

UPDATE ON THE EAST TEXAS FLORA

A Brief but Productive Break

We're proceeding with the second volume of our East Texas flora (the first half of the dicots), but publication of volumes 2–3 is still several years away—the projects seem to take longer the older we get! However, earlier this year a fern enthusiast and potential donor contacted us about doing an update on the ferns of Texas. The person approached us because in Volume 1 of our East Texas flora we treated 74 pteridophyte taxa (out of the estimated 143 taxa and 136 species currently known for Texas).

So, we're taking a brief break from the East Texas flora to research, write, and publish the definitive fern and lycophyte flora of Texas. Basically, the plant lover and anonymous donor is providing funding to publish the book and put it on the internet in a cutting-edge way. Our colleagues at BRIT, who have developed an impressive new botanical database/floristic program called Atrium, have the IT support to make the on-line flora a reality. The number of resources available to do a Texas fern flora is now extensive and easily accessible. There are good collections at BRIT, the University of Texas, and Sul Ross, and we have access to almost all of the relevant literature in the BRIT library. There are also a variety of recent publications covering various aspects of Texas pteridophytes: The *Flora of North*

It's been over 50 years since a book covering all the ferns of Texas has been published. In botany, we can learn a lot in 50 years, so it's certainly time...

America treatments, the recent *Pteridophytes of Mexico*, and *Ferns and Fern Allies of the Trans-Pecos and Adjacent Areas*. We have already done some preliminary work by developing a database of all Texas taxa, checking nomenclature, and writing additional treatments.

Since we have recently written detailed treatments of about half of the taxa (from East Texas), have access to distribution maps, have the infrastructure and a research assistant who can obtain and scan the neces-

sary illustrations, and have experience with publishing floras, a book of this scale seems like a very doable project to us. One of our primary concerns was not to take on something that would divert us for too long from our East Texas work. But, compared with one of our flora volumes, it will be quite small, and we think that we can have it wrapped up within a year.

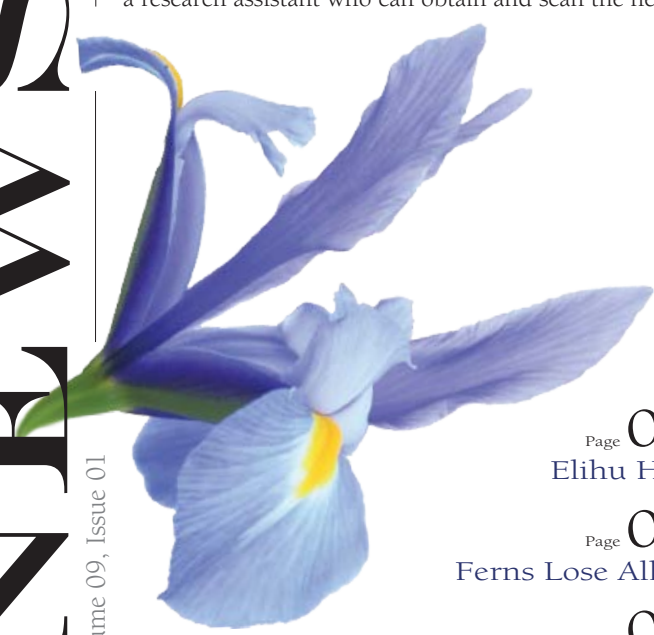
It's been over 50 years since a book covering all the ferns of Texas has been published. In botany, we can learn a lot in 50 years, so it's certainly time for a new and updated book on ferns! Let me tell you a bit about what we have planned.

But before we get started, let's straighten something out. Like many books on ferns, ours includes plants that aren't technically categorized as ferns. In the past, this was a group informally called the Fern Allies. They were composed of three formally recognized groups: Division Lycopodiophyta (club-mosses, spike-mosses, and quillworts), Division Psilophyta (the whisk-ferns), and Division Equisetophyta (the horsetails). Strictly speaking, it was a bit of a misnomer to call these three groups Fern Allies as this implies a fairly close relationship to the ferns when at the time they were considered only distantly related.

Now, fast forward to the present. Things have changed a bit. It turns out recent findings indicate the horse-tails (Equisetophyta) actually are ferns, as are the whisk-ferns (Psilophyta). If you're familiar with these two groups you may find this a little hard to swallow since their outward appearances seem to share little with that of the ferns. But it's similar to realizing that whales and porpoises are more closely related to humans than to fish. The upshot of all of this is that the horse-tails and whisk-ferns are now in the same group with the ferns (Division Polypodiophyta). And finally, only the Lycopodiophyta, often informally called the lycophytes, are left to the ill-named Fern Allies. You can only find three kinds or families of lycophytes in Texas: the club-moss family (Lycopodiaceae), spike-moss family (Selaginellaceae), and quillwort family (Isoetaceae).

All of this just to explain our current working title of *Ferns and Lycophytes of Texas*. This illustrated volume, modeled on our mammoth illustrated floras, will be different in some ways. With "only" a little over 140 different kinds (species, varieties, and subspecies) of ferns and lycophytes in Texas, the biggest difference will of course be overall size. We estimate the book will clock in at about 250 pages. So this book will truly be of field guide proportions (no pack mule required!). But there are other differences as well. While the fern book will have many of the same attributes as our previous floras (an introduction; keys to plant groups; descriptions at the family, genus, and species levels; human interest information; comprehensive glossary; and more), it is written in an even more accessible language (yet the "real science" is there when you want it). And given the narrow topic, we will have the luxury of devoting a whole page of illustrative components for each species covered. This includes two distribution maps (one distribution by county and one U.S. distribution), line drawings (which will be larger than in our previous floras), and additional color photographs.

We wasted no time in getting to work on this "side" project. The draft of most of the descriptions is written as is the all-important introduction. All the line drawings are edited, and we have found multiple color photos of nearly 100 of the over 130 species.



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The Illustrated Flora of East Texas
is a collaborative effort of the
Botanical Research Institute of Texas
&
Austin College Center for
Environmental Studies

Our Mission:

“To conserve our natural heritage by deepening our knowledge of the plant world and achieving public understanding of the value plants bring to life.”

The Flora of East Texas Newsletter:

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* Figures 1 - 4 are from the *Flora of Texas*, 1967.

We hope to have the writing of this wrapped up sometime in 2010 and have the book ready for distribution in late 2010 or early 2011; so make room on your bookshelf for *Ferns and Lycophytes of Texas*!

ELIHU HALL (1822-1882)

Plantae Texanae

Botanically oriented exploration of Texas probably first began while it was still part of Mexico. Edwin James, who was with Major S.H. Long's expedition to the Rocky Mountains, made the first collection of plants in what is now the Texas panhandle. From that point in time there was a constant stream of botanists and pioneer naturalists searching for Texas botanical treasures. Some came only during part of a year or two and returned to their more civilized native state. Others came and stayed and botanized throughout their life in Texas. They have names like Jean Louis Berlandier, Thomas Drummond, Melines Conkling Leavenworth, Ferdinand Lindheimer, Ferdinand Roemer, Charles Wright, and Gideon Lincecum. You may know some of these pioneers or their names may be familiar from common or scientific names given to the species they collected. These explorers and native Texans were all important botanical explorers and plant collectors in the early years (1800s) of the state. Some like Edwin James were attached to funded expeditions; others, as was often the case, were self-educated naturalists with a knack for plant collecting. These collectors typically sold their specimens either directly to professional botanists or to museums and herbaria both domestic and abroad. They often had some other vocation but supplemented their income with collecting. Many of the above sold their collections to well-known botanists such as Asa Gray at Harvard or George Engelmann and even William Jackson Hooker at the Kew Herbarium in London. It was these professional botanists who determined new species and assigned scientific names, yet they often acknowledged the importance of the amateur collectors by naming new species after them.

So why single out Elihu Hall for this story? Few have probably ever heard of him since there is little to be found about his life. While each of the above collectors has certainly earned their page in

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Texas botanical history for one reason or another, Elihu Hall earns his place as the first to make a significant collection in East Texas.

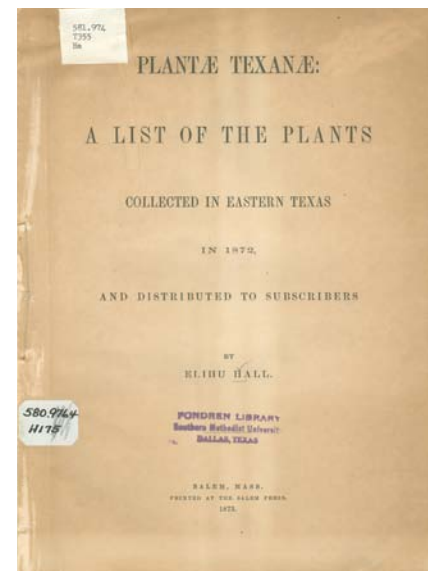
Though born in Virginia in 1822, Elihu moved with his family to Illinois seven years later where he spent his formative years. Apparently, his primary occupation was farming, and by all accounts he was fairly successful. And though he lacked formal education, he also served as a county surveyor for a time. Often distracted by the plants around him, it seemed almost as if surveying for Elihu was just an excuse to botanize.

Evidently Elihu became interested in plants and nature early in life. Having never heard of collecting and pressing plants, he first merely drew the plants he was interested in. As his interest grew he began to correspond with scientists and acquired books on botany. Fueled by these added influences, he began to collect in earnest and eventually built up an herbarium of over 10,000 specimens. He collected heavily in Illinois and surrounding states but also traveled to other parts of the young nation. He ventured on extensive collecting trips to Colorado, Oregon, Texas, Arkansas, and Michigan and short trips to Missouri, Iowa, Kansas, and Nebraska. His herbarium was populated not only with domestic specimens but also with exchanged specimens from persons abroad. He collected without discrimination, gathering lowly mosses and lichens as well as flowering beauties. As if his outstanding personal herbarium was not enough, in the style of European botanical institutions, he grew a garden from the seeds and cuttings of his collections. By all accounts this garden, too, was exceptional.

This garden was not only valuable scientifically, but was very lovely, even to those who had no botanical interest in it. On one side was a bank where those plants were placed that were sturdy enough to hold their own against native occupants, and these grew in the wildest luxuriance. For other plants, that could not unaided contend against the change of climate and soil, beds were carefully prepared and the foreigners alone were allowed to flourish in them. In other parts of the ground curious and beautiful vines, shrubs, and forest trees, in great variety, grew as if perfectly at home.

From Botanical Gazette, Vol. 9: No. 2, February 1884

Although Hall had a part in East Texas botany, his best-known botanical exploit, if known at all, was an expedition to the Colorado Territory. It began in 1862 when doctor, explorer, and naturalist Charles Christopher Parry (1823-1890) contracted both Hall and Hall's cousin, Jared Patterson Harbour (1831-1917), to join an expedition to Colorado.



Parry, a participant in the historic Mexican Boundary Survey and a botanist in the U.S. Department of Agriculture, had been to Colorado before but wanted help this time with collecting plants. As it turns

out, the Colorado expedition was a great success. The party collected about 700 species, and in many cases 10 sets of each species were collected. Hall, for his part, planned to distribute his specimens for profit, having joined the expedition with the hopes of boosting his finances to build a new house. One of the sets of the collection went to the pre-eminent American botanist of the day, Asa Gray, who had this to say about the collection as a whole.

...Dr. Parry was joined by two zealous and enterprising botanical companions, Messrs. Hall and Harbour, of Illinois, who devoted their entire energies to the collection of plants. The botanical collection, accordingly, through these conjoint labors and explorations, is full, excellent, and of great interest...

To his credit as an amateur, besides being a part of this historic expedition, Hall published on at least three occasions. "A list of mosses, liverworts and lichens of Illinois," co-authored with John Wolf, was a compilation of 186 species in 115 genera, most of which were collected in Menard or Fulton counties, Illinois. The list appeared in the *Bulletin of the Illinois State Laboratory of Natural History*, June 1878. "Notes on some features of the flora of eastern Kansas" was a short but well-written paper in *The American Journal of Science and Arts* of 1870. The following editor's note accompanied the paper.

The following consists of two articles (somewhat curtailed) published in the *Prairie Farmer*, which give so clear an exposition of the general features of the vegetation of the region under consideration that we have sought and obtained permission to reproduce them in this Journal.---Eds.

Aside from these two works, it is Hall's third publication that has importance to East Texas botany. As mentioned earlier he made solo expeditions to various states during his lifetime, one of them being Texas. It was on this expedition that he made what is probably the first significant collection of plants in East Texas. Before him others had made substantial Texas collections but not in the eastern portion of the state. *Plantae texanae: a list of the plants collected in eastern Texas in 1872, and distributed to subscribers* was a list of 861 species collected in East Texas. As with other Hall collections this one contains type specimens---the one, specific collected plant chosen by a botanist to represent a newly-named plant. One of these type specimens is a plant in the bean family (Fabaceae), *Dalea hallii* (Hall's prairie clover), that Asa Gray named and is recorded on page 7 of *Plantae texanae* as number 132. Hall's prairie clover is known only from Texas in about 14 counties. Another type specimen was *Thalictrum texanum* (Houston meadow-rue), a plant in the ranun-

still further north and east.

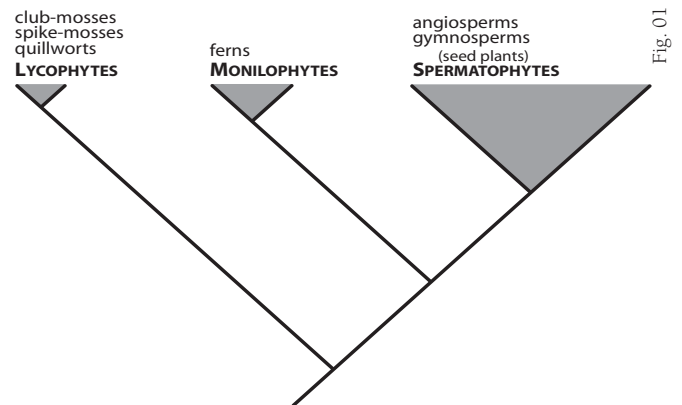
Thanks to Elihu Hall and other early Texas explorers, we have a record of the botanical history of our young state. Hall and others were an important part of exploring and recording the early diversity of the region.

FERNS LOSE ALLIES

War Between Splitters & Lumpers Rages On

Just like the whole internet/cell phone/gaming thing seems to catapult information and change at an astounding rate, so does the biological/techno thing. As we learn more about the plants around us through molecular and other micro techniques, taxonomists feel obliged to reflect this new information in how they organize or group plants. Often the question becomes, "Do we keep plants in groups of similarity or do we split them up to show their differences?" Hence, the splitters and lumpers are in constant battle. The trend seems to have the splitters winning the war as new knowledge usually results in larger groups broken into smaller groups. For instance, whereas the ill-termed fern allies (denoting some close kinship with the ferns when such was not the case) once included whisk-ferns, horsetails, and lycophytes (club-mosses, spike-mosses, and quillworts), it now only includes the lycophytes. The whisk-ferns and horsetails are now ferns (still a little hard for me to swallow)! So here's a little info on the only allies the ferns have left, the lycophytes.

The lycophytes differ from ferns not only in their DNA, but they also look different. For example, they produce a single sporangium (spore case which produces spores) on the upper side of a leaf at its base. Ferns make multiple sporangia on the undersides of the leaf. Lycophyte leaves are microphylls (also known as lycophylls). These leaves are typically small, but more significantly they have only a single vein down the middle of the leaf. This is in contrast to the branching veins found in all the other vascular plants. For these reasons and other more technical ones, we now know that the lycophytes are on an entirely separate evolutionary branch. They are separate from all the other vascular plants, including not only the flowering plants and cone-bearing plants but also the ferns, whisk-ferns, and horsetails (Fig. 1). Amazingly enough, ferns are actually more closely related to the flowering and cone-bearing plants than they are to lycophytes.



Dalea hallii (Hall's prairie clover) | Karan Rawlins, Lady Bird Johnson Wildflower Center

culus family, which is even more restricted geographically. According to a publication in the journal *Phytologia* in 2007, Houston meadow-rue is now known in only seven counties. A third type in Elihu's collection was found on page 25. Next to collection number 730 reads the name *Carex muhlenbergii* var. *australis*. Through various errors this plant has come to be called *Carex austrina*. This member of the sedge family (Cyperaceae) is more wide-ranging than the others above and stretches from Texas up through Oklahoma, Kansas and over to Missouri with outliers

There are about 1200 species of lycophytes worldwide today, less than 1% of vascular plants. They are living representatives of the oldest surviving group of vascular plants, an ancient group that separated from other vascular plants at least 400 million years ago. Ferns didn't come onto the scene until about 316 million years ago. We know that ferns and lycophytes were extremely abundant during these early days, dominating many ecosystems, and becoming tree-sized. They were the primary plants in the extensive swamps of the Carboniferous Period (~360–300 million years ago). Over geologic time, the remains of these swamp plants were compressed and became coal. In this form, the stored energy of sunlight caught in swamp forests hundreds of millions of years ago provides the modern world with much of its energy.

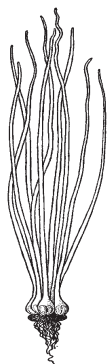
Of the three families of lycophytes still living, all three occur in Texas: the Isoetaceae (quillwort family), the Lycopodiaceae (club-moss fam

ily), and the Selaginellaceae (spike-moss family). Let's take look at these three little-known or at least often overlooked families.

The Quillworts

The quillworts take the cake for quirkiness. They're overlooked in the field (even by the professionals) because they're mistaken for stems of nondescript grasses or sedges. But upon closer inspection they are nowhere near like a grass or sedge (Fig. 2 *Isoetes lithophyla*). They have a short, squat stem with fibrous roots at the bottom and thin, linear, hollow leaves on top (they look like chives) with four air chambers running their length. Sporangia form at the broadened base of the leaves. It's often hard to tell the different species apart since they are all very similar in their basic characteristics. Often the most distinguishing characteristic is the surface of their spores!

Fig. 02



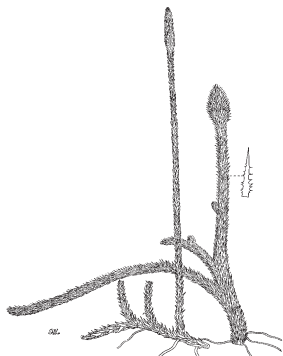
We have four species here in Texas, and their leaves range from a mere inch to as much as 15 inches long. One of them, *Isoetes lithophyla*, is found nowhere else in the world (that we know).

That nowhere-else-in-the-world place happens to be in middle of Texas. In fact, the Enchanted Rock area seems to be Quillwort Central. You can find all four species in and around the big granite domes. The Texas quillwort, *Isoetes peidmontana*, has an interesting story. It's smattered around the central Texas counties of Llano and Mason, but outside the state its closest population is in Alabama!

The Club-Mosses

All the club-mosses are in a family called the Lycopodiaceae. There are several genera in the family. In Texas we have three: *Lycopodiella* (formerly called *Lycopodium*), *Palhinhaea* (also formerly *Lycopodium*), and *Pseudolycopodiella* (again, formerly called *Lycopodium*). Many of the club-mosses outwardly resemble true mosses, hence the reference. Like the true mosses many of the club-mosses are diminutive, low growing, leafy plants (Fig. 3). But internally the club-mosses are quite different. They have complex vascular tissue while the true mosses have none or, in some cases, only very primitive vascular tissue. Their spores are organized into sacs (sporangia) borne on specialized leaves called sporophylls. These in turn, in most species, are organized into cone-like structures at the ends of branches.

Fig. 03

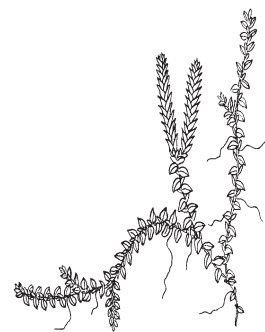


The Spike-Mosses

Outwardly, the spike-mosses can be hard to distinguish from the club-mosses. However, upon close examination of the leaves, spike-mosses will have two different-sized leaves: a larger one and a smaller one paired with it (Fig. 4). The smaller of the two is actually called a ligule. Another less obvious difference is that all the spike-mosses (with only one genus: *Selaginella*) have two sizes of spores: bigger ones (megaspores) and smaller ones (microspores). In the club-mosses, all spores are of one size.

Though not the most abundant of plants, the discovery of a lycophyte is worth the effort to see one of these living fossils in the flesh.

Fig. 04



UPCOMING EVENTS

Brown Bag Lectures & Exhibit

Don't miss the opportunity to meet with visiting scientists or to learn more about local and national conservation issues from a variety of speakers. This spring our guest lectures are sure to pique the curiosity of a broad audience. Everyone can appreciate hearing about the accomplishments of Benny J. Simpson, a researcher who showed the horticultural industry the way to sustainable gardens.

The lectures will mainly (but not *always*) be scheduled in the late afternoon to be more accessible to professionals, teachers, and students. As always, we offer free off-street parking. Come spend an afternoon with our botanical staff and friends. We all have something to learn.

Saturday, February 27, to Sunday, April 4 — 10:00am to 4:00pm
"Butterflies in the Garden"

The largest exhibit of live, exotic butterflies in North Texas. Approximately 12,000 beautiful butterflies of every hue and size will fill the conservatory with shimmering color during the month-long exhibit. The exhibit will be held at the Fort Worth Botanic Garden, 3220 Botanic Garden Boulevard, Fort Worth, TX 76107. For more information please visit www.brit.org/education or call 817-332-4441 (ex. 237).

Wednesday, March 10 — 4:30pm
"Dogwood Canyon: Where EcoRegions Collide"

Dana Wilson
Volunteer Coordinator, Trinity River Audubon Center



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