Chinquapin

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Earl Core Student Reports

This issue emphasizes the research of the three awardees for the Earl Core Student Award. Congratulations to Merry, Tara, and Leigha. SABS is proud of their accomplishments; supporting student research is one of the goals of our Society.

Investigating Potential Additional Species Within the Widespread *Micranthes virginiensis*

Micranthes virginiensis is a broadly distributed Eastern North American flowering plant that has long been known to exhibit lots of morphological variation. Interestingly, both diploidy and tetraploidy have been reported for this species. Recently, populations of putative *M. virginiensis* have been discovered in the Southern Appalachian escarpment region that appear to have some floral characters more in common with a sister species, *M. careyana*, as well as unclear phylogenetic relationships, indicating a potential hybrid origin. The presence of Southern Appalachian populations with unique morphology, the multiple ploidy levels, and the documented morphological variation across the wide distribution of this species led me to wonder if *M. virginiensis* may be comprised of multiple species.

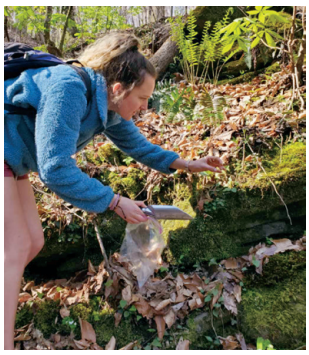
In 2022, I received an Earl Core award to support my master's thesis research at Western Carolina University. With the mentorship of my advisor, Dr. Kathy Mathews, I am further investigating the odd escarpment region populations to determine if they are of hybrid origin and potentially deserving of recognition as a distinct species. I also seek to unveil any other undescribed species that may exist within *M. virginiensis.* I am using multiple lines of evidence to delimit species, including cytological, morphological, and molecular.

With the funding from the Earl Core award, I was able to travel to 40 populations of *M. virginiensis,* as well as 10 populations of other *Micranthes* species for comparison and use as outgroups. I collected leaf material for DNA sequencing, young flower buds for chromosome counting, and voucher specimens from nearly every state and province where this plant occurs.

Following my field season, I used an anther squash procedure to obtain chromosome counts for 24 populations of *M. virginiensis* and seven populations of other *Micranthes* species, including *M. palmeri, M. careyana, M. petiolaris,* and *M. micranthidifolia.* Like previous research, I found both diploid (x = 10) and tetraploid (x = 19) populations of *M. virginiensis.* Tetraploidy is only known from coastal Virginia to the North Carolina Piedmont into Northwestern South Carolina. I have found populations in all other areas to be diploid. Morphological analyses of many leaf, fruit, and floral characters indicate no differences between diploid and tetraploid populations. I am also reporting the first counts for *M. palmeri, M. careyana,* and *M. petiolaris,* all of which are x = 10.

Multivariate analyses suggest that while there are no morphologically distinct groups associated with a particular geographic area within most of *M. virginiensis,* the odd Southern Appalachian escarpment populations are significantly morphologically different. In fact, the escarpment specimens display morphological intermediacy between *M. virginiensis* and *M. careyana* in all analyses, supporting the hypothesis of a hybrid origin. I have found that the most useful field characters for distinguishing the three groups are stamen length and presence/absence of petal spots. In *M. virginiensis,* the stamens are less than half the length of the petals and there are no petal spots. In *M. careyana,* the stamens are more than half the length of the petal and there are distinct green-yellow petal spots. Like *M. careyana,* the escarpment populations have stamens more than half the length of the petal, yet they lack petal spots. Additionally, *M. virginiensis* has a distinct hypanthium, *M. careyana* lacks a hypanthium, and the escarpment populations have a hypanthium, though it tends to be smaller than the hypanthium of *M. virginiensis.* I also found the escarpment populations to be tetraploid, potentially resulting from a hybridization event between diploid *M. virginiensis* and diploid *M. careyana.*

I completed DNA extractions from leaf samples throughout the range of M. virginiensis, and future work will include analyzing RADSeq data from these samples. This should help me draw stronger conclusions regarding the hybrid origin of the escarpment populations and the number of unique lineages present. As I have completed all my coursework and other analyses, I will be defending my thesis in July 2023, though I certainly plan to continue this research with the molecular data to determine the appropriate taxonomic rank for the escarpment populations and clarify the taxonomic boundaries of *M. virginiensis.*



Collecting from a site in Pickens Co., South Carolina.

Micranthes virginiensis found in Meriden, Connecticut.

Tara Hall, Western Carolina University

Southern Appalachian Botanical Society – Lunch Business Meeting

Friday, March 24, 2023, noon
Winston-Salem, North Carolina, Benton Convention Center

Call to Order: Jay Bolin (12:07 p.m.)

Minutes from the Spring 2022 Business Meeting
- Howie moved to accept, Horn seconded; Minutes unanimously approved

President's Report – Jay Bolin
- 20th meeting for Jay, first lunch meeting
- New students were recognized.
- Recognized Joe Pollard for his work with *Chinquapin* and Chris Randle for *Castanea*
- Noted that copies of the Agenda, Minutes, and Financial Report were on each table
- New lanyards available
- SABS functioning throughout COVID
- Recognized officers stepping down (Tom Diggs, Rebecca Cook)
- Introduced new Council Members Jessica Budke, Kadrin Anderson, Ashley Morris (Pres Elect)
- Need a new Editor-in-Chief (or Managing Editor) for *Castanea*
- Noted that the Council voted to support Smoky Mountain Wildflower Pilgrimage at $2000
- Tonight – the student mixer
- Noted book by Charlie Williams, whose proceeds go to SABS

Report from Jeremy Rentsch – Botanical Society of America, Southeast Division
- $2306.92 budget
- Ryan Long won the poster award last year, Rachel Jessup won the oral presentation award
- Had elections – Rentsch will continue as chair another term; Ben Gahagan still Activities Chair; Carolina Siniscalchi elected as Treasurer
- Considering additional awards
- Co-sponsoring Mixer tonight

Treasurer's Report
- Report not completely finished, but summary provided
- Approximately $12,000 in awards last year
- Diversifying funds in Schwab, long-term growth funds mainly
- Funds mainly for next generation students and maintaining the quality and continuity of *Castanea*
- Stock market has been bad this year, so numbers down
- Audits will be done in May

Membership Report – Given by Jay Bolin on behalf of Tom Diggs
- 236 members last year
- 231 this year
- QR Code for a 10% discount for those attending the lunch; good for one month

Castanea's Editor's Report – Chris Randle
- Submission rates down in 2022 like 2021, but volume larger (fewer but longer papers)
- Waiver to members on publication charges

The inconspicuous *Ludwigia*: quantitative habitat characterization of critically imperiled *Ludwigia ravenii* (Onagraceae)

I spent two warm late-summer field seasons crouched on the side of the road in unassuming locations across the Coastal Plain of Virginia, North Carolina, and South Carolina. I was searching for the critically imperiled wetland obligate, Ludwigia *ravenii* C.-I Peng (Raven's Primrose-willow) (Fig. 1). After visiting the majority of extant populations, I can confirm that this species does not seem to make it out of the roadside ditch, or rut. Only twice was it found unassociated with roadsides, and in both cases, it occurred in the tracks left from vehicles driven through the wetland area. As this is an understudied species, one of the aims of my master's research is to characterize what, if anything, is unique about these ditches.

Figure 1. Habit of *Ludwigia ravenii*.

My goals were practical in nature, what features can we use to detect this species or suitable habitat across the many miles of Coastal Plain wetland ditches? To contrast habitat variables across sites, the congeners *Ludwigia alternifolia* L. and *L. pilosa* Walter were sampled along with *L. ravenii*. Funding from the Earl Core research award helped me crisscross the Coastal Plain and ultimately sample 108 plots of target *Ludwigia*. By the end of my field seasons, I had a good sense for what qualified as a "good" ditch. I am now in the process of synthesizing those attributes based on the data collected from my plots including features such as vegetative composition, in quadrats and across transects, physical ditch measurements, and soil factors (nutrient composition and pH). Approximately 21 extant populations of *L. ravenii* exist globally, with all but one found in highly vulnerable habitat. Part of my field season involved slamming on the brakes any time a ditch looked suspect or walking along state highways trying to find these target species. Through these efforts, I discovered three new populations of *L. ravenii* and this makes me hopeful that more are out there. With a better defined understanding of habitat parameters, detection of this species can only increase.

In the hottest days of August, *L. ravenii* unfolds all 3 mm of its green sepals. These small flowers are required for identification of this species. It is an inconspicuous perennial forb, lacking petals, and one of two species in section *Isnardia* (L.) W.L. Wagner & Hoch with dense spreading hairs (Hoch 2021). In the field, the most apparent character to differentiate the two is the shape of the sepals, more deltate in *L. ravenii* and triangular in *L. pilosa* (Peng 1984). When *Ludwigia* first start blooming, they can also be distinguished by color, as sepals of *L. pilosa* are cream-white and *L. ravenii* are green (Fig. 2). For a complete account of distinguishing features, see the work by Peng (1984) who described this species.

Figure 2. Comparison of the flowers of *Ludwigia pilosa* (left) and *L. ravenii* (right).

This plant is not suitable for drive-by botany. Instead, be prepared to dip your toes into the loamy muck of the ditch bottom, where you will have the best chance of encountering this plant. This species undeniably enjoys the benefits of sun and moisture found in these roadside wetlands, beyond that there seems to be some subtlety to the ditch microhabitat in which it occurs. Notably, I have found it to be significantly associated with a higher average coverage of moss, and very acidic soils. For now, if you want to keep an eye out for this cryptic species on your drive to the beach, here are my suggestions: 1) start looking in August–October and 2) keep an eye out for the much showier blooms of *Ludwigia linearis* Walter, and patches of *Panicum verrucosum* Muhl. For an added challenge, be prepared to dodge cars and mowers as the timing of roadside maintenance seems to align perfectly with when this species is in bloom. If you do find it, please keep your state's natural heritage program informed, as this species is under review for federal listing and continued research efforts.

References

Hoch, P. C. 2021. *Ludwigia ravenii*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 21+ vols. New York and Oxford. Vol 10.

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Merry Conlin, North Carolina State University

Castanea's Editor's Report – *continued*

Submission rate for 2023: already got 7 submissions, so off to a good start; no desk rejections

Lytton Musselman has agreed to do book reviews to replace Allison Cusick

Need a need systematics subject editor: Pum Grubbs has agreed.

Need a Managing Editor, or an EiC and Chris Randle will agree to be ME

Recognized and thanked Subject Editors

***Chinquapin* Editor Report – Lytton Musselman**

Lytton thanks Joe Pollard for all his help in the change of editorship

Need Steve Leonard poetry

In Memoriam

George Ellison, Steve Leonard, Thomas Mellichamp

Awards – membership not needed, but presentation must be on plants

14 travel awards

Fairey deadline April 25

Earl Core (Jonathan Horton) – Megen Gauger, Clayton Hale, Devani Joman

Windler Awards (Chris Randle) – Ecology: Hessl et al.; Systematics: Culatta et al.

Bartholomew Award – (Wendy Zomlefer sends her regards as Chair) – Alan Weakley, who gave remarks

Adjourned at 12:45 p.m.

Botanical Brainteasers

Our Brainteasers in the last issue [Chinquapin 29(1)] were: (A) *Galearis spectabilis,* showy orchis; (B) *Platanthera ciliaris*, yellow fringed orchid; (C) *Pogonia ophioglossoides*, rose pogonia; (D) *Polygaloides* (fomerly *Polygala*) *paucifolia*, gaywings; and (E) *Cypripedium acaule*, pink lady's slipper. All these plants have showy flowers that are zygomorphic (bilaterally symmetrical) with one or more of the petals spectacularly modified into a fringe or other bizarre form. That sounds like a description of the Orchidaceae, but only four of these are orchids. (D) is a member of the Polygalaceae or milkwort family. The fringe in the middle of the flower is made up of 3 fused petals, whereas the lateral wings are showy sepals. The milkworts are eudicots, so not at all closely related to the orchids, which are monocots, despite the superficial similarity. (The genus *Polygala* is being reclassified; see the latest edition of Weakley's *Flora of the Southeastern U.S.* for details.)

We only received three entries on this one. The first completely correct response was from Donna Ford-Werntz, so she is winner for the spring issue. Some other members may have been waiting for the color pictures to be posted online, which never happened. Unfortunately, SABS is having problems posting updates to the society website. It's not something the authors of this column can fix, but the SABS council is working on it. In the meantime, we've chosen this issue's Brainteaser specifically so that color shouldn't be crucial.

For our new Brainteaser, here are pictures that show reproductive structures of five trees. To make it a little tougher, we have intentionally zoomed in close, so you won't get many clues from the leaves. You need to tell us what all five of them have in common, but explain why one of them is fundamentally different from the others. This is more a matter of plant anatomy than taxonomy, but we still want you to try to identify each plant as well. That could be tricky without leaves, so giving the genus is good enough for full credit, but species ID will be used in case a tiebreaker is needed. (It's also true that only four of these are native species; that's not the main point of the puzzle, but you can earn a little extra credit for correctly identifying the invasive tree.) As usual, there's no penalty for guessing. At the end of the year, we'll total the points and award a prize to the winner. To maximize your chances of winning, play regularly!

Send your answers by email to joe_pollard@att.net (that's an underscore character between first and last names).

Color photos will be posted at https://sabs.us/publications/#chinquapin.

[Photo credits: (A) by Billy Beck, (B–E) by JK Marlow]

Joe Pollard and Janie Marlow

Send your answers to:
joe_pollard@att.net
(that's an underscore character between first and last names).
Color photos that you can enlarge for a closer look are posted online at **https://sabs.us/publications/#chinquapin.**

Mustering the Measure of a Moss: The Importance of Moss Ecophysiology in the Southern Appalachian Mountains

In February of 2022, I received an Earl Core Student Research Award from the Southern Appalachian Botanical Society. This funding allowed me to construct an active warming system using infra-red heat lamps as part of my thesis research investigating the effects of climate change on several common moss species of the Southern Appalachian Mountains (SAM) in North Carolina. I placed four species of SAM mosses in mesocosms under ambient conditions and also beneath the warming system, which went active in November of 2022 and is continuing to this day (Figure 1). Two of my species (*Ceratodon* purpureus and *Polytrichum juniperinum*) were from open habitats and two were from forested habitats (*Hypnum imponens* and *Thuidium delicatulum*), with the latter being grown under 60% shade cloth. Weather conditions are recorded hourly, and the system maintains an elevated temperature above ambient of between 3-4oC to simulate future warming in this region3,5.

Despite their small stature, mosses can be responsible for a considerable amount of photosynthesis. In some boreal communities, carbon uptake of mosses may be around 20% of that of the entire ecosystem8. However, most research on moss ecophysiology is limited to subarctic or arid ecosystems. Since the SAM is home to almost 400 taxa of mosses1, it seemed appropriate to embark on such a study, especially given that significant climate change is on the horizon. Since mosses are highly dependent on moisture to be physiologically active, their growth could be adversely affected by climate change, with potentially significant impacts on SAM ecosystems. Since responses to altered rainfall patterns and higher temperatures may be species-dependent, it is important to understand the basic principles underlying the ecophysiology of SAM mosses.

I hypothesized that mosses subjected to the warming treatments would have higher rates of desiccation, less time available for photosynthesis, and less growth relative to samples under ambient conditions. I am predicting that open-grown moss species (see Figure 2) will be more tolerant of warming compared to forest understory species because their habitat, dense canopy architecture, and ability to alter leaf orientation, which predisposes them to tolerate greater stress2 than understory species. In contrast, pleurocarpous mosses (such as those that are abundant on downed logs in the forest; Figure 3) may be more susceptible to rapid desiccation upon warming and more adversely affected by elevated temperatures.

To understand the physiology of mosses to changing climactic variables, I am also measuring a variety of ecophysiological responses on my mosses. I am conducting gas exchange measurements using an LI-6800 gas exchange system equipped with a custom moss cuvette with an LED light source (Figure 4). I have been assessing their responses to light, moisture, and CO2, which will allow me to observe their photosynthetic activity in response to changing environmental conditions. Light response curves with the LI-6800 system show that *P. juniperinum* and *C. purpureus* reach their highest photosynthetic rates at higher light levels than the forest mosses. They also have higher maximum rates and higher respiration rates than *T. delicatulum* and *H. imponens. P. juniperinum* is particularly notable for its much higher photosynthetic rate than all of the other mosses.

I also studied how photosynthesis responded as the mosses dried. These moisture release curves showed that mosses desiccate nonlinearly, drying rapidly at first but then it slowing down over time. Photosynthetic rates peak at intermediate water contents (65-80%), because at full saturation, CO2 diffusion into leaves is inhibited by water films. *C. purpureus,* which has a dense canopy architecture, dries out the slowest, and maintains a positive carbon uptake longer than the other mosses.

I am also analyzing the water use efficiency of these mosses. Since moss leaves do not have stomata, they lose water through evaporation from their entire surface. This means their water use efficiency (the amount of CO2 uptake per unit loss of H2O) should be much lower than for vascular plants which can control water loss by closing their stomata. When mosses are at peak photosynthesis, I found that they lose anywhere from 2000 to 8000 molecules of H2O for each molecule of CO2 taken up, compared to ~500 for vascular leaves4. Any changes to the environment that result in a limitation of water availability to these mosses may have severe consequences for carbon uptake and ecosystem water balance. Climate change could greatly alter moss community structure and composition by reducing photosynthetic activity and lowering survival in the SAM region, which has implications for ecosystem functioning. Physiological differences in response to drought and warmer temperatures may shift species dominance in moss systems7. This work should increase our understanding of how climate change in the SAM of North Carolina may affect these native moss species in the future.

References

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Leigha Henson, Appalachian State University

Remembering Writer—and Chinquapin Co-founder—George Ellison Jr. (1941-2023)

I first met George Ellison on March 26, 1992—at least, so my personal records claim—after reading a column he wrote in the Asheville Citizen-Times on the mountain camellia, *Stewartia ovata.* I found the Danville, Virginia native's conversation about the flower so cordial, and my appreciation of his thoughts and ideas was so deep and lasting, that the following year I asked George for help in starting the Southern Appalachian Botanical Society (SABS) newsletter, *Chinquapin.*

I had little idea how a newsletter might emerge from typescript, drawings, and photos. Nor was I familiar with the procedure of laying it all out. But George gave me the confidence to proceed, and even offered to start a column for the newsletter, namely, "Botanical Excursions."

At that time the small committee we'd assembled to head the newsletter had yet to determine a name for it. George made note of the botanical title of the Journal *Castanea,* and I related what I knew about it: that the journal was begun in 1935 with the assistance of Earl Core and the University of West Virginia and was named to honor the declining American Chestnut species. For our more modest SABS newsletter, we felt the name of another (more modest) tree was an obvious choice. George and his family lived on the edge of Great Smoky Mountains National Park that had been formed from the hunting lands of the Cherokee. Taking inspiration from our Native American predecessors, he looked up the Algonquian Indian name for this species, and found it was *Chechinquamin.* Feeling this might be a mouthful as the name of a newsletter, we sought a few alternatives. I put forth several optional spellings of the American Indian name relating back to its original, that had, at various times, been used: *Chinkapin,* and *Chicapin,* and finally *Chinquapin.* Having thus dropped a syllable, we felt that the newsletter would carry the lyrical name well.

Of course, several folks still felt that pronunciation even of these modified titles would be too difficult. Indeed, Warren Herb Wagner, Grapefern *Botrychium* species authority, having the complex experience of this complex name for a study subject ("bow-*tricky*-um," being decidedly tricky to pronounce) was adamant that it was unpronounceable. Nevertheless, we decided to keep *Chinquapin* as a title—and it has borne it, as of 2023, for forty years now.

But this unerring nature-focused instinct isn't unexpected in one who, in his own way, managed to forge a literary path similar to that of Horace Kephart, another writer drawn to our Great Smokies, and one who was so influential in the national park's establishment. Like Kephart, George loved the Smokies region; like Kephart, he explored and interpreted the interactions of the human and natural world of the Southern Appalachians in his writings; and like Kephart, he came to be widely and warmly regarded in our region for his insightful prose about it, with a particular focus upon the GSM National Park area, authoring or contributing to numerous books that reference it. In 2016, the same year he was named Blue Ridge Naturalist of the Year by the Blue Ridge Naturalist Network, the Great Smoky Mountains Association had named George among the Park's "most significant" contributors. So it's not surprising that George, together with Janet McCue, would write a book about Kephart—*Back of Beyond: A Horace Kephart Biography* (Frances Figart, Ed)—for which he and Janet received the prestigious Thomas Wolfe Memorial Literary Award in 2019.

And only this past spring, George, in his self-effacing and humble way, received and sincerely appreciated the expressions of regard that were voted on by attendees at the SABS and Association of Southeastern Biologists meeting in Little Rock: though bittersweet that it should have been so briefly enjoyed, a lifetime membership in the organization was awarded to him; members also expressed an abiding appreciation for George's contributions to the society, to our discipline of botany, and to the Southern Appalachian region.

Always accommodating to both his friends and readers, George continued to craft his wonderful Asheville Citizen-Times and Smoky Mountain News columns, inspiring a deep regard for all of nature and especially the GSMNP…until pneumonia, compounded by Parkinson's, brought to a close the wonderful life we all came to appreciate.

The last visit I had with George, his wife Elizabeth and daughter Quintin, was as delightful as you might imagine. This was only last April, and George had discontinued his yearly engagements; he met me at home on his front porch, where he sat with his dog sleeping by his side and the rushing clear water of Lands Creek in front of him. George was as cordial that day as in the first conversation we shared about the camellia so many years ago. On that particular afternoon, his mind was set on a fern that was at the back of the cabin beneath a ramp. He asked me about it, and although I didn't go below to inspect it closely, I said it appeared it might be a Fancy woodfern, *Dryopteris intermedia.* In that wisp of a fern behind the cabin, partially obscured by the dark shadow of the ramp, there was something meaningful, something special, that George in his inimitable way had recognized, and to which he drew my attention. I was touched by this gesture; to my mind, it was a form of poetry. But yet again, this is no surprise. It was a unique talent George had, that ability to draw our attention to the infinite variations that nature produces as organisms evolve and adapt to the rapid pace of change we observe in Earth's diverse biosphere. But this unerring nature-focused instinct isn't unexpected in one who, in his own way, managed to forge a literary path similar to that of Horace Kephart, another writer drawn to our Great Smokies, and one who was so influential in the national park's establishment. It's what drew our attention to his writings, and indeed to him as a person. And it was his nature to do so with a literary and poetic awareness that, we trust, will last as long as his writings on these subjects—longer, even, than our memories of him, which I hope will last for many years to come.

George's writings have infused this newsletter, have influenced and inspired it, as long as his lilting multisyllabic title has been its banner. His written words will continue to influence and inspire those of us who have the privilege to read them...just as our memories will for those of us who had the privilege of knowing George Robert Ellison Jr.

And for this—albeit posthumously—to George and his family, I want to add on behalf of this publication as well as on my own behalf, a sincere and resounding *Thank you.*

J. Dan Pittillo

Awards Presented at SABS Annual Meeting with Association of Southeastern Biologists

Student Awards

Maccoy Kerrigan, North Carolina State University,
Best Oral Presentation

Jonathon Osborne, University of Southern Mississippi,
Best Poster Presentation

Richard and Minnie Windler Awards

Systematics Katherine Culatta, Alexander Krings, and Lilian Matallana-Rar Ross Whetten
"Clarifying taxonomic boundaries in *Nuphar sagittifolia* (Nymphaeaceae)"

Ecology Amy Hessl, Andrew Liebold, and Morgan Leef
"Dendrochronological reconstruction of the historical invasion of balsam woolly adelgid"

Elizabeth Ann Bartholomew Award

Alan Weakley

I observed on most collected stones the imprints of innumerable plant fragments which were so different from those which are growing in the Lyonnais, in the nearby provinces, and even in the rest of France, that I felt like collecting plants in a new world… The number of these leaves, the way they separated easily, and the great variety of plants whose imprints I saw, appeared to me just as many volumes of botany representing in the same quarry the oldest library of the world.

— Antoine de Jussieu
(Memoires de l' Academie Royale des Sciences, 1718, trans. by A.V. and M. Carozzi)

From the Editor

Whew! I finally got this issue together and started work on the third issue which is scheduled for late fall. winter. In that newsletter we will begin our planned series on viewing a foreign flora through American eyes, phylogeny of common names, reports by recipients of SABS student research awards, and continue the long running Brainbusters.
Please consider writing something yourself. Chinquapin is a great place to publish articles reporting interesting observations, weird plants, biographical topics, and notable quotes.

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Return Service Requested

Sweet pepperbush (*Clethra alnifolia*) is a common shrub in moist areas of the mid-Atlantic coastal plain. This mid-summer flowering bush has abundant fragrant flowers. Isle of Wight of County, Virginia.