PETAL PUSHER

January-February 2021 Newsletter of the Missouri Native Plant Society Volume 36 No.1
"… to promote the enjoyment, preservation, conservation, restoration, and study of the flora native to Missouri."

In this issue

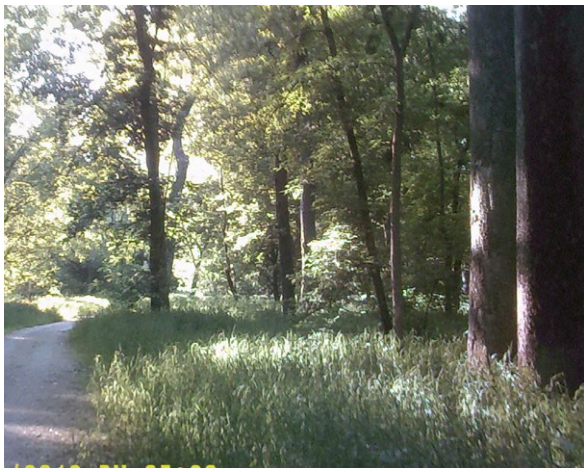
Pre-Settlement Central Missouri Flora

by Sam Delphin, delphins@missouri.edu

With great admiration and appreciation for Rex Hill's "Seasons of Missouri's Trees" in the Petal Pusher (November-December 2020) here is an interesting, pre-settlement information source for central Missouri plant and tree flora. Some of us have hopes of finding major funding to begin a Research Professorship in Ecological Restoration here at UMC with students, support staff, lab options, and logistics, based on this work:

In about 1907, Francis Potter Daniels submitted his University of Missouri-Columbia (UMC) PhD thesis describing then existing local, pre-settlement (that is pre-settlement!) plant communities, habitat by habitat, in great detail. His doctorate-decisive professors considered Daniels' PhD thesis of such value it was published as a book in 1907 by UMC as *The Flora of Columbia, Missouri: An Ecological and Systematic Study of a Local Flora*. His thesis is readable in a primitive, on-line form from UMC: **http://dl.mospace.umsystem.edu/mu/islandora/object/mu%3A348420#page/1/mode/2up.**

Twenty-four years later, in 1931, two Botany professors at UMC, H.W. Rickett and B.F. Bush, carefully located and inspected, and, doing so, confirmed the continuing accuracy of the Daniels' pre-settlement plant communities, habitat by habitat, now with minor presence in these locations of invasive human-introduced, uncontrolled ambient plants.



Floodplain near Hinkson Creek in Columbia, MO. Photo by Sam Delphin

In his work, Daniels defines the habitats of pre-settlement plant communities—generalizing here—as creek beds, creek banks, flood plains, drier prairies, hillsides in shade versus hillsides in sunlight, and hill-topping, thin-soiled glades. Particular habitats' pre-settlement plant communities weren't chaotic across scattered habitat locations in Daniels' search but were largely consistent, even when the habitat locations were, in fact, separate and far apart, indicating the plant

communities were, in Daniels' words, "systematic": pre-settlement plants' habitat communities were evidently based on moisture levels across seasons, the habitats' degrees of slope, the soil characteristics or rockiness, sunlight exposure, and, possibly, bio-chemical, vegetative, and biotic interactions.

What is unique about Daniels' *Flora* is that it is apparently the only historical, confirmed, systematic and system-wide description of persisting, stable, pre-settlement plant communities anywhere in the United States! While Steyermark in his major work, *Flora of Missouri* (and as now updated by George Yatskievych) lists every native and naturalized botanical plant in Missouri, they develop their plant lists as biologically evolved families, genera by genera (not by habitats). Steyermark's plant descriptive inclusion of habitats generalizes habitats, seldom lists associated plants, and begins from habitat observations in the 1930s to more recently and, thus, after more domestic herds' grazing and introduction of disparate seeds, settlers' logging, fires, and after introduced harvestable plants or invasive, exotic plants. Other historical observers generalize—such as the initial, General Land Office, range-line surveyors' quick-note summaries along their survey lines, "…oak & hickory…;" or more-current botanists who describe broad habitats for plants, such as "prairie," without separating prairies' degree of water: quick draining, mounded-top prairie plant communities aren't separated from runoffs' downward courses, from flat prairie plateaus' water-retained plant communities. Steyermark's later habitats' focus is on the Ozark plant communities alone, the Ozark rough-hilled, rocky-terrain defining habitats for his plant lists.

Photo of Francis Potter Daniels from a 1912 book called the Golden Trove (Copyright expired)

A Columbia remnant of the "wild rye'" creek-bank forest, much as Daniels describes, is publicly accessible. From Providence Road, south of Stadium, take the right turn-off at the bottom of the hill and go on south to the tennis pavilion parking lot. Walk a little more than a mile down the Hinkson Creek-bank Trail. The remnant forest is located on the UMC property beside Hinkson Creek, and some 113 years after Daniels' book is remarkably similar to Daniels' description (see the picture on page 1 and the current description on page 3).

We anticipate that restoring some trial plots of Daniels' pre-settlement plant communities will demonstrate interactive plant characteristics, previously unknown. For instance, Daniels credits these creek-bank "wild ryes" - here having a very dominant Virginia wild rye (*Elymus virginicus* var. *glabriflorus*) element and minimal presence of Canadian wild rye (*Elymus canadensis*) (which is more dominant farther north) - with maintaining, in Daniels' words, "park-like" forests of remarkably tall trees, spaced significantly widely apart. Still persisting, this particular Daniels' Virginia wild rye creek-bank forest, a largely intact pre-settlement remnant, is in strong contrast to other present day, severely human disturbed "forested" habitats, often beside creeks or along the MKT Trail, now with close-growing saplings and intermediate trees.

Another instance of Daniels' value: hypothesizing a Virginia wild rye exudate which suppresses tree seeds' germination, maintaining "park-like" forests of remarkably tall trees, spaced significantly apart. There are, in particular, some tall American elms at the Hinkson Creek site, apparently untouched by the stunting, tree-killing fungus known as Dutch Elm Disease. The Virginia wild rye's" exudate (the "Virginia" in the plant's name, likely indicates the plant's originally observed plentitude in Virginia and then plausibly along the East Coast of the U.S.) may also—assuming similarity to agricultural rye's (*Secale cereale*) anti-fungal attributes—be absorbed internally by the encompassed, tall-growing trees, and the wild rye exudate may then protect forest trees against fungal attacks. That would suggest that east coast settlers' unintentional eradication of Virginia wild rye through logging, forest burns, sheep and goat grazing, and introduced ground covers, may have left east coast trees, such as the American chestnut - once a spectacularly dominant tree species - desperately vulnerable and now, in the absence of Virginia wild rye, nearly extinct due to the American chestnut blight.

There is, too, the hypothesis of pan-Gaea which envisions all the continents of earth having begun as one continent. Hypothetically, millennia of broken boulders that are sited in and around Elephant Rocks State Park and

Johnson Shut-Ins, once volcanic-granite mountains but now erosion-rounded and smoothed - and then diamond mines in Arkansas - suggest the pan-Gaea core of continents may have been the Ozarks! With the thesis of pan-Gaea, the existence of many “Missouri-resembling” tree species—oaks, maples, walnuts, ash, dogwoods, and so forth—as plentiful, usually somewhat separately evolved, tree species in the U.K., suggests that the Daniels’ Missouri-observed, systematic, pre-settlement, habitat-specific plant communities may also have meaning in other temperate parts of the world.

We perceive the UMC, Daniels’ oriented, Research Professorship in Ecological Restoration as becoming a nationwide leader in preservation and restoration of sustainable, persisting, pre-settlement habitats’ plant communities; methods or techniques—such as isolating and function-determining below ground botanical exudates—even assisting those habitats drastically different from mid-Missouri’s, and perhaps, as suggested above, assisting international parallels.

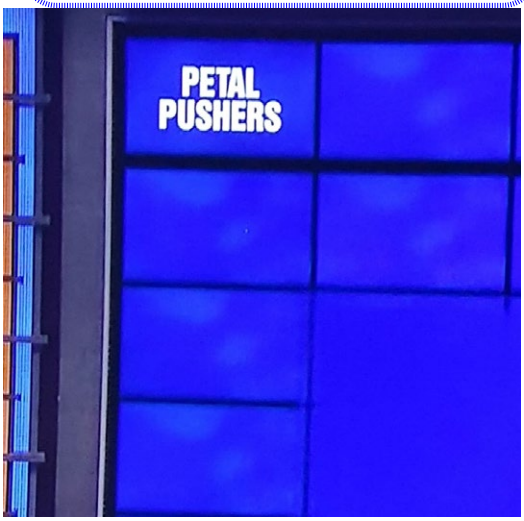
A UMC, Daniels’ oriented, Research Professorship in Ecological Restoration could explore generalized, new organic or ecological approaches benefitting conservation, and perhaps, agriculturally useful anti-fungal assistance, weed control, bio-systems’ nitrifying nourishments of surrounding plants, and other organic agricultural strategies.

Thanks for your interest. I appreciate any thoughts on funding leads. You can e-mail Sam at: delphins@missouri.edu.

A DANIELS REMNANT CREEK BANK FOREST

Francis Potter Daniels was a UMC botanist who, around 1900, described the plants from the trees to the ground cover for the habitats of Columbia, MO, in his doctoral thesis which was then published as *The Ecology of Columbia Missouri and Vicinity: An Ecological and Systematic Study of a Local Flora*. This is a remnant of a pre-settlement creek bank forest habitat. The indigenous trees are predominantly sycamore, box elder, silver maple, cottonwood, American elm, and hackberry. Some of the major tree species Daniels described are not here (swamp white oak) and presumably the species were cut-out from high usage. Virginia wild rye’s (*Elymus virginicus*) seed head is just beginning to emerge in May. Virginia wild rye is the predominant grass of the creek bank. The invasive exotic ground ivy is the next dominant and, along with large patches of seasonal, autumn-favoring, adventitious stinging nettle indicates, perhaps, that prior to university ownership, owners used the creek bank for grazing farm animals. There are minimal numbers of other plants such as Canadian wild rye and poke. It appears the Virginia wild rye has allelopathic exudate from its roots which suppresses tree seed germination and germination of many other grasses and plants (analogous to a similar characteristic of agricultural rye) and creates this wide-open, “park like,” forest. The Virginia wild rye finishes heading and goes dormant near the end of July, just prior to a time of frequent dry periods in mid-Missouri.

One of Alex Trebeck’s last Jeopardy shows featured a category after my own heart.



From the editor

Apologies for this issue being so late again! Let's blame it on it being 2021. Thank you for hanging in there! Thank you to our proofreading team (especially Pam Barnabee); Malissa Briggler, Dana Thomas, and other board members. Thank you authors, chapter representatives, and other contributors

Please consider making a submission for a future Petal Pusher! Here is some information for submissions:

A. The theme for the next issue is "Favorite Natural Areas." Other submissions are also welcome!! B. Send ONE email saying "here is my contribution," and attach (don't embed) the following:

1) an article in Word format with photo captions at the end (no photos in the Word document).

2) Two to 3 images, preferably in JPEG format

C. Use only one space between sentences

D. Even short notes with pictures would be great!

E. Send to: **mbowe@missouristate.edu**

Thank you so much,

Michelle Bowe

Missouri's Diverse Landscapes – the Ecoregions of our State

Mike Leahy, Missouri Department of Conservation

As botanists know, the geographical distribution of a plant species is a key attribute. Many of us find it fascinating to study the county level distribution maps produced in the North American Plant Atlas (Kartesz 2015). Why do certain plant species grow where they do? To answer that question, we need information on regional climate, geology, soils, associated plant and animal species, and human land use history. In Missouri, the distribution patterns of our native flora at a broad scale are defined by four major ecological regions, or ecoregions—large geographic areas having distinctive topography, geology, soils, vegetation, and climate patterns (Figure 1).

Ecoregions are defined by characteristic natural communities such as Ozark fens (Nelson 2010). Plants and animals don't respect anthropogenic boundaries, and neither do ecoregions. Each encompasses thousands of square miles and spills over into adjacent states. The following descriptions offer brief introductions to Missouri's ecoregions. *The Atlas of Missouri Ecoregions* by Timothy Nigh and Walter Schroeder (2002) offers more detailed information.

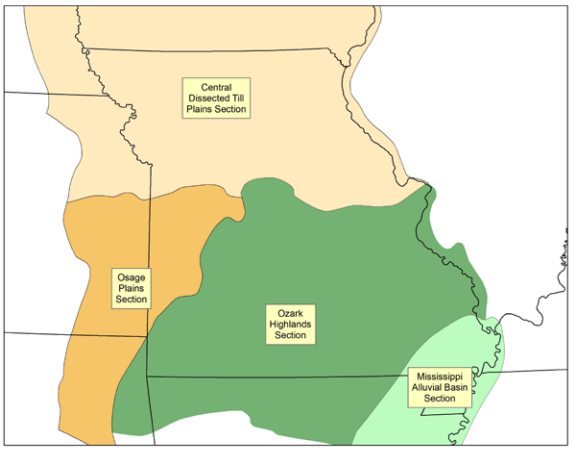


Figure 1: Missouri's Ecoregions

The Central Dissected Till Plains, or glaciated plains, ecoregion of north Missouri (Figure 2) stretches into Illinois, Iowa, Nebraska, and Kansas. Glaciers sculpted this region about 500,000 years ago, leaving behind deposits of till over mainly Pennsylvanian and Mississippian period bedrock. Subsequent geologic events led to loess, wind-borne particles of sand and silt, to be deposited in a pattern across the state, with the deepest deposits occurring in the northwest quarter of our state.

The landscape is characterized by gently rolling hills dissected by broad floodplains, though rugged topography exists near the Grand, Chariton, Missouri, and Mississippi rivers. Historically the region was predominantly a mix of tallgrass prairies, savannas, woodlands and wetlands. Today, many acres have been converted to row crops or tall fescue pasture, forming part of the corn belt of the Midwest. The largest unplowed prairies in the region are found in northern Harrison County, Missouri, and Ringgold County in Iowa. Remnant wetlands dot the Missouri, Mississippi, and lower Grand River flood-plains, providing crucial habitat for migratory waterfowl, shorebirds, and other wildlife.

Figure 2: A Representative Scene of the Central Dissected Till Plains - Pawnee Prairie Natural Area

In the small band of remnant loess hill prairies north of St. Joseph, Missouri, are many plant species more typical of the mid- and shortgrass prairies of the Great Plains. Species such as nine-anthered prairie clover (*Dalea enneandra*) occur here and nowhere else in the state. Other species such as pussy willow (*Salix discolor*) that are common north of Missouri reach their southern range limit here in this ecoregion.

The Osage Plains ecoregion of west-central Missouri (Figure 3) is an unglaciated plain that extends west into Kansas. Named for the Osage, a Native American tribe who lived in the area until 1808, the region is characterized by flat to gently rolling topography. Upland soils here are developed from moderate loess deposits overlying residuum of Pennsylvanian period sandstone, shale, and limestone bedrock. Historically, this ecoregion was dominated by tallgrass prairie, but it also contained extensive savannas and wetlands. Today most of the region has been converted to row crops or tall fescue pasture. However, significant tallgrass prairie remnants occur in this ecoregion, usually on rocky soils overlying sandstone bedrock that were too rocky to plow. These are the largest unplowed tallgrass prairies east of the Kansas Flint

Figure 3: A Representative Scene of the Osage Plains – Golden Prairie Natural Area

Hills ecoregion. Willow-leaved sunflower (*Helianthus salicifolius*) and hairy parsley (*Lomatium foeniculaceum*) are primarily found in this ecoregion in Missouri.

The Ozark Highlands ecoregion (Figure 4) spills into five states but occurs primarily in Missouri and Arkansas. The region got its start more than two billion years ago when volcanic eruptions formed the St. Francois Mountains. About 1.5 billion years later, shallow seas washed over what is now Missouri, flooding everything except the highest of peaks. During that time, Taum Sauk Mountain, Missouri's highest point, was part of a chain of islands jutting out of the sea, reminiscent of the Hawaiian island chain. Ocean water receded from and reflooded the area repeatedly, each time depositing layers of limestone, sandstone, dolomite, and shale.

Most of the ecoregion is underlain by Ordovician period bedrock but large areas of Precambrian, Cambrian and Mississippian bedrock occur as well. During the past 300 million years, these sedimentary rocks were uplifted and eroded to create the topography of hills, plateaus, and deep valleys we see today in the Ozarks. Outside the narrow floodplains, Ozark soils are typically rocky, droughty, and not very fertile. They often have a thin layer of loess overlying rock residuum.

Historically, the Ozarks also included a mix of prairies and savannas on the broad plains surrounding present-day Springfield, Lebanon, West Plains, and Salem. Rugged hills rising above large rivers, such as the Gasconade or Current, contained a mix of forests, woodlands, and glades. Significant pine dominated woodlands occurred in the drainage basins of the Black, Current, Eleven Point, Big Piney and Elk Rivers. These were extensively cut over from 1800-1920.

Although the region has changed significantly in the past century, the Ozarks contain the greatest concentration of Missouri's remaining wild lands. The Ozarks contain a large region of nationally significant karst features. Most of Missouri's caves (more than 7,000) are found here, and springs, fens, and sinkhole ponds provide other unique karst habitats. Some of these springs are significant nationally and internationally for their daily discharge rates of freshwater. At least 150 species living in the Ozarks are found nowhere else in the world (The Nature Conservancy, 2003).

Figure 4: A Representative Scene of the Ozark Highlands – Current River valley

The flora of the Ozarks is quite diverse due to many endemic species and influences of both northern, southwestern and coastal plain species. Plant species endemic to the Ozarks as a whole (not just Missouri) include Trelease's larkspur (*Delphinium treleasi*) and Bush's skullcap (*Scutellaria bushii*). In Missouri several plant species are restricted to the Ozarks including yellow coneflower (*Echinacea paradoxa*), glade coneflower (*Echinacea simulata*), vernal witch hazel (*Hamamelis vernalis*) and Ozark spiderwort (*Tradescantia ozarkana*). The Ozarks also support plant species known as glacial relicts, species more widespread in the state in the Pleistocene but today only found in certain microenvironments including fens (queen of the prairie [*Filependula rubra*], swamp aster [*Symphyotricum puniceum*]), sheltered sandstone cliffs (Sullivantia [*Sullivantia sullivantii]*) and protected dolomite bluffs along the Jacks Fork river (northern bedstraw [*Galium boreale*]). In the White River watershed of the southwestern Ozarks occur species more common in the southern plains of Oklahoma and Texas, including Palafoxia (*Palafoxia callosa*), Soaptree (*Sapindus saponaria*), and Ashe's juniper (*Juniperus ashei*). Last, coastal plain disjunct species in the Ozark plateau include epiphytic sedge (*Carex decomposita*), water tupelo (*Nyssa aquatica*) and featherfoil (*Hottonia inflata*).

The Mississippi River Alluvial Basin ecoregion (Figure 5), or Missouri's Bootheel, is part of the vast, flat flood-

plain of the Mississippi River that extends all the way to New Orleans. The only blip in the landscape's apparent uniformity is Crowley's Ridge, a long, narrow ridge that runs from Cape Girardeau to Helena, Arkansas. This ridge is formed of Cretaceous and Tertiary period deposits overlaid by moderate loess deposits.

While the lowlands may appear uniform, there are subtle changes in elevation and soil type and both aeolian and fluvial landforms. As the Mississippi River coursed across this floodplain through the Quaternary period, its meanderings left behind a variety of soils and hydrologic conditions. Historically the area was an immense mosaic of bottomland forests, swamps, shrub swamps, and sloughs with significant sand ridges supporting sand savannas and prairies centered between today's towns of Sikeston and Kennett.

Modern humans have altered this landscape more than any other ecoregion in Missouri. Most of its wetlands have been drained and hundreds of thousands of acres of forest have been cleared. Row crop agriculture is the dominant land cover. However, at places like Mingo National Wildlife Refuge, important remnant natural communities support a distinctly southern flora with species such as bald cypress (*Taxodium distichum*), Thalia (*Thalia dealbata*), aquatic milkweed (*Asclepias perennis*) and copper iris (*Iris fulva*).

Missouri's Ecological Classification System (ECS) is a framework that allows natural resource managers to identify, describe, and map units of land with similar physical and biological characteristics at scales suitable for natural resources planning and management. This system breaks each of Missouri's four primary ecoregions described above into finer ecological units. Once in place, an ECS serves as a basis for an inventory of the number, size, location, and status of natural communities. An ECS allows planners and managers to assess the capability of land to produce resources and respond to management. Finally, an ECS is a common communication tool for considering the conservation of multiple resource values.

Figure 5: A Representative Scene of the Missis sippi Lowlands – Otter Slough Natural Area

Missouri's ECS was developed by a team of interagency experts from state, federal and private natural resource organizations and academia. This team developed the ecological units at the subsection scale (10-100s of square miles) and finer. The Missouri ECS ties directly into multi-state and subcontinental scale units already developed by the U.S. Forest Service (e.g., Ozark Highlands Section of the Eastern Broadleaf Forest Province). Missouri has 32 ecological subsections and multiple Landtype Associations (LTAs) in its ECS which are described in Nigh and Schroeder (2002) and contained within geographical information system (GIS) data.

In 2015 the ECS project completed its first version of Missouri's ecological sites GIS data layer – the finest level of resolution in the ECS hierarchy. Ecological sites are available as a layer on the U.S. Department of Agriculture Natural Resources Conservation Service web soil survey site at: **https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm**. This web application allows landowners to map the soils and ecological sites on their land. Missouri's ECS is a hierarchical map that assesses vegetation patterns, both current and historical, based on regional climate, surficial and bedrock geology, hydrology, soils, and topography. It provides context and information on the potential productivity of a site or landscape for things ranging from timber production to natural community restoration. It assists with natural resource management planning at scales from a forest stand (100 acres) up to 1000s of acres.

Botanists and other natural history enthusiasts in Missouri can use information on Missouri's ecoregions and ECS as a tool to more fully appreciate and understand our state's wonderful native flora.

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Nigh, T. and W. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation.

The Nature Conservancy, Ozarks Ecoregional Assessment Team. 2003. Ozarks Ecoregional Conservation Assessment. Minneapolis, MN: The Nature Conservancy Midwestern Regional Office.

Announcements, field trips, etc.

COVID Response Plan. The Board determined that due to the travel and crowd size at our state field trips, our “cancelled until further notice” policy should remain in place at least through the spring. The decision whether to hold summer and fall statewide field trips will be made at the spring meeting. However, the Board approved a motion for MONPS chapters to hold their field trips and/or meetings as long as local safety guidelines are met. Keep an eye on the Petal Pusher and website for further information.

The spring board meeting will be held virtually on April 17 at 9:00 a.m. via Zoom.

MISSOURIENSIS:

--From Dana Thomas and Doug Ladd

Volume 38 (2020) of Missouriensis can be accessed on our website at **https://monative-plants.org/publications/missouriensis/.**

This issue is packed with fascinating topics, including current research about a new (and colorful) lichen in Missouri, a new and potentially invasive *Viburnum*, new occurrences of two unusual imperiled sedges, exploration of a conundrum in *Desmodium*, delving into an historic Missouri collection to clarify moss nomenclature, a review of the latest must-read book, and more.

Some links to Hawthorn meeting presentations:

Lea's Outdoor Native Plant Classrooms: **https://1drv.ms/p/s!AjscdYpHSUkgccDCmcryKAdf1sk?e=3Y-Wx6d**

Becky’s Pollinator ID & Garden Plants: **https://1drv.ms/p/s!AjscdYpHSUkgc3nMcng4S-pzkVU?e=qvUO-JL** (the NOTES show up in the bottom, but you might need to click "notes" at the bottom of the screen to see the verbiage).

New Members!

By Ann Earley, Membership Chair
Click here to join!

Kansas City

Linda McCaughey, Overland Park, KS

Frederick Trawick, Kansas City

Adriana Paez, Lee’s Summit

Hawthorn

Stephanie McLerran, Jefferson City

Paradoxa

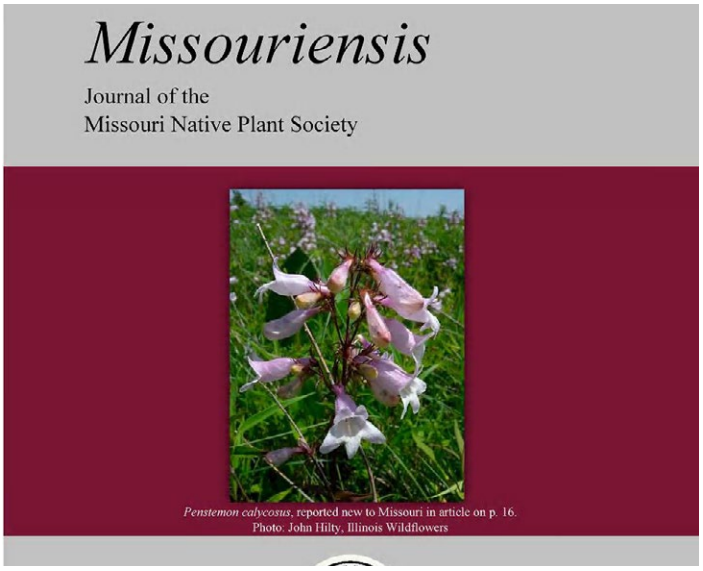
James O’Connor, Rolla

St. Louis

Sophie Kohn, St. Louis

Southwest

Maggie Mayberry, Springfield



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Aspens on the Edge of Pando, Photo by Rex Hill

In Search of the Unusual

by Rex Hill

Trees have been the reason for, or sometimes the surprise associated with, many of the trips my wife Martha and I have taken around the country. Because we have children living in the western states, much of our exploration has been west of the Rockies. However, we have made several eastern trips such as one to Florida one year when seeking out a natural sinkhole area named Leon Sinks just south of Tallahassee. Much of Florida is karst topography with the springs and sinkholes we are familiar with in Missouri. After hiking there we were looking for other places to visit and stumbled on to Torreya State Park closer to the Apalachicola River to the west of Tallahassee. The park was named for a rare and endangered tree in Florida, the Florida Torreya (*Torreya taxifolia*) in the yew (Taxaceae) family. Once common in the Apalachicola River valley, it has succumbed to over-harvesting and currently a fungal blight that has reduced its population to an estimated 200 trees.

Across the northern tier of states from Minnesota to the upper peninsula of Michigan the habitat can be wet and boggy. My hiking buddy whose relatives came from that area always referred to the habitat as muskeg and 'popple' when we were hiking in Minnesota. Muskeg is a loosely defined term used for boggy terrain consisting of perennially wet areas of sphagnum mosses, tussock sedges, scrubby timber, if any, and poorly drained, oxygen deprived soils. In my friend's words "Moose Country". We would drive around late in the evening scanning these areas from the road in hopes of spotting a moose. We were less than successful. The term "popple" was one I had to research to understand. It most probably came from the pulpwood industry and referred to the scrubby poplars including Bigtooth and Quaking Aspen, and Cottonwood that were harvested from these areas. Some discussions of the word 'popple' also include birches and willows that grow in these same wet areas and were included in any pulpwood harvests. Just consider for a moment that people used to traverse areas of muskeg and 'popple' on foot! Further to the north in the bogs I have been to in Maine and Canada, two other somewhat stunted trees, Tamarack and Black Spruce are the predominant players.

Our western trips have yielded some of the greatest finds for unusual trees. We have returned to the desert southwest often in the last 20 years. One of

the more fascinating aspects of desert ecology is the survival of plants in a harsh environment. Trees such as mesquites (*Prosopis* sp.) and palo verdes (*Cercidium* sp.) have adapted to the environment by sending down deep roots to reach the water table. Plants that do this are referred to as phreatophytes. They tend to be more prolific along washes where the water table is not quite so deep for them to reach. Many of the plants have small leaves or sometimes intermittent leaves that only emerge in wet periods. The green stems of the palo verde provide some measure of photosynthetic activity to support the plant in lieu of ever-present leaves. While the Joshua tree (*Yucca brevifolia*) is not technically a tree, it does meet part of the definition in that "it has a single stem or trunk growing to a considerable height and bears lateral branches at some distance from the ground". The national park bearing the plant's name is the obvious place to find these, but it is the signature plant of the Mojave Desert and is found elsewhere in that desert. We were pleasantly surprised to find groves of them in another part of the Mojave when one day we were avoiding Las Vegas on a road trip from Kingman, Arizona, to Death Valley and stumbled onto the "Joshua Tree Highway" which runs from Searchlight, Nevada, to Nipton, California. Another 'not quite a tree' is the California fan palm (*Washingtonia filifera*) found in and around Anza Borrego State Park in southern California and in Joshua Tree National Park. Palms need water and are found typically in narrow, wet canyons in an otherwise dry desert. We had a delightful trip one year searching for small groves of these in the vicinity of Anza Borrego, parking and hiking into likely looking canyons.

Some of our western trips take us across Kansas on I-70 where the state tree, the telephone pole, whizzes by the car windows. Just kidding. The state tree of Kansas, so named in 1937, is the cottonwood (*Populus deltoides*). Eventually, after crossing Colorado and Utah, we reach one of our favorite national parks, Great Basin in eastern Nevada. Off the beaten path, with facilities mainly for tent camping, the park does not get an overwhelming visitation. It is the site that was established to save a grove of bristlecone pines (*Pinus longaeva*) after an unfortunate incident. While it was still a National Forest property, in 1964, a graduate student in geology was given permission to cut down one of the trees when he was unable to retrieve the increment borer he was using to date trees. A section of the tree was sent to the dendrochronology laboratory in Arizona and found to be the oldest known tree seen to that date. It was dated at almost 4,900 years old. The pyramids in Egypt were under construction at that time. It has since been dubbed the Prometheus tree. It was decided the National Park Service would be a better steward of these trees and the park was established in 1986. Fortunately, a tree has been found more recently (2012) that has been dated at over 5000 years old. It was found in a grove of bristlecone pines in the White Mountains near Bishop, California, and Martha and I have had the privilege of visiting this site as well. Another interesting story associated with this tree involves the remarkably preserved wood of the tree, even after death. In a process called cross-dating, tree ring information has been used to date archaeological timbers back to over 10,000 years ago.

Bristlecone pines with Martha Hill at Great Basin National Park. Photo by Rex Hill

You cannot talk about unique trees without mentioning the most massive tree, the giant sequoia (*Sequoiadendron giganteum*) and the tallest tree, the coast redwood (*Sequoia sempervirens*). They grow in different environments, the redwoods depending on the fog laden, moist costal atmosphere and the sequoias growing in the Sierra Nevada mountains. We have visited several sites in the Sierras to see the sequoias including Sequoia and Yosemite National Parks, and an out-of-the-way California state park named Calaveras Big Trees State Park. That park also had some huge old growth sugar pines (*Pinus lambertiana*). I just finished reading an account of the Scottish botanist David Douglas and his exploits in the Pacific northwest. He had heard accounts of this tree extolling its

Sugar pine cone. Photo by Rex Hill

size. It is the tallest and most massive of the pines and has the longest cones, up to 20 inches in length. He finally found some examples in the Cascade Mountains in Oregon in the northern reaches of its range, described it to science, and named it for a British botanist, Aylmer Bourke Lambert. A whole series of articles could be done on Douglas whose life story reads like an adventure movie plot making heroic ventures into the wilderness including traveling from the mouth of the Columbia River to Hudson Bay, all the while suffering from failing eyesight.

Back to the redwoods growing near the California coast starting about Muir Woods just north of San Francisco and in protected patches north to the Oregon border. Redwoods National Park is a collection of disjoint areas, some maintained by the National Park System and some by California State Parks. Martha and I have had the privilege of visiting several redwood areas and one year had the good fortune to secure a beautiful campsite on the Smith River at the base of a giant redwood in Jedediah Smith Redwoods State Park in northern California. Each year the park installs a floating bridge that allows the visitor to roll out of his tent and take the bridge across the river to a deep, dark grove of redwoods, Stout Grove.

My last rambling story involves a grove of quaking aspens (*Populus tremuloides*) in the Doctor Creek Recreation Area in the Fishlake National Forest in central Utah. This grove has been given the name Pando, loosely translated as “I spread”. This is a clonal group of genetically identical trees, deemed to be the most massive organism ever found. There are fungi clusters that have been identified as larger in volume, but not as massive. After a little searching we found the area with the help of a friendly campground host. You could only approach the cluster of trees from the edges, the main grouping had been fenced off to protect it. Alas, like so many things of value, the trees are in somewhat of a state of decline due to over-browsing from deer, insect pests, and possibly climate change. It was inspiring to see the trees and stand next to the grove, and if we ever have the chance to do this again, it will be in the early fall when aspens are at their showiest.

There are so many other places we have visited all over the US and Canada. We have been inordinately blessed to be able to do these things. This has been an unusual year and somewhat confining and our hope is that the experience with COVID-19 will soon be a memory and one that sharpens our appreciation for what we have and what we might do with our time and freedom.

MONPS is Now Taking Applications for the 2021 Stan Hudson Research Grant

Deadline for submissions is 31 January 2021

The Missouri Native Plant Society announces the availability of funding for research projects conducted by college or university students under the supervision of a faculty member. This award honors the late H. Stanton Hudson (1921–2002), a longtime member of the Missouri Native Plant Society.

To qualify for the Stan Hudson Research Grant, research must involve Missouri native plants in some way, but may have as its primary focus any pertinent subject-area in plant biology, including conservation, ecology, physiology, systematics and evolution, etc. The grant may be used for any non-salary expenses relating to the proposed research, including travel, equipment, and supplies. For 2021, we anticipate awarding two grants in the amount of $1,000 each. At the conclusion of the project, grant recipients will be expected to prepare research results for publication in a scientific journal, and present their research at the Missouri Botanical Symposium during the year following the award.

Proposals should not exceed 5 single-spaced typed pages and should include:

1. Description of the project;
2. How the project relates to native Missouri plants;
3. Estimated completion date;
4. Overall budget for the research;
5. How an award from the Stan Hudson Research Fund would be used;
6. A list of other funding received or applied for toward the project.

Applicants should also include a current curriculum vitae. Also, two letters of reference must be included, one of these being from the student’s faculty advisor. Materials may be submitted electronically as e-mail attachments in Microsoft Word or PDF format. Letters from the applicant’s references may be submitted as e-mails. Proposals will be reviewed by the MONPS grants committee. Deadline for submissions is 31 January 2021, and winners will be announced by 1 March 2021, with funds to be awarded by 1 June 2021.

Application materials should be sent to: Malissa Briggler at **malissa.Briggler@mdc.mo.gov**

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—Aldo Leopold