



Highstead Log

Spring
News 2004

Highstead Arboretum

frond of ferns: a storied past

In German folklore there is a tale of a young maiden who was so frightened when her lover turned into a wolf, she fell over a cliff to her death. Where her body lay, a spring of water began, and where her hair lay, the maidenhair fern grew. At Highstead, bringing people and plants together is an important part of our work, but with considerably less tragic results. What this tale shows is our need to explain what we do not understand.

Walking through a woodland or meadow, we are quick to stop and exclaim with pride the trees and flowers we know by name. "Look at the size of that *Quercus alba*," or "What a lovely stand of *Erythronium americanum*." And then, passing a feathery stand of green, remark, "Aren't those ferns lovely?"

So many of us shy away from learning more about ferns because at first glance they seem so commonplace, and at second glance, so complicated. But, with a focus on the basics, we can quickly learn some of these local denizens by name.

Connecticut, as documented in the *Preliminary Checklist of the Flora of Connecticut* by Joseph J. Dowhan, has more than fifty species and varieties of ferns. At the Arboretum, we have located eleven and introduced three. Once we know the ferns, we can surely expect to find an easy six on a casual afternoon walk. But what fun and excitement can be had by seeking even more, as we begin to learn the where and why of ferns.

sicnr

As with any new endeavor, we must learn the language. Keeping pace with developments like text messaging, we quickly learn that we can not hope to understand what we are reading until we understand the language (*sicnr*, as it applies to text messaging, means "sorry, I could not resist"). Thankfully, with

ferns there are only a few words we need to get started. Familiarity with these terms will help us identify the species we seek to know, by knowing what we are looking at.

easy as one two three

At the Arboretum we instruct students of all ages to look twice, even at plants they think they know. With ferns, we must sometimes look three times. The leaf of a fern is called a **frond** (see illustration center).

The frond is first broken down to its basic parts. The leafy part of the fern is called the **blade**. The stem within the blade is called the **rachis**, and the stem below the blade is the **stipe**.

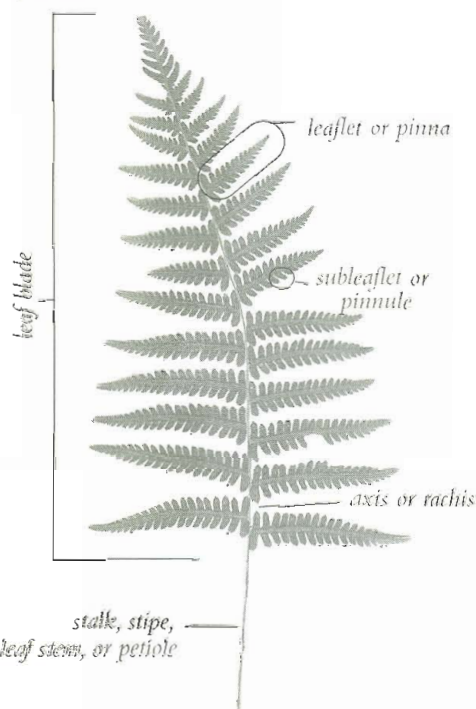
Here's where we use the *one-two-three* method. The smaller division of the blade that looks like a leaflet is referred to as a **pinna**. Looking closely at the blade and the pinnae(pl.) can help us identify different fern species.

Many field guides will refer to the ferns as once-cut, twice-cut or thrice-cut. This is best explained through illustration. The top illustration in the left margin is a Christmas fern (*Polystichum adrostichoides*). The drawing directly below this (1b) is a single pinna from the same fern. As there are no further divisions of the pinna, this fern frond is referred to as once-cut. The next fern depicted (2a) is the New York

fern (*Thelypteris noveboracensis*). Looking again at the pinna illustrated below (2b), we can see that the pinna shows a second division (**pinnules**) and is referred to as twice-cut. Take this one step further, as with the hayscented fern (*Dennstaedtia punctilobula*) and we have a divided pinnule or thrice-cut fern. Each in turn gives the frond a lacier appearance than the one before and, more importantly, a visual aid for identification. There are more complex and botanically correct terms for each, but this simplified approach is a good first step.

There are ferns that lack pinnae because their blades have no divisions and appear to be simple leaves. These fronds are described as undivided. There are others that are so unique, such as the maidenhair fern, we will consider them separately from the above descriptions.

parts of a fern frond



1a



1b

once-cut frond and pinna
of Christmas fern



2a



2b

twice-cut frond and pinna
of New York fern



3a



3b

thrice-cut frond and pinna
of hayscented fern

frond of ferns: continued from first page

growing know where

Now that we have some basic terminology to work with, forget it for a moment. Let's jump back to one of the first things we should ask ourselves when we are looking at any new plant. Where is it growing? Most of us think of ferns as residents of shaded, moist ground, and although most of our native ferns fit this profile, we must look twice at the amount of moisture, the shade (or sun) present, and the type of soil. Ferns, adaptable in the garden, tend to be more site selective in the wild.

If you are up to your ankles in muck (or more graciously strolling on the boardwalk at Highstead) you are obviously in a wet environment. This will help you narrow your search to ferns that prefer this setting. At the Arboretum, this is where cinnamon fern and royal fern will be found.

Perhaps the site is an open meadow, but one that you can hear the squish of earth beneath your feet. A wet meadow might lead you to sensitive fern. A rocky outcrop with seasonal moisture and some sun may find you hunting for common or rock polypody. But, when we venture into the woodland, identification is not always so straightforward. Time for some new terms, and another look.

turn over a new leaf

This next step in the identification process is sure to impress friends and family on your next walk together. On the backside or along the margin of many fern fronds we find a key to the reproductive cycle of ferns. Odd little bumps or clusters are actually heaps of spores or fruitdots.

These clusters are called **sori** (from the Greek meaning "heaps"). Not all fern fronds are fertile, so you may have to turn over more than one leaf to find what you are looking for. Summer and autumn are the best seasons for this search, as the sori are ripening and most visible. Some ferns, like the ostrich, sensitive, and cinnamon, hold their spores so densely and tightly on the fertile frond that the frond looks nothing like a leaf at all. This can actually be used for ornamental advantage in the garden.

Once sori are found, note the shape and arrangement of these heaps (a hand lens is very helpful). The shape and arrangement will help us narrow the field to at least the genus level. Take a moment to study the illustrations on the enclosed insert.

Look again at the sori. Each sori is made up of a

number of spore cases (**sporangia**), these in turn hold hundreds of spores. As explained in brief in the left margin, the reproductive cycle of a fern is a fascinating two-step process.

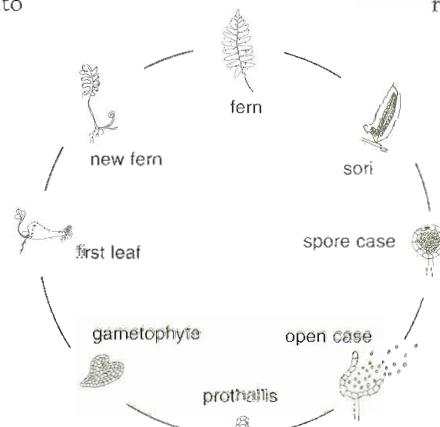
Habitat, leaf cut, and spore case are only the beginning, but a solid start for getting to know our native ferns. These basics will hopefully find you looking twice, learning more, and igniting a passion for a plant that is worthy of notice and cultivation.

cultured tastes

The following ferns, currently found at Highstead, are adaptable for use in the home garden. Moist, organic soils in an area of dappled sunlight will suit most of the species listed. Several species are very adaptable to drier, sunnier sites. Once established, these minimal-care perennials will add a lush, yet quiet look to the home landscape. Most are deer resistant.

Adiantum pedatum, maidenhair fern

Folklore aside, this denizen of moist and rocky ravines is a light and lovely addition to the shade garden. Whether it is placed among trout lily (*Erythronium americanum*) or blue phlox (*Phlox divaricata*), its graceful, wiry, purple-black stem, gently waves the horse-shoe-shaped frond in the lightest of breezes. The stem, rising to an average height of 18 inches, splits, with each resulting rachis curving back in on itself. The resulting frond is held in a nearly parallel plane to the ground. This fern prefers neutral soil.



Athyrium filix-femina, lady fern

This close relative of the Japanese painted fern can be a terrific addition to the garden. Although its stem can be brittle and therefore easily broken, take a chance on this native. Many variations are available, including a lovely red-stemmed variant. This color, combined with its upright growth (18-30 inches), lacy fronds (thrice-cut), and good behavior, make it a nice starter fern.

Dennstaedtia punctilobula, hayscented fern

Beware the hayscented fern! This is the fern the uninitiated select because it is easy to establish. Too easy. By year three you will curse yourself for not heeding the warning. Save this for naturalizing in large sunny locations. There it will provide a mid-height (18 inch) ground cover, showing its light-green, thrice-cut foliage, and dark stem base.

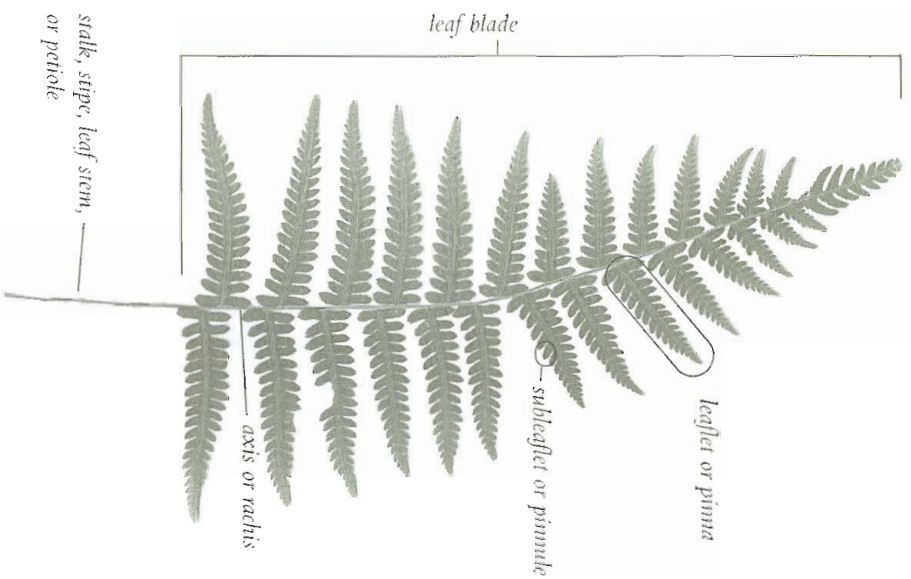
two-stepping

Like flowers and trees, ferns are vascular plants. This means they contain the specialized tissues of xylem and phloem for the transport of water and nutrients. What makes them distinct is their lack of flowers for reproduction. Instead they reproduce through a two-step process beginning with the spores. When the spore cases dry, they burst open and fling the spores to soil or wind.

Should they be lucky enough to descend to the right location and ample moisture, the spore begins the process of cellular division to form the prothallus, setting anchor with a rootlike hair, and eventually growing to a somewhat heart-shaped structure. This structure, called a gametophyte, contains both the female organs (at the notch of this heart) and the male organs (at the tip of the heart) on the underside. Again, with moisture present, the male sperm make their way to the female. Once fertilization occurs, as with seed germination, a root is set, a stem begins to grow, and eventually a leaf to manufacture the food needed for survival. It is not uncommon for this process to take nine months!

Ferns also regenerate vegetatively through creeping rootstock (like hayscented ferns), fronds that touch the earth and root (walking fern), and even bulbs that form on fronds (bulblet fern).

parts of a fern frond



the individual leaflets or pinnae shown below display what is referred to as leaf cut



once cut — like Christmas fern



twice cut — like New York fern



thrice cut — like hayscented fern

quick key to Highstead's ferns

If the frond is: once-cut — go to #2.
twice-cut — go to #5.
thrice-cut — go to #8.
other — go to #1.

1. rachis forks in two, blade is horseshoe-shaped — *maidenhair fern*

2. a. pinnae attached to rachis by distinct stem — *Christmas fern*
b. most pinnae lack a distinct stem (3)

3. a. blade is no wider than three inches — *rock polypody*
b. blade is wider than three inches (4)

4. a. most pinnae arranged opposite one another, sori appear bead-like — *sensitive fern*
b. most pinnae arranged alternately, sori appear elongated in narrow adjoining rows — *netted chain fern*

5. a. blade tapers acutely at base (6)
b. blade does not taper acutely (7)

6. a. 1'-2' frond, blade is broadest at middle, delicate, sori on back of frond are round — *New York fern*
b. frond 2' or more, blade broadest above middle, fertile frond smaller, brown, and woody — *ostrich fern*

7. a. fertile pinnae at tip of frond, sterile pinnae widely spaced — *royal fern*
b. fertile stalk is rust colored, woolly tufts appear at base of each sterile pinna — *thrush fern*
c. fertile pinnae in center of frond (blade) or pinnae appear to be missing from this area; sterile pinnae have no woolly tuft — *interrupted fern*
d. base of stem has visible scales, sori on margin of pinnae — *marginal wood fern*

8. a. stalk light brown or red, and stalk very visibly scaly near base — *spineless wood fern*
b. stalk not scaly (9)

9. a. frond finely toothed, sori elongated or curved, appear in herringbone pattern — *lady fern*
b. sori round cup, slight hair underneath frond, smells of fresh mown hay when crushed — *hayscented fern*

below are simplified illustrations of leaflets that show the typical location and arrangement for spores or spore cases of the ferns discussed



Adiantum



Athyrium



Dennstaedtia



Dryopteris marginalis



Dryopteris carthusiana



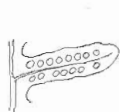
Matricaria



Onoclea



Osmunda



Polypodium



Polystichum



Thelypteris



Woodwardia

ferns									
blade shape	leaf cut	habitat	growth	spore(case) location and spore case shape					
maidenhair fern <i>Adiantum pedatum</i>	other	moist/shade	creeping	upper margin, rounded					
lady fern <i>Athyrium filix-femina</i>	thrice	moist	creeping	at veins, herringbone					
hay-scented fern <i>Denstaedtia punctilobula</i>	thrice	dry	fast, running	margins, cup-shaped					
marginal wood fern <i>Dryopteris marginalis</i>	twice	light/rich	creeping crown	margins, kidney-shaped					
spinulose wood fern <i>Dryopteris carthusiana</i>	thrice	moist	creeping crown	midvein, kidney-shaped					
ostrich fern <i>Matteuccia struthiopteris</i>	twice	wet	fast, running	fertile leaves, pod-like					
sensitive fern <i>Onoclea sensibilis</i>	once	damp	running	fertile leaves, bead-like					
cinnamon fern <i>Osmunda cinnamomea</i>	twice	wet/damp	spreading crown	fertile leaves, club-like					
interrupted fern <i>Osmunda claytoniana</i>	twice	drier	spreading crown	fertile leaves interrupted					
royal fern <i>Osmunda regalis</i>	twice	wet	spreading crown	fertile leaves, terminal					
common polypody <i>Polypodium virginianum</i>	once	wet/rocky	creeping	round, present all year					
Christmas fern <i>Polystichum acrostichoides</i>	once	varied	clumping	end of veins, round					
New York fern <i>Thelypteris noveboracensis</i>	twice	drier	spreading	near margins, kidney shaped					
netted-chain fern <i>Woodwardia arcolata</i>	once	moist shade	creeping	fertile leaves, chain-like					

frond of ferns: cultured tastes

This fern's common name refers to the fragrance emitted when the leaves are crushed. Unless you have the right site, don't let the fragrance entice you.

Dryopteris marginalis, marginal wood fern

This twice-cut fern, and its thrice-cut relation, the spinulose wood fern (*Dryopteris carthusiana*), are typically found in a woodland setting. The marginal woodfern prefers the drier mid-slope, while the spinulose favors a moister location. Both are typically evergreen, and have an abundance of scales along the lower stem (an aid to identification). Not only a welcome addition to the garden, they are also ferns that hold up well in floral arrangements.

Matteuccia struthiopteris, ostrich fern

This is the gastronomes fern, a major source of the fiddleheads many enjoy as a spring menu item. One of our largest natives, the bold fronds make a statement in the summer garden, as do the shorter, dried, fertile fronds in the winter garden. Be careful, as this fern will spread aggressively once established.

Onoclea sensibilis, sensitive fern

Don't let this fern's fragile sounding name fool you; it can be invasive in the garden. While the fertile fronds remain in place as winter sentries in wet meadows, first frost will knock out the (sensitive) infertile fronds. It is often confused with the netted-chain fern (*Woodwardia areolata*), but the fertile fronds are quite different, and the sensitive fern is more likely to have opposite placed pinnae, which are coarser than those of the netted-chain fern. Depending on the habitat in which the sensitive fern is grown, the fronds will show variation in color.

Osmunda cinnamomea, cinnamon fern

Local denizen of the wetland, this fern's descriptive common name is in reference to the tall, mature, fertile fronds which arise from the center of the crown. Green when young, the fertile fronds turn rust colored as they mature, and are a prominent feature in the growing season. They are an arresting complement to the bright-green sterile fronds.

Osmunda claytoniana, interrupted fern

The common name of this fern provides us with a clue to identification. Only several pinnae near the center of each fertile frond carry spore cases. As they ripen, these pinnae seem to disappear, leaving the frond "interrupted." In the absence of fertile fronds it is easy to confuse this fern with the cinnamon fern, unless we keep in mind that this fern usually occurs on much drier sites.

Osmunda regalis, royal fern

Not at all lacy, like so many other ferns, the fronds of this fern are more reminiscent of a locust tree leaf. Regal at a height nearing six feet (if given ideal conditions), this fern is happy when wet. The fronds can be a brilliant green in sunlight, with the stems growing red in shade.

Polypodium virginianum, rock polypody

This fern is often mistaken for christmas fern (see below). While they are both leathery and evergreen, the leaf tissue of the polypody is not cut all the way to the rachis. Look for this fern tucked into the cracks along rock outcroppings, especially in areas with limestone or less acidic soils. A wonderful addition to the rock garden.

Polystichum acrostichoides, Christmas fern

This fern's common name can aid us in identification. The pinnae of its fronds are shaped like boots or Christmas stockings. Years ago, its evergreen nature led to its near endangerment as it was over-harvested from the wild for decoration. If you can tolerate its flattened winter appearance (which I suggest you do), this fern is a welcome and adaptable addition to the garden. Be prepared for some variation in size and color depending on siting and soil.

Thelypteris noveboracensis, New York fern

Not one for wet soil, this fern is more likely found in a sunny spot of a mixed woodland. This fern, of all those listed here, is unique in that both ends of the frond are acutely tapered. This characteristic is a terrific visual for identification. It can also assist you in remembering this fern's common name, as New Yorkers are apt to burn the candle at both ends!



frond comparison of rock polypody (left), and Christmas fern

Preliminary Checklist of the Vascular Flora of Connecticut
Joseph J. Dowhan, Connecticut DEP, 1979

A Field Guide to the Ferns of Northeastern and Central North America
Boughton Cobb, Houghton Mifflin, 1956

Fern Grower's Manual
Barbara Joe Hoshizaki & Robbin C. Moran
Timber Press, 2001

Ferns, Time-Life Encyclopedia of Gardening
Philip Perl, Time-Life, 1977

The enclosed insert provides some additional information on Hightstead's mature ferns, and can easily be tucked in a pocket for use during your next walk.

"When one tugs at a single thing in nature,
he finds it attached to the rest of the world"
John Muir



127 Lontown Road
P.O. Box 1097
Redding, CT 06875

Highstead Arboretum

Highstead Programs

For outdoor programs, come dressed to walk and plan to stay one to two hours. Reservations are requested: call ahead for weather-related rescheduling. For further information, call Highstead Arboretum at 203 938 8809, 9am-4pm Mon.-Fri. There is a non-member fee of \$5 per program, unless otherwise noted.

Spring 2004

azalea walk

Sunday, May 23, 10am, 12pm, 2pm

The dappled shade provided by five native species of oak on a terrain of wet and dry soil, proved perfect shelter and habitat for a collection of deciduous azaleas. Fourteen east coast native species are now represented at a site where pinxterbloom azalea alone was originally found. This naturalistic setting in the heart of the woodland is also home to ericaceous companion plants and has been fenced for protection from deer. Mid to late May should find several in bloom, a perfect opportunity to be spoiled by the color and fragrance during a ninety minute guided tour of the Arboretum.

members' day walk

Sunday, June 6, 10am, 12pm, 2pm

A guided tour of Highstead's Kalmia Collection in bloom presents the opportunity to compare the characteristics of mountain laurel found in the wild with plants which have been cultivated. A part of the North American Plant Collection Consortium, this collection has over sixty cultivars to admire. This ninety minute guided walk will also traverse more than twenty-six acres of native mountain laurel growing in a variety of soils and exposures.

clethra walk

Sunday, August 8, 10am, 12pm, 2pm

The sweet smell of swamppland? A magnificent natural stand of sweet pepperbush fills the air with its summer scent. Nearly three acres of this unusually late native bloomer is made accessible by boardwalk for a dry-footed discovery of the swamp habitat at Highstead. This habitat is one of several at the Arboretum maintained to allow the appreciation of the native plants, birds, and wildlife dwelling there. A one hour guided walk will lead you to the pond and meadow where selected cultivars of this shrub have been introduced for comparison.



marsh marigold
Caltha palustris
by Helka Gordon

Botanical Art Exhibit

May 3 – June 30, 2004

Artist's Reception, Sunday, May 16, 1-4pm

Our celebration of native plants continues with this spring's art exhibit of wildflowers native to the northeastern United States. Our fondness for wildflowers often finds us failing to distinguish between those that are native and those that have been introduced. From the bold to the diminutive, many pieces will be available for purchase. Come and "pick" a favorite.