

## THE HARDY FERN FOUNDATION

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Web site

www.hardyferns.org

The Hardy Fern Foundation was founded in 1989 to establish a comprehensive collection of the world's hardy ferns for display, testing, evaluation, public education and introduction to the gardening and horticultural community. Many rare and unusual species, hybrids and varieties are being propagated from spores and tested in selected environments for their different degrees of hardiness and ornamental garden value.

The primary fern display and test garden is located at, and in conjunction with, The Rhododendron Species Botanical Garden at the Weyerhaeuser Corporate Headquarters, in Federal Way, Washington.

Satellite fern gardens are at the Stephen Austin Arboretum, Nacogdoches, Texas, Birmingham Botanical Gardens, Birmingham, Alabama, California State University at Sacramento, Sacramento, California, Dallas Arboretum, Dallas, Texas, Denver Botanic Gardens, Denver, Colorado, Georgeson Botanical Garden, University of Alaska, Fairbanks, Alaska, Harry P. Leu Garden, Orlando, Florida, Coastal Maine Botanical Garden, Wiscasset, Maine, Inniswood Metro Gardens, Columbus, Ohio, New York Botanical Garden, Bronx, New York, and Strybing Arboretum, San Francisco, California.

The fern display gardens are at Lakewold, Tacoma, Washington, Les Jardins de Metis, Quebec, Canada, University of Northern Colorado, Greeley, Colorado, and Whitehall Historic Home and Garden, Louisville, KY.

Hardy Fern Foundation members participate in a spore exchange, receive a quarterly newsletter and have first access to ferns as they are ready for distribution.

Cover Design by Willanna Bradner.

HARDY FERN FOUNDATION QUARTERLY

## THE HARDY FERN FOUNDATION

# QUARTERLY

Volume 10 • No. 1 • Editor Sue Olsen



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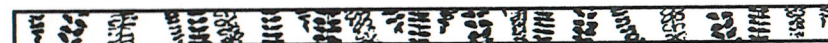
### The Spore Exchange Needs You

Please continue to send spores to:

Jocelyn Horder

16813 Lemolo Shore Drive N.E.

Poulsbo, WA 98370



HARDY FERN FOUNDATION QUARTERLY

Winter 2000 -

## President's Message

At the beginning of a new year, Presidents of organizations are expected to say or write something inspirational or profound. However, at the beginning of a new century this task becomes more demanding and visionary, but at the beginning of a new millennium it is formidable indeed so I won't even attempt it - anyway, a very Happy New Year to you all.

Last fall the Hardy Fern Foundation's Board undertook an inventory of its, "activities", not the house-keeping activities of the board but those undertaken in the name of the Foundation. It came up with a list of fifteen! Fifteen activities that carry out the purposes and promote the goals of the HFF - all the way from cutting the dead fronds off the newly planted ferns in the Bellevue Botanical Garden to raising ferns for the Satellite and Display gardens, for example. With few exceptions, each of these activities is in the hands of a board member who follows through. The Board is small but it is very dedicated. It is this dedication that makes it possible to face a new year or a new century with confidence.

The new year has brought some changes, however. Please note that our web address has changed and you can now find us at [www.hardyferns.org](http://www.hardyferns.org). We will be adding to the web's photo gallery during the course of the year and we thank Sue Mandeville for maintaining the site for all of us. Our thanks also go to Jocey Horder who is pulling the spore exchange together. Jocey was our original spore exchange director and we welcome her back along with her expertise. Be sure to watch your ferns for ripe spores and send them along. The more contributions the more interesting the exchange. Come summer look for an updated edition of The Hardy Fern Foundation's Directory of Gardens, Nurseries and Reserves. Joan Gottlieb (with technical assistance from her daughter Sara) has graciously agreed to compile the data and edit this for us.

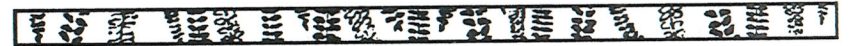
Right now the board is organizing Fern Festival 2000, our major fund raising effort for this year and the plans are well under way. Mark your calendars for June 2<sup>nd</sup> and 3<sup>rd</sup>. It will follow its usual format with a plant sale, primarily ferns, Friday and Saturday with a lecture Friday evening following a short annual business meeting and election.

Friday evening we are looking forward to a lecture by Dr. Art Kruckeberg on "Native Ferns and Their Natural Haunts". As many of you know, Dr. Kruckeberg is a Professor Emeritus in the Botany Department at the University of Washington and an expert on using native plants in home landscaping. His wife, Mareen is an expert plantswoman as well and a founding member of the HFF.

This spring check your garden for possible donations for the plant sale. Ferns are great and companion plants are gratefully accepted too. Last year we received over fifteen hundred dollars from the sale of plants donated by Sue and Herman Entz, Jocey Horder and Sylvia Duryee among others. Sylvia led the effort with sixty different species bringing in around thirteen hundred dollars!! This year we could use everyone's help.

Finally our congratulations go to member Alastair Wardlaw of Glasgow, Scotland whose fern collection has been given full National Collection status under the National Council for the Conservation of Plants & Gardens.

*John Putnam*  
*January 2000*



## CALENDAR

### **Rhododendron Species Botanical Garden Spring Plant Sale**

March 31 & April 1

Weyerhaeuser Corporate Headquarters, Federal Way, WA

### **Washington Park Arboretum Plant Sale**

April 29 & 30

Sand Point Naval Station, Seattle, WA

### **Bellevue Botanical Garden Plant Sale**

May 6

Bellevue Botanical Garden, Bellevue, WA

## Perry Creek, Washington, a Fern-watcher's Eldorado

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Reprinted with permission from the American Fern Journal,  
Volume 66, Number 2, 1976

*(Ed., Please note that quite a number of name changes have taken place since this was first published. This is the original version.)*

The vascular plant flora in the major drainage systems of western Washington is highly predictable from one river valley to the next. The typical coniferous forest plants reoccur throughout the region. This expectation holds as well for the ferns and fern-allies in the cismontane Pacific Northwest. The same species, Bracken (*Pteridium aquilinum* var. *pubescens*), Sword Fern (*Polystichum munitum*), Lady Fern (*Athyrium filix-femina*), Oak Fern (*Gymnocarpium dryopteris*) and Deer Fern (*Blechnum spicant*) can be expected in the usual range of forest communities. But the botanist-naturalist is in for a big surprise along a two-mile segment of the Perry Creek trail in Snohomish County, Washington, about 40 miles north of Seattle. No fewer than 26 species of ferns and fern-allies are known from this remarkable locality. It is a truly exceptional habitat well within the lowland coniferous forest biome.

The first detailed collecting in Perry Creek was that of Mr. John W. Thompson in the 1930's. Thompson, then a high school biology teacher in Seattle, had a keen eye for the unusual. His collections of Pacific Northwest plants turned up many a novelty. A complete set of his collections was acquired by the University of Washington Herbarium, where Thompson served as assistant curator from 1943 to 1960.

Following Thompson's discovery of the diverse ferns of Perry Creek, the locality has been visited frequently by botanists and amateur naturalists. In 1963, Dr. Warren H. Wagner, Jr. visited Perry Creek in the company of the author. Wagner's interest in the locality was whetted by the earlier Thompson finds—seven species of *Botrychium* and the sympatric occurrence of three *Polystichum* species. It was on this foray that Wagner found the hybrid between *P. andersonii* and *P. munitum* (Wagner 1973). The richness of the Perry Creek fern flora was revealed to other pteridologists in 1969. A trip to the area, led by Drs. Wagner and T.M.C. Taylor, was made during the 12<sup>th</sup> International Botanical Congress held that year in Seattle. Members of the foray were able to verify the occurrence of many pteridophytes that Thompson had first found.

### Perry Creek Ferns

The following paragraphs list the pteridophytes that occur along the first two miles of the Perry Creek Trail. This listing is compiled from observations and herbarium records (WTU) made over the years. The most recent corroboration of this list was made on September 11, 1975 by members of the Fern Study Group of the Northwest Ornament Horticultural Society and the author.

Although most of the species listed are frequent to common in western Washington, it is exceptional to find them so closely associated in a single, rather small natural area. The occurrence of *Polystichum andersonii*, its hybrid with *P. munitum*, *P. lonchitis*, *Asplenium trichomanes*, *Dryopteris filix-mas*, *Cryptogramma crispera*, three *Lycopodium* species, and seven *Botrychium* species are of special interest.

*Adiantum pedatum* L., so common along the Perry Creek Trail on wet talus mostly under hardwoods, is infrequent and local elsewhere. At Perry Creek it is nearly as abundant as *Cryptogramma crispera*, a fern found everywhere on the more open but moist talus.

*Athyrium filix-femina* (L.) Roth is very common throughout the area; in forb-rich talus habitats it is the dominant forb.

*Blechnum spicant* (L.) J. Smith is restricted to regenerating clear-cut hemlock-fir forest near the trail head and is rare on wet talus.

*Botrychium boreale* Milde, *B. dusenii* (Christ) Alston, *B. lanceolatum* (Gmel.) Ångst., *B. lunaria* var. *onondagense* (Underw.) House, *B. multifidum* (Gmel.) Trev., *B. simplex* E. Hitchc., and *B. virginianum* (L.) Swartz are all infrequent on wet, mossy talus in hardwood glades. None is at all common, although *B. multifidum* is not infrequently encountered from the coast of Washington up to mid-montane altitudes. Some years it has not been possible to locate the other species even after intensive searches above and below the trail. It was considered the high point of the 1969 pre-Congress foray for the party to have rediscovered all of the Grape Fern species located many years before by Thompson.

*Cryptogramma crispera* (L.) R. Br. is common on wet talus, with or without hardwood cover. The plants are unusually large and lust, and well below their usual lower altitudinal limit. In the Cascade and Olympic Mountains, *C. crispera* normally occurs on subalpine talus and rock outcrops.

*Cystopteris fragilis* (L.) Bernh. is rare under the cover of hardwoods on talus.

*Dryopteris filix-mas* (L.) Schott is another fern of sporadic and infrequent occurrence in the west (Reisender, 1974), and is not common at Perry Creek, having been collected by Mickel in 1969 and Denton in 1974. It was from a plant collected at Perry Creek (Snohomish, not Chelan County) that Reisender obtained the first chromosome count (2n+82, tetraploid) of any western member of the complex.

*Dryopteris assimilis* S. Walker (=D. *austriaca* (Jacq.) Woyнар) is infrequent, mostly in coniferous woods.

*Gymnocarpium dryopteris* (L.) Newm. is occasional but gregarious in coniferous woods and under hardwoods on talus.

*Lycopodium clavatum* L. is infrequent in regenerating, clear-cut forests, with Deer Fern. *Lycopodium miyoshianum* Makino is present at Perry Creek, according to Mr. Joseph Beitel (pers. comm.). It occurs on wet, moss-covered talus in the shade of Vine Maples. *Lycopodium selago* subsp. *patens* (Beauv.) Calder &

*continued on page 6*

## Perry Creek, Washington continued from pg. 5

Taylor, although frequent at Perry Creek in habitats like those of *L. myoslanum*, seldom makes more than a sporadic appearance in the Pacific Silver Fir zone elsewhere in our area.

*Polypodium glycyrrhiza* D. C. Eaton occurs mostly on trunks and limbs of maples. *Polypodium hesperium* Maxon (or possibly *P. montense* Lang) grows on rocks in crevices, and is infrequent.

*Polystichum andersonii* Hopkins is frequent under hardwoods on moist talus slopes. It is sporadic and infrequent in the Pacific Northwest; its few localities are widely separated throughout its range from northwestern Oregon to southeastern Alaska and east to Montana. The hybrid of *P. andersonii* with *P. munitum* is sporadic and rare, and usually occurs with both parents. It has been found on Mt. Hood, Oregon, and on Mt. Rainier, Washington, according to David Wagner (pers. comm.) *Polystichum lonchitis* (L.) Roth typically is a fern of high, wooded to open talus in the fringes of the subalpine forest, the Mountain Hemlock Zone of Franklin and Dyrness (1973). The Perry Creek station is certainly the lowest in elevation for this fern in Washington. It is intermittent mostly under hardwoods on talus, but also occurs on open talus slopes. Obvious hybrids involving *P. lonchitis* with *P. munitum* or *P. andersonii* have not been discovered, despite attempts to find them. *Polystichum munitum* (Kaulf.) Presl. is locally abundant, elsewhere frequent, mostly in the shade of hardwoods or conifers.

*Pteridium aquilinum* var. *latiusculum* (Desv.) Underw. is locally abundant, mostly along the Perry Creek trail.

*Selaginella wallacei* Hieron. is frequent on moss-covered talus boulders, mostly in the open.

## Vegetation of the Perry Creek Area

The Perry Creek fern habitat is a most exceptional enclave within the broadly distributed lowland coniferous forest biome (Western Hemlock or *Tsuga heterophylla* Zone of Franklin and Dyrness, 1973) in western Washington. One needs only to traverse similar tributary canyons of the major river systems of the Puget Sound basin to discover why. Whereas most such drainages are uniformly clothed with a mixed coniferous forest of Douglas Fir, Western Hemlock, and Western Red Cedar, with associated typical understory species, the fernery of Perry Creek is located along a succession of hardwood glades, patches of exceptional assemblages of conifers of smaller than usual stature, and open talus, all on steep, moist slopes. The hardwoods are chiefly maples: *Acer macrophyllum* of low and sparse profile, along with thickets of the shrubby *A. circinatum* and *A. glabrum*. The maple thickets frequently are replaced by similarly dense stands of deciduous, shrubby *Cornus stolonifera* or pure forb communities dominated by *Athyrium filix-femina* and *Rubus parviflorus*.

Hardwood thickets are the dominant community of wet talus, and contain no conifers. The seed plants and associated ferns are: *Acer circinatum*, *A. glabrum*, *Actaea arguta*, *Alnus rubra*, *Aruncus sylvestris*, *Athyrium filix-femina*, *Carex*

*mertensii*, *Cornus stolonifera*, *Elymus glaucus*, *Epilobium angustifolium*, *Geum macrophyllum*, *Oplonanax horridum*, *Osmorhiza occidentalis*, *Pteridium aquilinum* var. *latiusculum*, *Ribes petiolare*, *Rubus parviflorus*, *R. spectabilis*, *Sambucus racemosa*, *Sorbus sitchensis*, *Thalictrum occidentale*, *Tolmiea menziesii*, *Valeriana sitchensis* and *Veratrum viride*. The species with asterisks apparently are restricted to trailside. It is in the understory of these hardwood glades that most of the Perry Creek ferns occur, although several species extend beyond onto the massive bouldery talus tracks between the hardwood glades.

On slightly less precipitous slopes, one finds open, coniferous woods, but not of the same composition as those of the climax coniferous forests on adjacent slopes. Rather, Alaska Cedar (*Chamaecyparis nootkatensis*), Subalpine Fir (*Abies lasiocarpa*), Douglas Fir (*Pseudotsuga menziesii*) and Western Hemlock (*Tsuga heterophylla*), all of smaller than expected stature, occur interspersed with the same hardwood dominants mentioned above.

Open bouldery talus has a rich cover of mosses and lichens. The frequent ferns are: *Cryptogramma crispum*, *Asplenium trichomanes*, *Lycopodium selago*, and *Selaginella wallacei*. Very few angiosperms occur, among them *Montia flagellaris*, *Saxifraga bronchialis*, and *S. ferruginea*.

Wooded, bouldery talus replaces hardwood thickets or open talus on gentler slopes, and yet has the same rocky nature. This habitat is dominated by Alaska Cedar although *Acer macrophyllum* also is common. Douglas Fir and Pacific Silver Fir (*Abies amabilis*) are occasional. Thick carpets of moss occur on the shaded talus, commonly with *Asplenium trichomanes*, *Cryptogramma crispum*, *Goodyera oblongifolia*, *Montia flagellaris*, and *Polystichum munitum*.

Nearly everywhere along the two-mile sector of the trail the substrate is rocky ranging from gravelly textured scree to massive, jagged boulders arranged in long steep talus slopes. Although the soil is shallow to non-existent, the rock is mantled with a luxuriant coat of mosses and lichens. This non-vascular mat serves as a substrate for the ferns, fern-allies, grasses, forbs, and even for some of the woody plants. In sum, we find a microcosm of wet, rocky talus surrounded by the climatically dominant coniferous forest; the former must be an enclave caused by a unique combination of environmental factors.

In the absence of carefully instrumented monitoring of the habitat, some of the operational factors may be inferred by observing the topography and the biological indicators of the area.

Perry Creek is a tributary of the south fork of the Stillaguamish River in central Snohomish County, western Washington (Fig. 1). It is well within the lower to mid-montane transition zone along the western flanks of the Cascade Range. The terrain along this sector of the Stillaguamish drainage is one of spectacularly sheer and high peaks rising abruptly out of the valley floor, which lies at ca. 1700 feet altitude. Perry Creek itself is in a narrow, steep-sided canyon bounded on the east and west by two dominating peaks, Mt. Dickerman (5266 feet) and Stillaguamish Peak (5863 feet). Downstream from Perry Creek, just beyond its junction with the Stillaguamish River, is the massive, sheer wall of Big Four Moun-

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## Perry Creek, Washington continued from pg. 7

tain (6120 feet), which has on its north-facing slope permanent snowfields and at its talus base low-lying snowfields that are sculpted into the well known Ice Caves near Big Four. At the Ice Caves, the local environment and flora are truly subalpine, despite the altitude of only 1800 feet.

Given the frigid shelter of towering mountain walls on all sides, the occurrence of a truncated and telescoped sequence of "life-zones" is not unexpected. Under the usual conditions of gradual increase in elevation, the shift from the Western Hemlock through the Pacific Silver Fir to Mountain Hemlock, with their attendant plant communities, would be gradual and not perceptible over short distances. But at Perry Creek and at other sites along the Stillaguamish River abrupt topographic and associated local climatic changes cause similarly abrupt changes in the floristic assemblages. But this inference from topography and climate alone does not wholly explain the hardwood scrub and talus communities within the foreshortened zonation of coniferous forest life-zones. I believe it is a matter of two integrated physical factors. First is the local climate, which provides a cool, moist habitat, shaded for much of the day. Second is the unstable, bouldery talus. Both climate and substrate provide niches for ferns and other plants from diverse communities. Further, the talus of the hardwood glades that contain the bulk of the fern species is rich with mosses, which provide an optimally moist substrate for ferns throughout their life-cycles.



FIG. 1 Looking down Perry Creek to the canyon of the south fork of the Stillaguamish River and Big Four Mountain on the horizon. Photo courtesy Mr. J. W. Thompson.

The nearest weather station to Perry Creek is at Silverton (1500 feet), about 5 miles west and downstream in the same river valley. From weather records (Table 1) it is easy to see that winter temperatures decrease and precipitation increases across the altitudinal transect from Puget Sound to the lower montane elevation of the Stillaguamish River. Undoubtedly, winter temperatures are still lower and precipitation greater along Perry Creek.

TABLE 1. CLIMATIC DATA FOR PORTIONS OF SNOHOMISH COUNTY, WASHINGTON<sup>1</sup>

Station and altitude	Distance (mi) from Perry Creek	Temperatures (°F)				Precipitation Annual average (in)
		Jan. average	July average	max.	min.	
Everett, 100 ft.	40	38.0	61.2	99	3	32.74
Granite Falls, 391 ft.	20	—	—	—	—	59.41
Silverton, 1500 ft.	5	33.0	61.2	103	0	94.80

<sup>1</sup>Data from U.S. Dept. Of Agriculture (1941, p. 1173).

The Washington State geological map (Hunting, 1961) portrays the rocks in the region of Perry Creek as pre-Jurassic sediments. It has not been possible to identify the particular sedimentary rocks along the crucial stretch of wet talus that supports the ferns. The entire formation is complex, and according to Hunting (1961), consists of "graywacke, argillite and siltstone with some slate and phyllite; [it] includes graywacke breccia and ribbon chert with minor local limestone lenses and basalt flows."

The entire drainage of the south fork Stillaguamish River is exceedingly rich floristically and includes other fern species besides those that cluster along the Perry Creek talus. From herbarium records and observations by the author, the following ten pteridophytes can be added to the Perry Creek list. Three species characteristic of ultramafic (high magnesium) rocks occur in the nearby upper Coal Creek drainage: *Aspidotis densa* (Brack, in Wilkes) Lellinger, *Adiantum pedatum* subsp. *aleuticum* (Rupr.) Calder & Taylor, and *Polystichum mohrioides* var. *lemmonii* (Underw.). Fern. (Kruckeberg 1969, p. 84). David Wagner (pers. comm.) confirms the presence of *Polystichum kruckebergii* Wagner along with *P. mohrioides* var. *lemmonii* on Devil's Thumb, also in the upper Coal Creek drainage, as reported first by Slater (1967). D. Wagner also found *Lycopodium sitchense* Rupr. in the same area. *Athyrium distentifolium* is a common talus species in the subalpine sections of the drainage; it is also at the Ice Caves. Other ferns and fern-allies known to occur in the Perry Creek drainage basin are *Asplenium viride* Huds. (Mt Dickerman) *Thelypteris limbosperma* (All.) H. P. Fuchs (Monte Cristo), *T. phegopteris*, (L.) Slosson (Big Four Mtn.), and *Woodsia scopulina* D. C. Eaton (Mt Dickerman). Expected but not yet found, in the Stillaguamish River drainage are *Chellanthus gracillima* D. C. Eaton, *Cryptogramma*

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## Perry Creek, Washington continued from pg. 9

*stelleri* (Gmel.) Prantl, *Dryopteris arguta* (Kaulf.) Watt, *Pityrogramma triangularis* (Kaulf.) Maxon, *Selaginella oregana* D. C. Eaton in Wats., and *Equisetum* spp.

The Perry Creek fernery is within the jurisdiction of the U.S. Forest Service (Monte Cristo Ranger District, Snoqualmie-Mt Baker National Forest). Although there seems to be no immediate danger to the habitat, it is conceivable that mining or logging operations in other parts of the Perry Creek drainage could pose a threat. When I first visited the site in the early 1950's, our party hiked in from the bottom of the river valley through a virgin Hemlock-Cedar-Douglas Fir forest before reaching the fern-hardwood talus. The lower coniferous forest was logged in the late 1950's to within 1/4 mile of the critical fern habitat. It is to be hoped that the Forest Service will take steps to preserve the Perry Creek fern area in perpetuity, either as a Botanical Area or as a Research Natural Area. At present the trail through the site is a tolerable and handy intrusion, but no further modification of this priceless botanical and scenic habitat should occur. (*Ed. note...This has since been accomplished see The Hardy Fern Foundation Quarterly Vol. 9, No. 4, 74-76.*)

1. I am indebted to W. H. Wagner, Jr. and T. M. C. Taylor for their valued counsel over the years on the ferns of Perry Creek. Two members of the Fern Study Group (Northwest Ornamental Horticultural Society), Mareen S. Kruckeberg and Sue Olsen, have been helpful in the field surveys. Thanks are due David Wagner for data from his recent forays in the area.

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## *Phegopteris decursive-pinnata*

James R. Horrocks  
Salt Lake City, Utah



*Phegopteris decursive-pinnata.*  
Photo by Sue Olsen.

The genus name *Phegopteris* means literally "Beech Fern". The species name *decursive-pinnata* refers to the extension of the base of each pinna to the rachis. The attachment is often referred to as "wings". The Japanese beech fern is closely related to the two North American beech ferns, *P. hexagonoptera* and *P. connectilis* (formerly *Thelypteris phegopteris*). In fact, the species names "hexagonoptera" and "connectilis" obviously refer to the winged attachments of the pinnae; the term "hexagonoptera" alludes to the crude six-sided pattern made by the opposite pairs of pinnae. The Japanese beech fern shares with them this curious winged attachment to the rachis but differs from them in having fronds that taper at both ends and are narrower. In the North American species, the fronds are triangular in outline. Another difference is with the rhizomes.

The American species have long-creeping underground stems that spread far and wide. In the Japanese species, the rhizomes are erect to ascending with short runners that make new plants.

This species ranges from India to east Asia, including Formosa and Japan. It frequents rocky lowlands and also low mountainous areas. Like its close relatives, it is at its best in areas of higher humidity.

**Description:** As has been already mentioned, the rhizomes are short and erect to ascending, sending out occasional runners at short distances. The stipes are tufted and from 2 to 8 inches long with sparse scales and straw-colored. The fronds are lanceolate, from 12 to 24 inches long, rather arching and gradually tapered to the base. They are quite deciduous, being cut down by the first hard frost. The entire frond is covered with soft white hairs on both sides, giving it a soft velvety feel. The pinnae are broadly linear to deltoid-lanceolate, acute to acuminate and rather coarsely obtuse-toothed. Often they are pinnately lobed

*continued on page 12*

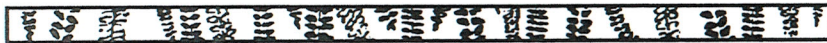
*Phegopteris decursive-pinnata* continued from pg. 11

and without stalks. The pinnae are attached directly to the rachis giving them the characteristic "winged" look of the genus *Phegopteris*. The color of the frond is a light green which persists throughout the growing season. The sori are round and the indusium is quite minute or more often absent.

**Cultivation:** This species is fairly easy to grow, especially in more humid climates. It is fairly adaptable. The tendency to spread is limited to rather short runners which seem to enjoy the proximity of rocks and walls. It can be easily divided by digging and separating the new plants from the parents. It is quite cold-hardy and has proven to be a dependable and delightful addition to the fern garden. It is beautiful growing among large rocks. The fronds, with their winged attachments, are an interesting conversation piece, being rather quaint and curious.

**References:**

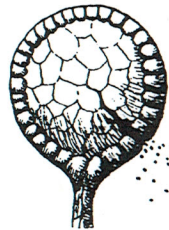
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# SPORE EXCHANGE 2000

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5. Joan Gottlieb
6. Zdeněk Seibert
7. Jocelyn Horder
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To order: Please print your selections clearly in alphabetical order using the genus, species and cultivar. Include 25 cents for each fern requested (check payable to the Hardy Fern Foundation) and a self-addressed stamped envelope. No charge for overseas members, but please enclose an international postal coupon (2 for larger orders) and an envelope. Maximum order 25 per year. Mail requests to:

Jocelyn Horder  
 16813 Lemolo Shore Drive NE  
 Poulsbo, WA 98370

1	Adiantum	aethiopicum		97	3
2	Adiantum	aethiopicum		97	3
3	Adiantum	aleuticum	Subpumilum aka A. a Dwarf	99	3, 8
4	Adiantum	pedatum		99	3
5	Adiantum	venustum		99	1
6	Arachniodes	simplicior		99	3
7	Arachniodes	standishii		99	4
8	Asplenium	aethiopicum	Brathwathii	99	6
9	Asplenium	bilottii		99	6
10	Asplenium	foreziense		99	6
11	Asplenium	incisum		99	7
12	Asplenium	kobayashii		99	1
13	Asplenium	monanthes		97, 99	6, 2,
14	Astrolepis	sinuata		99	9
15	Athyrium	filix-femina	Bornholmiense	97	2
16	Athyrium	filix-femina	Frizelliae	97	2
17	Athyrium	grammitoides		99	6
18	Athyrium	melanolepis		99	6
19	Athyrium	niponicum		93	2
20	Athyrium	niponicum	"Giant" form	99	1, 5
21	Athyrium	niponicum	Pictum	99	3
22	Athyrium	otophorum		99	1, 3,
23	Athyrium	wardii		99	6
24	Athyrium	yokoscense		99	6
25	Blechnum	niponicum		99	6, 2,
26	Blechnum	penna-marina	Cristatum	99	1
27	Blechnum	spicant		99	1
28	Blechnum	spicant		99	4, 2,
29	Blechnum	spicant	Ramosum Piskowitz	99	6
30	Blechnum	spicant	Richard's Serrate	99	6
31	Ceterach	officinatum		97, 99,	2
32	Cheilanthes	argentea		99	6
33	Cheilanthes	buchtienii		99	9
34	Cheilanthes	fendleri		96, 97,	2
35	Cheilanthes	intertexta		99	9
36	Cheilanthes	lendigera		98	9
37	Cheilanthes	lindheimeri		99	9
38	Cheilanthes	tomentosa		99	9
39	Doodia	media		99	1
40	Dryopteris	aemula		99	6
41	Dryopteris	affinis	Crispa	99	1
42	Dryopteris	affinis	Pinderi	99	1
43	Dryopteris	arguta		99	1, 5
44	Dryopteris	celea		99	3
45	Dryopteris	championii		99	1, 5, 6
46	Dryopteris	corleyi		99	6
47	Dryopteris	cystolepidota		99	3
48	Dryopteris	dilatata		99	3
49	Dryopteris	dilatata	Jimmy Dyce	98	2
50	Dryopteris	erythrosora		99	5
51	Dryopteris	filix-mas	Linearis Polydactyla	99	1
52	Dryopteris	formosana		99	3
53	Dryopteris	maderense		99	6
54	Dryopteris	neorosthornii		99	6
55	Dryopteris	sacosancta		99	1
56	Dryopteris	saxifraga		99	6
57	Dryopteris	sieboldii		99	3, 2,
58	Dryopteris	wallichiana		99	3
59	Dryopteris	indusiata		99	1
60	Gymnocarpium	oyamense		99	2
61	Lemmaphyllum	microphyllum		00	7
62	Liavea	cordifolia		99	9
63	Notholaena	standleyi		99	9

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66	Pentagramma	pallida		99	9
67	Phyllitis	hybrida		99	6
68	Phyllitis	scolopendrium		99	3
69	Polypodium	appalachianum		99	6
70	Polypodium	hesperium		99	6
71	Polystichum	aculeatum		99	1, 4
72	Polystichum	braunii		99	4, 8, 3
73	Polystichum	craspedosorum		99	6
74	Polystichum	discretum		99	6
75	Polystichum	dracmontanum		99	6
76	Polystichum	dudleyi		99	6
77	Polystichum	imbricans	Siskiyou	99	4
78	Polystichum	munitum	cv WA	99	1
79	Polystichum	neolobatum		99	4
80	Polystichum	richardii		99	6
81	Polystichum	tagawanum		99	1
82	Polystichum	triangulum		99	6
83	Polystichum	tripteron		99	1
84	Polystichum	tsus-simense		99	3
85	Polystichum	thomsonii		99	6
86	Pteris	gallinopes		99	1
87	Pyrrosia	sheareri		99	1
88	Woodsia	obtusa		99	3

The Hardy Fern Foundation published its biographical information on Dr. Wagner in the spring Quarterly 1999. The following is a brief biography of Dr. Knobloch:

**Dr. Irving W. Knobloch**

He was born in Buffalo, NY in March of 1907 and was interested in nature from an early age becoming a botanical assistant at the Buffalo Museum of Science at age 13. He earned his bachelors and masters degrees at SUNY-Buffalo in 1929 and went on to become a teaching assistant at Harvard under the late Dr. Edward Jeffrey. Later he was chosen to be a cultural foreman and naturalist by the CCC administration with the work to be done in Allegheny State Park, NY. In 1937 he moved to Mexico as manager of the Cia Minera de Barranca del Cobre (a copper mine). While there he discovered a number of previously undescribed plants. In 1942 he received his Ph.D in Botany from Iowa State University and later took a permanent position at Michigan State University, teaching successively in biological science, natural science and finally in botany and plant pathology. He retired as Professor Emeritus in 1976 but continued to devote many volunteer hours at M.S.U. He published many articles and a number of books including *Ferns and Fern Allies of Chihuahua*, 1962, with Donovan Correll and more recently *Living Planets are Hard to Find*. He enjoyed music, fishing ballroom dancing and softball.....playing in a local senior league until a shoulder injury forced him to retire at age 82!

**IN MEMORIAM**

We were sorry to learn of the passing of two well known pteridologists.

**Dr. Warren H. (Herb) Wagner**, Professor Emeritus, University of Michigan, January 8, 2000

**Dr. Irving W. Knobloch**, Professor Emeritus, Michigan State University, December 27, 1999

*They will be sorely missed and we extend our condolences to their families.*

**Observations on the Effect of Heat and Drought on Native Mid-Western Ferns**

Ralph C. Archer - Louisville, KY  
Dr. Betty Hamilton - South Bend, IN

While most of last summer's weather news covered the drought along the east coast, an area including large parts of Indiana, Kentucky, and Tennessee had the most severe summer drought since the 1930's. The Louisville, KY area suffered the worst summer drought ever. Dr. Betty Hamilton in South Bend, IN posted comments on fernet (the internet fern forum) regarding the effect of the severe heat wave and drought in NE Indiana & SW Michigan ("Michlana") on native fern populations and requested information from other areas. Since I am interested in the summer hardiness of ferns, it seemed that investigating local native fern reactions would be a natural area to obtain such information. Dr. Hamilton and I would be most interested if others would like to make comments on this subject. While there is considerable information available on the response of many ferns to cold temperatures, it seems that there is little available on the response of temperate climate ferns to extremes of heat coupled with drought. This article covers native fern populations only and consists of my observations first and then Dr. Hamilton's.

**Observations and comments by Ralph Archer on the Louisville, KY area:**

It occurred to me to revisit an area in the wild forest of the Bernhelm Arboretum and Research Forest, just south of Louisville, to evaluate the effect that the heat and drought had on local native ferns. Several years ago I was honored to be asked to participate in a fern survey in a natural forest area and so had a basis for comparison.

The area I surveyed was the south side (north facing slope) of a ravine and both sides of the creek bed. The creek is twenty to thirty feet wide in places and lined with rock face in places.

The dominant upland fern is *Polystichum acrostichoides*. Few of them showed fertile fronds and they appeared almost as if it were the middle of winter. Almost all of the ferns with fertile fronds were immediately below the path with no vegetation intervening. I counted a group of twenty ferns above the path and only two showed any fertile fronds. It is tempting to suspect that the path supplied enough additional moisture to sustain a more normal growth pattern.

The second most dominate upland fern was *Adiantum pedatum*. In general it grew near the various gullies running down to the creek. I recall seeing about ten individual large clumps in the same area with one about three feet across. I only saw one on the return visit and the fronds were totally brown.

There is an area where the rock face above the path split off and a large rock fell into a gully. This rock had been almost covered with moss and *Asplenium rhizophyllum* from near the top to the bottom on the north side. The top two thirds of the rock was bare. A large crater area across the bottom still was covered with moss and ferns. Other groups of ferns and moss were still present

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## Observations of the Effects of Heat and Drought on Native Mid-Western Ferns continued from pg. 15

at the base and in crevices near the bottom of other rock surfaces. The total population seemed to be somewhat less than half of previous in the various areas.

We had seen previously a very few *Asplenium platyneuron* in this area. I would estimate that I saw less than one fourth of the previous population both upland as well as on the high rock faces along the creek.

The dominate fern on creek banks was *Cystopteris bulbifera*. I saw few and those were single or double fronds in various rock crevices. I did not see any dead fronds as I had expected in the areas where large groups had previously been. Only one frond was found with a bulblet and that bulblet was black and shriveled.



*Asplenium platyneuron*

### Observations and comments by Dr. Betty Hamilton on the "Michiana" area:

... we have had a terrible heat wave and drought this year, as severe as in the northeast US, but receiving less media attention. Your (R. Archer) observations generally parallel what I am seeing and expect. This summer I was struck by the reduced numbers of *Dryopteris carthusiana* in several locations, including a major swamp woods and a nearby primeval beech maple forest. This could be more complicated than simple drought since *D. carthusiana* is favored by disturbance, and these habitats are but near climax conditions.

*Botrychium dissectum* populations have been delayed in emergence, an effect I have observed other years in *B. onidense* populations during early summer drought conditions. The fronds come up to the soil surface, and then stop until a soaking rain falls.

Ostrich fern colonies near the Gallen River have failed to set fertile fronds, and an adjacent population of *Adiantum pedatum* was looking very tattered. This is an interesting population as it is on a moist, south facing bluff face where the right of way is kept semi cleared under very high tension power lines. It gets lots of snow in winter and sees sun in winter only a short time each day due to protection from adjacent tall woodlands. In summer it gets lots of light under shrubby cover and experiences reduced competition for moisture. It will be interesting to know how your maidenheads do next year if moisture is good this winter.

Your observations of *C. bulbifera* match what happened in my pot garden in this season of neglect - though at one point the main plant put up new fronds. A nearby colony of *C. prostrata* did all right but went dormant a bit early.

*Dryopteris celsa* is another plant of moist soils. Our native populations, and the one in my pot garden, did well this year. This species seems to stand dry conditions better than I could have expected based on its reputation as a swamp dweller. I know of several plants in SW Michigan in areas that were once swampy, but have been drying out due to both weather changes and human activities.

They do not get as big as the swamp dwellers, but persist and grow even in very bad seasons.

I am surprised that *A. platyneuron* was so severely affected. Perhaps it has gone dormant. That is a common strategy among dry land ferns. Here, *A. platyneuron* is restricted to areas protected from winter sun, and so is a bit protected from the worst of the heat and dry wind, so I have not seen much impact.


### Conclusions and Summary

It is evident that there has been damage to the health of some native fern populations by the weather extremes. However, it may be temporary in nature. We plan to revisit the wild areas next year to see what the effects of the past summer were on the native population survival and health over the short term. It may be that the effect will be temporary in nature if the weather conditions moderate. It is clear that locally native ferns will have the best chance of survival in the local garden setting. I believe it is also true that how ferns respond to environmental extremes is of great interest when attempting to grow them in areas where they are not native. It seems to me that this indicates garden conditions needed for survival outside the native ranges.

A second article will compare the condition of ferns in cultivation with those in the wild. In this way, a comparison of ferns receiving additional water with those in drought conditions can be made, as well as a ranking of how well different species withstood hot and dry weather with additional water being provided. This discussion will cover garden ferns in central Kentucky and eastern Tennessee.



*Cystopteris bulbifera*



**THE HARDY FERN FOUNDATION**  
**QUARTERLY**

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**Newsletter:**

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## Response of Native Ferns in the Garden to Heat and Drought Stress

Ralph C. Archer

The accompanying article discussed the condition of native ferns in Kentucky and north-east Indiana during the drought and heat wave of the summer of 1999. One of the authors grows sixteen of the fern species listed by Mr. John Knouse (1) as collected in Jefferson County, KY. They include all of the wild species mentioned in the previous report except for *Botrychium dissectum*. This report covers these ferns grown in the author's garden in Louisville, KY. which is in Jefferson County.

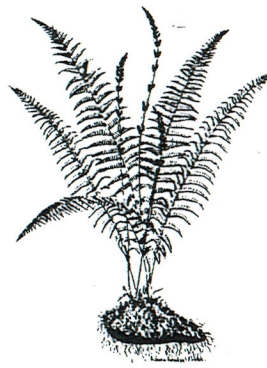
In addition to the drought, the temperature in Louisville was over 90°F. nineteen days in a row and was in the middle 80's to 90°F. at night. It ended with several days over a 100°F. and 107°F. for an all time high. All of the ferns were watered as appeared necessary and time permitted.

### 1. *Adiantum pedatum*, *Osmunda cinnamomea* and *O. claytoniana*.

Established plants in a bed under a large burr oak on one side and a large white oak on the other showed signs of severe stress and frond damage. Several *A. pedatum* had new frond growth as the days cooled off and the watering was continued. It was difficult to keep this bed from becoming excessively dry as the tree roots provide aggressive competition for water. The maidenhair seemed to fare the worst of any of the plants in this bed, such as *Dryopteris filix-mas* cultivars, *Athyrium niponicum* 'Pictum' and hostas, except for the two *Osmunda cinnamomea* and one *Osmunda claytoniana*. These went dormant prior to the first of August in spite of one plus inches of water per week. This is about 30 to 40 days earlier than normal. They usually start to go dormant about the first of September. It appears that the plant stress was due to water deprivation and not to heat stress. Several *A. pedatum* are grown each year in a raised shade bed (50%) as mother stock for division in the fall. These plants were regularly watered and there was no difference from former years in terms of their growth. Several flats of *O. cinnamomea* sporelings, growing in a cold frame with regular watering, did not suffer from the heat. It appears from this that the unusual heat wave had no effect if the plants had sufficient water.

### 2. *Asplenium platyneuron* and *Asplenium rhizophyllum*

These plants showed no effect from the summer. They are planted in shade along a creek in a bed that is a series of alternating layers of large limestone gravel and a 50%-50% peat-sand loam topsoil mixture. A depression was created by building up a section of a limestone dry wall on the bank top. The mixture fills this hollow. The plants were planted in pockets dug down to the base soil and were backfilled with the peat-soil mixed with small pieces of the gravel. They were watered about every seven to ten days by allowing water to flow down the bed to the creek until water stood on the bed top surface around the rock to about an one inch depth. The two oldest *A. platyneuron* still retain traces of fertile fronds and fronds on all plants look healthy.



*Osmunda cinnamomea*

### 3. *Athyrium asplenoides* and *Athyrium thelypteroides*

These two ferns performed the best of the lady ferns. The others are *A. angustum*, *A. cyclosorum* and four exotic species (*A. filix-femina*, *A. japonicum*, *A. niponicum* cultivars and hybrids and *A. otophorum*). When regular watering was instituted, all recovered and some new growth appeared. (I find it interesting that the *A. cyclosorum*, although not nearly the glory I have seen in the Seattle area, seemed to do better than the *A. angustum*.)

### 4. *Cystopteris bulbifera*

These plants are in an area along a creek bank that is covered with large pieces of crushed limestone to protect the bank from erosion. The single original plant has thrived and the patch now covers a triangular area down toward the creek about five feet long. There were still green fronds present when a hard frost occurred, although they were going dormant. They were in very much better condition than the wild plants and the green fronds still had green viable bulblets. They received what might be considered an excessive amount of water. (They are near my "scolly" bed. Three "scolly" plants were added this spring, and received additional water for good establishment)

### 5. *Dryopteris* species

I have four of the *Dryopteris* listed as native. They are *D. carthusiana*, *D. goldiana*, *D. intermedia* and *D. marginalis*. *D. carthusiana* appeared significantly more stressed than the others around it. It seemed to have a permanently wilted look. One *D. marginalis* went dormant and appeared damaged. It was on the fringe of the water pattern and it did not receive much water. In addition, a tree which gave it full shade all day was lost. It is now in the sun from about 9 to 11 AM all summer. Two other *D. marginalis* in the same area did get adequate moisture. They showed some stress but put up new fronds when the weather cooled. By contrast, a new plant of *D. marginalis* in full shade with good water looked normal. *D. goldiana* and *D. intermedia* did the best of the native *Dryopteris*. They showed little sign of stress.

There are several exotic (to the area) *Dryopteris* in the same location as the three *D. marginalis*. The *D. pseudo-filix-mas* (Mexican male) seemed to thrive. Next in performance would be *D. filix-mas* and assorted cultivars along with most North American species. Next would be the *D. affinis* varieties and lastly most of the Asian varieties just holding their own or struggling (except for *D. erythrosora* which I think would shrug off a chain saw). One *D. clintoniana* in this area appeared to become dormant. It appeared to be lack of water as a number of *D. clintoniana* in another area are fine.

### 6. *Onoclea sensibilis*

These are in the shade in a bed of *Pachysandra* ground cover. They went dormant in the middle of the summer regardless of the water they received. This is the earliest since they were planted. (If it sounds nuts, I loved the notion when I first saw it in Mickel. If I had first seen it growing in a bed of English Ivy as a

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## Response of Native Ferns in the Garden to Heat and Drought Stress continued from pg. 19

friend of a friend has it, I would have planted Ivy instead of "packy". The score, when I last saw it, was FERN 50 Ivy 0.)

### 7. *Polystichum acrostichoides*

The plants are about fifteen years old and line the top edge of the rock bed in which the "Scollies" are growing. They also were in the water pattern. The center of each clump had fertile fronds with the sterile framing them until the first freeze. They have had a very good year. A real contrast to the wild population.

### 8. *Matteuccia struthiopteris*

Two well established beds received limited additional water and went dormant prior to putting up many fertile fronds. Five new transplants were planted this spring in a low area along the creek. They received additional water and stayed green until fall. This fern is not listed as native to Jefferson County, but was included due to the mention by Dr. Hamilton in the previous article. I do not know why the ostrich fern is not listed as a native plant. There certainly was a large swamp area in the County center where *Osmunda cinnamomea* and *Osmunda regalis* grew. It may be that they are drought and/or heat sensitive to the point they will not grow here as a wild plant. It is not uncommon to have a mild drought and week to ten day heat waves every few years.

### *Osmunda regalis* and *Polypodium virginianum*

These were planted this spring, and received ample water. They appeared to have normal growth until the fall freeze.

1. Knouse, John A. *The Ferns and Fern Allies of Jefferson County, Kentucky* Internet Posting on the American Fern Society Web-Page

## WELCOME New Members

Douglas W. Allinger  
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