we're no longer likely to find Indian pipe in large patches like the one described in the 1878 quotation above, but it's fairly common in dry to moist woods throughout Maryland. If you keep in mind its Latin name *uniflora*, meaning one-flowered, you won't confuse it with its relatives *Monotropa hypopitys* (pinesap) and *Monotropis odorata* (sweet pinesap). Both of those have flowers in racemes rather than single flowers. They are also much less common; in fact *M. odorata* is classified as rare in Maryland. Next time you find Indian pipe in bloom, take the time to pull out your hand lens and admire its flower, while contemplating the extensive and intricate system of roots and fungi that support its growth.

~ Kirsten Johnson

*For details see Tucker, G.C., C. C. Freeman and G. D. Wallace. 2009. *Ericaceae Jussieu subfam. Monotropoideae*, In: Flora of North America North of Mexico. 16+ vols. New York and Oxford. Vol. 8, p. 377. Online at <http://www.efloras.org>

Cover photo: Courtesy of photographer and MNPS member Janice Browne. For more of her work, see www.janicebrowne.com.
Erratum. The cover photo of Mountain Laurel on the Spring 2013 issue was misattributed. It was by Carole Bergmann.

Wavy-Leaf Basket Grass – How Big a Threat?

Interview with Dr. Vanessa B. Beauchamp of Towson University

Back in 2008, Kerrie Kyde, Invasive Plant Specialist at Maryland Department of Natural Resources (DNR), gave a talk at a MNPS monthly program about wavy-leaf basket grass (WLBG), *Oplismenus hirtellus* ssp. *undulatifolius*. This exotic invasive plant was discovered at Patapsco Valley State Park in 1996 and has been spreading aggressively in the park and elsewhere. In March of this year, Dr Vanessa Beauchamp of Towson University told us about her research on this little-studied species. We thought it important to share this information and encourage you to report your sightings. MNPS President Kirsten Johnson talked recently with Vanessa about her research. **Please take a look at the photo of wavy-leaf basket grass on the back cover of this issue.** You can recognize it easily in the field by its wavy leaves.

MNPS: What got you interested in studying WLBG?

VB: I was working on a project for the Middle Patuxent Environmental Foundation on re-surveying the long-term study plots that have been established at the Middle Patuxent Environmental Area. The manager there mentioned she was worried about the potential impacts of this new invasive grass they kept finding and said I should get in touch with Kerrie Kyde at DNR for more information.

MNPS: How did WLBG get here and how far has it spread?

MNPS: So how bad a threat is it?

VB: To predict how likely it is that an exotic plant will become a problem invasive, we look at the characteristics of successful invaders: They grow and reproduce rapidly; they tolerate a variety of habitat conditions; they compete aggressively for resources; and they lack natural enemies or pests in the new ecosystem.

MNPS: Let's start with growth and reproduction. Anyone who's hiked at Patapsco in the fall knows how those pesky WLBG seeds can stick to clothes.



Seeds of WLBG will stick to almost anything. Photos by V. Beauchamp.

VB: Another subspecies, *Oplismenus hirtellus*, ssp. *variegatus*, is commonly available in the trade. So there's been an idea floating around that WLBG is a reverted form that escaped into Patapsco from the Hernwood landfill. But genetic comparisons do not confirm this. The invasive WLBG is genetically different from the variegated form sold in the trade. Strangely, it seems to bear the closest resemblance to plants native to the Krasnodarskiy region of western Russia. We'll probably never know how it got here.

How much it's spread in North America is anybody's guess. EDD-MapS shows only 6 locations, including Patapsco. But we know from anecdotal reports that it's much more widespread than that in Maryland and Virginia. Hopefully more people will get onto EDDMapS this summer and report their findings. [See inset for details on how to do this. – Ed.].

VB: It's like nothing I'd ever seen. We counted the seeds on various fabrics after a 30 second walk through a patch of WLBG, and found that denim pants picked up about 300 seeds. Even slippery fabrics like nylon and twill pick up quite a few. And dogs? Just take a look at the photo! Not only do those seeds adhere, they're hard to remove. The other thing we did was to obtain deer legs from a slaughterhouse and run them through a patch of WLBG. After 30 seconds, we averaged 176 seeds per leg. Interestingly, we did not observe seeds clinging to small animals like squirrels. Maybe they run under the seeds, or maybe they avoid the wavy leaf. It seems that WLBG is being spread by humans and other large mammals.

On the subject of reproduction, those seeds seem to have a high germination rate. And WLBG also spreads vegetatively with stolons. So put a checkmark by rapid growth and reproduction.

MNPS: How tolerant is WLBG of various habitat conditions?

VB: We know it thrives in the typical piedmont forest at Patapsco and it's also been recorded in the Shenandoah Mountains. Unfortunately we have no information about its native Russian habitat. An intriguing observation at Patapsco is the existence of clear lines of demarcation between patches of Japanese stiltgrass (*Microstegium vimineum*) and WLBG, with stiltgrass growing along trails, and WLBG growing farther into the woods. The obvious hypothesis was that the difference was due to differential amounts of sunlight. But our data show that sunlight only accounts for some of the difference. Instead, it turns out that because WLBG is a perennial, it can emerge from under a much deeper litter layer than Japanese stiltgrass, which is an annual. It looks like Japanese stiltgrass may be able to outcompete WLBG in areas with shallow litter near forest edges, but under the canopy, where the litter layer is deeper, WLBG wins. My students are conducting research this summer at Patapsco to see if this is the case. Because WLBG can thrive in areas with litter up to 6 cm deep, it can inhabit much more of the forest than Japanese stiltgrass. So it appears thus far that a large proportion of the mid-Atlantic is suitable for WLBG invasion. However, there is one place where it doesn't grow well. Even in a dense patch of WLBG, the area under the beech trees is bare. So it seems that beech trees inhibit WLBG, but we don't know if this is due to shading, competition, allelopathy, or some other mechanism.

MNPS: Moving on to the next factor, how about competitiveness with other species?

VB: We observed less WLBG in areas with more species diversity. This suggests it may not compete well with other understory plants and may only be good at colonizing empty ground, for example, areas where deer browse has eliminated the native ground cover. Alternatively, perhaps it's early in the process of invading the more diverse areas and hasn't yet out-competed the other species. We don't know.

MNPS: Any natural enemies?

VB: Apparently not to any significant extent in our region. A leafhopper has been seen on WLBG, but that's about it. WLBG leaves are generally free of insect damage. Whether WLBG might be susceptible to soil microorganisms or other pathogens remains to be seen. Certainly it is not eaten by white-tailed deer. We don't know what controls its spread in its native habitat.

MNPS: How does one kill it?

VB: Hand pulling, removing all the roots at the nodes is most effective. But this is not feasible for large infestations like at Patapsco. Grass-selective herbicides, Envoy Plus and Roundup WM, are also effective.

MNPS: What are the next steps for your research?

VB: There's so much we have to learn about this species. Some of my top priorities for research with my students over the next two years relate to determining the competitiveness of this grass against native species, how much of it there is right now, and how fast it is spreading. We tried to get money from the USDA to study this species back in

2009. One reason our proposal was rejected was that we didn't make the case that WLBG posed a real threat to forest ecology. We knew nothing about WLBG ecology at that time. The whole point of the proposal was to gather information to determine the threat this species posed, so the rejection was frustrating. We hope that with our new information on ecology and dispersal, we'll be more competitive for funding.

MNPS: What can the public do to help?

VB: I'm especially excited about the launch of our smartphone app for mapping WLBG. Knowing how much of this grass there is and where it's found is critical for educating the public, legislators and funding agencies. I can conduct small research projects with my students but I can't map WLBG across several states. We also need information on absence points, where the grass is not found, so that we can measure spread rates over time. We're asking for the public's help this summer and beyond to report WLBG presence and absence points. The idea is that as you hike and explore this summer, the app allows you to record the abundance (or absence) of WLBG. The Android version of the smartphone app will be ready this June, with the iPhone app ready later in the summer. If people don't have a smartphone, it's also easy to record data using a hand-held GPS. If we can get dozens or even hundreds of people involved in mapping WLBG this summer we can really start to understand how big a problem this species may be. All the points will also be uploaded to the EDDMapS national database. Anyone interested in helping with the mapping project can contact me at vbeauchamp@towson.edu.

What You Can Do

Report sightings:

- Go to eddmappings.org, register, and take it from there, or
- Download Towson U's smartphone app, designed specially for reporting wavy leaf basketgrass, <http://skappsrv.towson.edu/wavyleaf/website/>, or
- Contact Dr Beauchamp at vbeauchamp@towson.edu

Avoid spreading this plant. When it is in seed—September and October—do not hike off-trail in Patapsco State Park or anywhere else that WLBG is known to occur. Don't let your dog off leash, and check yourself and your dog for seeds before you get back in the car.

Conservation Watch

Mattawoman matters: must sprawl smother our natural heritage?

In comments rebuking Charles County for its Comprehensive Plan draft-revision, Maryland's Department of Natural Resources noted that the county ranks third highest in the state for ecological value. Only Dorchester, on the eastern shore, and Garret in the extreme western panhandle, have more acres of Targeted Ecological Area. Charles is Maryland's last county on the inner-coastal plain to retain comparable integrity, largely on the strength of its diverse forested areas rich in streams, wetlands, and estuaries, as epitomized by the watersheds of Zekiah Swamp, and Nanjemoy and Mattawoman Creeks.

Most threatened by far is Mattawoman, an avian, herpetological, and botanical hotspot, and Maryland's most productive fish nursery to the Chesapeake Bay. But it is closest to Washington DC, making its watershed ripe for land speculators who are enthusiastically assisted by majorities on county governing boards. Hardly blameless is a weak and inattentive regulatory apparatus that has shirked responsibilities it assumed to guard against unbridled growth when it funded an expanded wastewater treatment plant in 1990. After the plant enabled speculators to push a "development district" larger than DC through local government, it took less than two decades for Mattawoman to descend—in the words of state scientists and sustainability experts—from "near to ideal conditions..." to a "tipping point" that is dangerously close to "irreversible resource deterioration."

An unprecedented interagency Task Force was convened to find solutions to the declining fish communities and loss of natural heritage inflicted by land-use policies. The Task Force noted it is not too late. It made dozens of recommendations to fix the Comprehensive Plan, warning that the ongoing plan's revision "may well represent the last opportunity the County will have to establish permanent protection of the Mattawoman's resources and ecological functions."

The "Comp Plan" revision, required of all jurisdictions every six years, began in 2011 on a promising path that produced scenarios respecting overwhelming public support for protection of natural resources and "smart growth." Unfortunately, a majority on the Planning Commission rejected the progress, refused even to acknowledge the Task Force, and instead devised a draft plan based on a septic/sewer

map (the Tier Map required by the "septics bill") that had literally been produced by a land-speculators' lobby.

If allowed to continue, we will watch sprawl-development decimate one of the state's ecologically richest counties, with three DNR

"Natural Areas" (including Mattawoman and exceeded in number only by Garret County), and holding the key to the Potomac's Treasured Landscape designation under the Executive Order to restore the Chesapeake Bay.

When local officials act as sycophants to development interests, the only recourse is public outcry, as state oversight is essentially limited to an advisory role. When Charles County's Comp Plan goes to public hearing before the elected Board of Commissioners, please be there! Those living out

of the county can note that their presence is evidence of the potential for heritage tourism to contribute to the local economy. (*cont. page 5*)



Watched over by Wild Rice (Zizania aquatica), the emergent American Lotus (Nelumbo lutea) blooms in July and August in the freshwater-tidal Mattawoman estuary, the only western-shore site to host a natural population.



Sweetbay Magnolia (Magnolia virginiana). Globally rare (G1) Magnolia Bogs serve as the sources for two Mattawoman Creek tributaries, but are threatened by new and planned subdivisions.

Mattawoman matters cont.

To learn more, including ways to see the Mattawoman, visit www.mattawomanwater shed.org

Updates on the Charles County Comp Plan process can be found at www.save charlescounty.com, the website for the Smarter Growth Alliance for Charles County, of which MNPS is a member.

The Task Force report can be downloaded via this address: www.dnr.state.md.us/ccp/pdfs/MEPR_Dec2011.pdf

~ Jim Long President,
Mattawoman Watershed Society & long-term member of MNPS



The state-endangered Potato Dandelion (Krigia dandelion) blooms in May in the path of the proposed Cross County Connector. Despite a strong permit denial by the Army Corps of Engineers, the highway is back in the draft Charles County Comprehensive Plan.

Research Grants Now Available

MNPS offers small grants for research on Maryland native plants and their habitats.

We especially encourage students and teachers at all levels to apply, but any project that meets the application requirements will be considered, whether the applicant is a student, a teacher, an academic, or an independent researcher.

See www.mdflora.org/grants.html for details

FOR MNPS MEMBERS ONLY

WIN A FREE TICKET TO THE 2013 MNPS CONFERENCE

QUIZ



In 2011, MNPS began featuring a plant group that we study together throughout the year. This quiz highlights the three groups we've studied thus far.

1. This tree is often dominant in dry forests of the piedmont. Its thick, deeply furrowed bark is a giveaway to those who are familiar with it. The leaves are usually obovate (i.e., egg-shaped, with the wider end toward the outside), and have shallow rounded lobes lacking bristle tips.
2. At first glance, this small or medium-size fern might be mistaken for a young Christmas fern—its pinnae have a similar 'boot' shape. But it's narrow, the pinnae are fully tapering to the base, and its stipe is smooth and dark.
3. This low creeping subshrub is well known for the fragrance of its creamy or pale pink clustered flowers. The leaves, up to 3 inches long, are leathery, evergreen, alternate and entire. The twigs are often covered with rusty hairs. It's found throughout the state, but most commonly in the mountains.

Submit your entry to info@mdflora.org or to MNPS, PO Box 4877, Silver Spring, MD 20914.

Answers must be received by 6:00 pm August 23, 2013. Include your name, email address and/or telephone number. The winner will be selected at random from the correct entries, and will be notified by phone or email by August 31, 2013. Failure to respond within 3 days results in forfeit of ticket and another winner will be chosen. YOU MUST GET ALL THREE ANSWERS CORRECT TO WIN. YOU MUST BE A MEMBER OF MNPS AS OF AUGUST 23. Board members and their immediate families are not eligible.

Phenology and Floral Visitors of *Lithospermum virginianum* L. (Boraginaceae) in Great Falls Park and Chub Sandhill Natural Area Preserve, Virginia

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Abstract

This report regards the phenology and floral associates of the rare Virginia plant *Lithospermum virginianum* L. in rare forest habitats in Great Falls Park (GFP) and Chub Sandhill Natural Area Preserve (CSNAP), in Virginia, U.S.A., based on observations made from 2005 through 2012. Shoots emerged from the ground in April, started flowering in late May, and had mature fruit by mid-July in GFP. Plants were in full bloom in late May in CSNAP. Worker *Bombus bimaculatus* and *B. vagans* imbibed nectar through natural corolla openings in GFP. Worker *B. bimaculatus* and *B. griseocollis* and *Thorybes pylades* evidently imbibed nectar through natural corolla openings, *Ancistrocerus* wasps were primary nectar robbers, and small moths and three *Lasioglossum* spp. were secondary nectar robbers in CSNAP. In GFP, a test shoot group within a pollinator-exclusion cage bore only a few nutlets while two control shoot groups each had scores of nutlets, suggesting that insect pollination increases fruit production in this plant.

Introduction

Lithospermum virginianum L. (False-gromwell, Gravelweed, Virginia False-gromwell, Wild Job's-tears), formerly called *Onosmodium virginianum* (L.) A. DC. (Cohen and Davis 2009), is a perennial herb with a known original range of Eastern U.S. (Alabama, Connecticut, Delaware, Georgia, Florida, Louisiana, Maine, Maryland, Mississippi, North Carolina, New Jersey, New York, Pennsylvania, Rhode Island, South Carolina, and Virginia) (United States Department of Agriculture 2012). This plant grows in dry, sandy woods; open sands; and pinelands (Fernald 1950). According to the United States Department of Agriculture (2012), it is endangered in Connecticut, Maryland, New Jersey, and New York; extirpated in Pennsylvania; and historical in Rhode Island. *Lithospermum virginianum* is a U.S. G4 plant, a Virginia S2 plant, and a Maryland S1 plant (Maryland Department of Natural Resources 2007, Townsend 2012). This species was infrequent in the Maryland Midland and Coastal Plain (Brown and Brown 1984). The tiny population on the Maryland side of the Potomac Gorge is now evidently extinct, and this species may now be a historical plant in Maryland as well.

Lithospermum virginianum has shoots up to 8 dm tall with leaves that are alternate, narrowly oblong through lanceolate and oblanceolate, up to 9 cm long, and often narrowed toward their bases (Fernald 1950, Brown and Brown 1984). Flowers are in initially

curled, raceme-like clusters that elongate as they develop. Tubular corollas are up to 10 mm long, with narrow, acuminate, erect lobes 2–3 times longer than wide, and are light greenish-yellow through orange. Nutlets are boney, ovoid, erect, pitted, whitish, 2–2.8-mm-long nutlets. Shoots are sparsely through densely covered with short, stiff, appressed hairs on calyces, leafy bracts, leaves, and stems.

Our study provides information on selected aspects of *L. virginianum* phenology and floral visitors in two Virginia locations—great Falls Park (GFP) in Fairfax County and Chub Sandhill Natural Area Preserve (CSNAP) in Sussex County. To our knowledge, there are no published reports on the floral ecology and almost no published information on the rest of the reproductive biology of this species (Ellman 2004).

Materials and Methods

We observed *L. virginianum* at its only known site in GFP from 2005 through 2012 and at the two sites in CSNAP where it was flowering in 2012. We refer to the small *L. virginianum* patches as shoot groups, not by their number of plants, because it was unclear how many plants were in each patch based on locations and spacing of shoots.

The GFP population consisted of four shoot groups within 4 m of each other in a sunny, sandy area in the globally rare Potomac River Bedrock Terrace Oak-Hickory Forest (USNVC CEGL006209, NatureServe 2013) along the Potomac River. The trees within 10 m of the shoot groups were *Acer negundo* L. (Boxelder), *Carya glabra* Miller (Pignut Hickory), *Chionanthus virginica* L. (White Fringetree), *Hamamelis virginiana* L. (Common Witch-hazel), *Juglans nigra* L. (Black Walnut), *Platanus occidentalis* L. (Eastern Sycamore), *Quercus montana* Willenow (Chestnut Oak), and *Quercus rubra* L. (Northern Red Oak). In GFP, *Lithospermum virginianum* formerly occurred also in the globally rare Piedmont/Central Appalachian Riverside Outcrop Prairie (USNVC CEGL006478) in GFP (Steury et al. 2008.)

The CSNAP population is in a globally-rare, fire-maintained community called the Pine, Scrub Oak, Sandhill Forest (Virginia Department of Conservation and Recreation 2012). *Pinus taeda* L. (Loblolly Pine) and *Quercus falcata* Michaux (Southern Red Oak)

are the dominant trees of this forest which also contains *Carya sp.* (hickory), *Castanea pumila* Miller (Allegheny Chinkapin), *Diospyros virginiana* L. (Common Persimmon), *Ilex opaca* Aiton (American Holly), and *Sassafras albidum* (Nuttall) von Esenbeck (Sassafras). This Preserve has several isolated, nonflowering *L. virginianum* plants and two flowering patches, one with two shoot groups (site-1) and the other with three shoot groups (site-2). These patches were about 100 m apart. In site-1, *L. virginianum* grew within a thicket of *Toxicodendron pubescens* Miller (Poison-oak), *Rhus copallina* L. (Shining Sumac), *S. albidum*, and other plants, and in site-2, *L. virginianum* grew in a more open area among *Opuntia humifusa* Rafinesque (Rafinesque) (Eastern Prickly Pear), *P. taeda*, *T. pubescens*, and other plants.

To investigate *L. virginianum* floral visitors, we directly observed flowers in GFP for a total of 6 hr (on 28 and 31 May, 11 June, and 16 June 2007, 31 May 2008, and 14, 15, and 16 June 2009, 2 June 2012) and a total of 5 hr in CSNAP (on 27–29 May 2012). To learn about the possible role of floral visitors as *L. virginianum* pollinators in fruit set, we placed cages over four shoot groups in 2007 and 2008. Each cage was cylindrical and 50 cm in diameter by 82 cm high and had sides of hexagonal “chicken wire”, with each hexagon about 2.5 wide x 3.5 cm long. The test cage and two control cages had lids made of gray, plastic, 1-mm-grid window screening and silver duct tape. In addition, the test cage sides were covered with this screening. The test cages excluded bees, butterflies, moths, and other large insects, but not potential pollinators such as ants and thrips. We also placed a lidless, protective cage (made only of chicken wire) around one shoot group to protect it from possible herbivory by *Odocoileus virginianus* Zimmerman (White-tailed Deer) and other mammals because we saw herbivory of some *L. virginianum* shoots, and we wanted to observe as many flowering shoots as possible. We anchored cages to the ground using bamboo stakes and twine.

We classified an insect that moved among flowers and probed them with its proboscis as a nectar imbibitor and possible pollinator; an insect that bit a hole in a corolla base and extended its proboscis into the hole as a nectar robber; and an insect that extended its proboscis into a hole in a corolla base made by another insect as a secondary nectar robber. Because the plants and their floral visitors were rare, we did not collect any floral visitors for identification purposes. We were able to identify some visitors to species from field observations and photographs taken at *L. virginianum* sites.

Results and Discussion

Phenology

Shoots in GFP emerged from the ground in April and had mature fruit by mid-July. These shoots were 12 cm tall in early May (4 May 2005), were 30 cm tall and had small flower buds in late May (22 May 2007), started to flower in late May (28 May 2007, 24 May 2012), were in full bloom in early and mid-June (14 June 2009, 2 June 2012), nearly finished flowering in mid-June (16 June 2007), and had mature fruit as early as mid-July (15 July 2007). In 2012, group-1 had 2; group-2 had 36; group-3 had 25, and group-4 had 44 inflorescences.

Shoots in CSNAP were in bud through late-flowering stages on 27–29 May 2012. Site-1 had 2 shoot groups with a total of 43 inflorescences, and site-2 had 4 shoot groups with a total of 58 inflorescences (fig. 1). At both sites, there were dried *L. virginianum* stems from 2011 with scores of stunted, whitish fruit on them. Dry conditions in 2011, might have stopped full fruit development in that year. In site-2, one shoot was cut about 1 cm above the ground possibly by a herbivore, and its flowering branches arose from beneath the cut.

Floral Visitors

Floral-visitor species varied between the GFP and CSNAP and between the two CSNAP sites. In GFP, we saw two nectar-imbibing *Bombus bimaculatus* Cresson (Two-spotted Bumble Bee) on 15 June 2009 and 2 June 2012 (fig. 2) and one nectar-imbibing *Bombus vagans* Smith (Half-black Bumble Bee on 24 May 2012.)

In CSNAP at site-1, 1 female and 2 male *Thorybes pylades* Scudder (Northern Cloudy Wing, Hesperidae) were nectar imbibers (fig. 3). At site-2, we saw two workers of *B. impatiens* Cresson (Common Eastern Bumble Bee), one worker of *B. griseocollis* DeGeer (Brown-belted Bumble Bee) which were nectar imbibers, one *Ancistrocerus spinolae* (de Saussure) (Vespididae) nectar robber (fig. 4) (Buck et al. 2008), and secondary nectar robbers consisting of several *Lasioglossum* bees of three species including *Lasioglossum vierecki* Crawford (fig. 5, 6) and small black moths (fig. 7). Most of the site-2 flowers had holes in their corollas possibly all made by this vespid which bit holes in corollas, but no flowers at the CSNAP site-1 or at GFP had robbers' holes.

Bombus bimaculatus, *B. impatiens*, *B. griseocollis*, and *T. pylades* may be usual *L. virginianum* pollinators. They obtained nectar through natural corolla openings and generally fed from several flowers per foraging bout. For example in CSNAP, a *B. bimaculatus* visited flowers in 13 inflorescences in 60 sec, a *B. griseocollis* visited flowers in 11 inflorescences in 75 sec, and a *Thorybes pylades* visited flowers in 12 inflorescences in 90 sec. We did not see any ants on carpels or inside flowers and saw no thrips on the plants.

Seed Set

Shoots in the control cages set scores of nutlets (fig. 8 and 10), and shoots in the test cage set very few nutlets (fig. 9). On 15 July 2007 in GFP, we found that the two shoot groups in the control cages and the shoot group in the protective cage each had scores of mostly unripe nutlets in calyces and only a few fruitless calyces, and the shoot group in the test cage had only four nutlets and scores of fruitless calyces, including many with attached dried corollas. On 13 August 2008, we found scores of fruit on the two control shoot groups, and only six fruit on the test shoot group. The test shoots might have set fruit through self-pollination without insects as pollen vectors. Such self-pollination in this species might be infrequent, in part, because its stigmas extend far beyond its anthers (Johnson 1954 in Elliman 2004). The single shoot group in the test cage and the two shoot groups in control cages comprised a sample size that is too small for statistical analysis. However, these data from two growth seasons are consistent with the hypothesis that *L. virginianum* requires animal pollination for maximum seed set.

In conclusion, we found that *L. virginianum* has bee, butterfly, wasp, and moth floral visitors that differed among its locations. This plant has nectar-imbibing floral associates that are not nectar robbers, in addition to primary and secondary nectar robbers. Insect pollen vectors are likely to increase this plant's fruit set. Future research on *L. virginianum* reproductive biology should include discovery and identification of its floral associates throughout its large range, determination of which visitors are actual pollinators and which are nectar robbers, examination of how robbery affects seed set, and how land managers can increase *L. virginianum* population sizes to avoid population extinctions of this intriguing species.

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Figure 1. *Lithospermum virginianum* shoot group-2 in full bloom in Chub Sandhill Natural Area Preserve (CSNAP), Virginia on 27 May 2012. Other plants in this photograph include *Diospyros virginiana*, *Rhus copallina*, and *Toxicodendron pubescens*.



Figure 2. A *Bombus bimaculatus* worker foraging for *L. virginianum* nectar from shoot group-4 in Great Falls Park (GFP), Virginia on 15 June 2009. The Potomac River is in the background.



Figure 3. A *Thorybes pylades* sunning on a leaf of *L. virginianum* after foraging for nectar in shoot group-1 in CSNAP on 28 May 2012.



Figure 4. A nectar-robbing *Ancistrocerus* wasp chewing a hole in the base of a *L. virginianum* corolla in shoot group-2 in CSNAP on 28 May 2012.



Figure 5. A male *Lasioglossum* sweat bee secondarily robbing nectar through a hole in the base of a *L. virginianum* corolla in shoot group-2 in CSNAP on 29 May 2012. *Toxicodendron pubescens* leaves are in the background.



Figure 6. A female *Lasioglossum vierecki* (sweat bee) secondarily robbing a *L. virginianum* flower in shoot group-2 in CSNAP on 29 May 2012.



Figure 7. Moths of a species that is a secondary robber of *L. virginianum* nectar in shoot group-2 in CSNAP on 28 May 2012. The left moth is imbibing nectar through a hole in the basal part of a flower's corolla. The right moth is resting.



Figure 8. A *L. virginianum* branch that is in a control cage (one that did not exclude insect pollinators) in GFP on 15 July 2007. Nine nutlets are visible in this photograph.



Figure 9. A *L. virginianum* branch of that is in a pollinator-exclusion cage in Great Falls Park on 15 August 2008. One unripe nutlet and 21 calyxes which did not bear nutlets are in this photograph. Such calyxes often bore only brown, dried, threadlike styles with stigmas.



Figure 10. Bony, whitish, ripe *L. virginianum* nutlets in a control cage in Great Falls Park on 27 August 2008. The leaves were wilted during the summer dry spell.

MONTHLY PROGRAMS

All events known at press time are listed chronologically. For up to date news of MNPS programs and events please see our website, www.mdflora.org and find us at meetup.com.

July 30, Tuesday – 7:30 PM, doors open at 7:00

Let's Do Lunch: The Uneasy Relationship Between Ungulates and the Landscapes They Inhabit

Montgomery County, location: Kensington Library

Speaker: Dr. Stephen Parks, Physicist and lifelong naturalist

Hoofed animals have shaped some of our planet's most beloved landscapes, which can be seen as platforms where plants and animals evolve together. Together with man and fire, these interactions have molded ungulates' anatomies, their behavior, and their landscapes. Our ungulate, the white tailed deer, survived the Pleistocene extinctions and hunting by early humans, and now does well in South America, Mexico, Canada, and suburban DC. Dr. Parks will share his learning on the effects of grazing and overgrazing, and the predator/prey/habitat relationship.

August 20, Tuesday – 7:00 PM

Biodiversity in a Warming World: From the Mountains of Maryland to the Outback of Australia

Western Mountains Chapter, location: Appalachian Laboratory, Frostburg

Speaker: Matt Fitzpatrick, Assistant Professor, Appalachian Lab

Details to follow. The program will begin immediately following a brief MNPS chapter business meeting.

August 27, Tuesday – 7:30 PM, doors open at 7:00

The Geology and Natural History of Maryland

Montgomery County, location: Kensington Library

Speaker: Ned Tillman, author of *The Chesapeake Watershed: A Sense of Place and a Call to Action*

Come gain a better understanding of soils, rocks, watersheds and the natural and un-natural histories of Maryland. Ned is a sustainability advisor for local governments, businesses and non-profits as well as serving on numerous boards. He has farmed, fished, canoed and hiked all across our state. Ned will be available to sign books after his presentation.

September 24, Tuesday – 7:30 PM, doors open at 7:00

Grassland Restoration

Montgomery County, location: Kensington Library

Speaker: Dr. Douglas E. Gill, Professor Emeritus, Department of Biology, University of MD

October 15, Tuesday – 7:00 PM

Pest Vulnerability of Elms in Washington, DC

Western Mountains Chapter, location: Appalachian Laboratory, Frostburg

Speaker: Mitch Hall, Graduate Student, Department of Biology, Frostburg State University

Details to follow. The program will begin immediately following a brief MNPS chapter business meeting.

October 29, Tuesday – 7:30 PM, doors open at 7:00

How are mountain wildflowers and pollinators responding to a changing climate?

Montgomery County, location: Kensington Library

Speaker: Dr. David Inouye, Professor, Department of Biology, University of MD

Dr. Inouye has spent 43 summers at Rocky Mountain Biological Laboratory in Colorado researching how the flowering timing and abundance of about 100 species of plants are responding to the changing climate; and how those changes are affecting their population biology and their interactions with pollinators.

November 26, Tuesday – 7:30 PM, doors open at 7:00

Members Share

Montgomery County, location: Kensington Library

After a brief business meeting, we will view members' slides from their local field trips. We hope we'll have plenty to see from the field trips at the September conference, since we can't attend all of them!

FIELD TRIPS

Unless otherwise indicated, MNPS field trips are generally geared to adults. Please see the information provided for individual field trips, some of which may welcome children. If you have questions, feel free to contact the field trip leader.

July 7 – Sunday, 10:00 AM – 1:00 PM

Loch Raven Reservoir Watershed

Leaders: Kirsten Johnson, Dwight Johnson, and Geoffrey Hoesch
Please check the MNPS website, www.mdflora.org, for more information.

September 8 - Sunday, 10:00 AM – 2:00 PM

Civil War Fort Sites in Washington, DC

Leaders: Mary Pat Rowan and Lou Aronica

Please check the MNPS website, www.mdflora.org, for more information about the September Fort Circle field trip.

October 6 - Sunday, 10:00 AM – 2:00 PM

Civil War Fort Sites in Washington, DC

Leaders: Mary Pat Rowan and Lou Aronica

Please check the MNPS website, www.mdflora.org, for more information about the October Fort Circle field trip.



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Maryland Native Plant Society

Marilandica Summer 2013



Wavy-leaf basket grass, *Oplismenus hirtellus* ssp. *undulatifolius*, an aggressive non-native invasive plant. See the article on page 2 to learn about this plant and how you can contribute to research on its spread.