NYFA Newsletter

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of the New York State Museum Institute

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New York State Museum
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A New Fern Hot Spot in a Cool Clime

by Brian and Eileen Keelan

In the December, 1992 NYFA Newsletter, Frank Knight listed 25 species of ferns found in Joralemon Park, Albany Co., and suggested that it would be interesting to look for other small areas with even higher fern diversity in New York State. In that same newsletter, Dick Mitchell announced a formal contest to find the most fern species within a one mile diameter circular area within the state. In the NYFA Newsletter of Feb. 1994, Joseph McMullen, Bernard Carr and Diane Wheelock reported 26 species from the lovely Clark Reservation, Onondaga Co., and took the prize in the contest.

When we joined NYFA later in 1994, we learned of this contest and its results in the back issues of the newsletter, and wondered whether any site in the acidic, largely granitic Adirondacks could support fern diversity even approaching that of lowland limestone areas such as Joralemon Park and Clark Reservation.

In 1995 we began a survey of vascular plants in the Moose River Plains and vicinity, southeast of Inlet, Hamilton Co., NY, in the southwest Adirondacks. Our study area, which would fit in a 6-mile radius, lies mostly between 1700 and 2100 feet in elevation, although there are a few higher areas with difficult access. The study area is primarily maple-beech forest, also encompassing coniferous forest, sandy plains and various acidic lakes, creeks, marshes and boggy areas. In addition, there are very limited calcareous outcrops along one ridge.

We decided to try to define a fern circle somewhere within this study site. Early field work in one small area (about 150 yards radius) with roadside access, where the calcareous ridge closely approaches a marshy, acidic opening in the forest cover, revealed a concentration of 17 species. The ridge harbored *Cystopteris bulbifera*, *C. tenuis* and *Dryopteris marginalis*, species that we have not found elsewhere within our study site. In fact, *C. bulbifera* is the only fern we have found in the area that is typically classified as a calciphile, although the other two species mentioned are frequently found on limy substrates, and seem to be restricted to them in our area.

By contrast, a nearby moist opening contained such species as *Dryopteris cristata* and *D. carthusiana*, which are typical of acidic environments, at least in our region.

This location was chosen as the nucleus of our "fern circle," and we started searching for other sites with different habitats that would add species to the list. In one area, where the same calcareous ridge drained into a heavily forested swamp, a circumneutral situation appears to have resulted from approximate cancellation of the alkaline and acidic contributions of nearby substrates. There we found a beautiful stand of *Dryopteris goldiana*, the only one seen in the entire study area. At two similar locations along the base of the ridge, separated by 0.6 miles, we located *D. clintoniana*. At one of the locations, perhaps two dozen *D. clintoniana* plants, most of them nearly three feet high, dominate a small drainage.

Dryopteris clintoniana is a hexaploid species believed to have been originally derived through hybridization of diploid *D. goldiana* and tetraploid *D. cristata*, with subsequent chromosome doubling [1].

By the end of the 1995 season, we knew of 24 fern species within a 0.5-mile radius centered on the calcareous ridge. We had also found *Thelypteris palustris* by canoe at a site that could be included within a one mile radius, bringing our total to 25 species. Furthermore, we had located populations of two additional species, *Woodsia ilvensis* and *Dryopteris campyloptera* within our larger vascular plant study site, suggesting that they might also occur somewhere within the fern circle. *Woodsia ilvensis* is usually found in cracks on sunny cliffs, and *D. campyloptera* is typical of higher elevation coniferous forests (very scarce below 2550 feet). Perusal of topographic quads suggested that the most likely location for both species would be on a 2600 foot peak with a very steep south slope, bisected by a narrow "plateau" on the saddle, which might provide access to open rock faces. The local forest ranger, Gary Lee, confirmed that the downslope section had exposed cliffs, which at one time had been considered as a possible hacking site for peregrine falcon.

In the first of three hikes up this peak in 1996, we bushwhacked up to the summit along the gentlest slope. Unfortunately, it was not possible to obtain satisfactory views of the upslope cliffs by looking down from the summit, due to dense forest cover. The summit proved to be mostly deciduous forest, with lush *Dryopteris intermedia* stands, but no evident *D. campyloptera*. Our second hike was to the plateau, from which we were able to view some upslope cliffs, but we could not locate *Woodsia ilvensis* despite careful binocular scans. But, on our return hike, on a very steep slope at the surprisingly low elevation of 2350 feet, we encountered three *D. campyloptera* plants, bringing the fern circle's total to 26 species and tying the record!

This bushwhack was extremely slow because much of the hiking was on talus slopes covered with deadfall. It was very difficult to determine whether one was standing on rock or soil, or simply suspended over a cavity in the talus by a network of branches and leaves. It was not uncommon to suddenly break through to the knees or fall even further without notice. Despite the fact that we hiked nearly continuously, with hardly any rest stops or areas of botanical interest to delay us, it took us five and a half hours to cover only 1.1 miles! Our third and final hike was a last attempt to view the downslope cliffs, this time from the lower side.

This shorter bushwhack, through many large glacial erratics covered by *Polypodium*, led to the base of some nearly sheer cliffs over 120 feet high. It took little time to find several cracks with *W. ilvensis*, our 27th species!

One nice prospect while collecting during the field season is that of the hours of later enjoyment identifying and processing the specimens during the winter. Indeed, our search for additional species in the fern circle actually continued through the winter as we examined our series of specimens of *Cystopteris* and *Polypodium*. One specimen of *Cystopteris* that we collected in 1995 seemed to look more like *C. fragilis* than *C. tenuis*. Specimens of a more extensive series of *Cystopteris* collected along the calcareous ridge in 1996 failed to turn up any additional specimens suggestive of *C. fragilis*, but some seemingly intermediate material was found, so we relegated this issue to the unsolved problem list. After Dick Mitchell read a draft of this article, he e-mailed us and expressed surprise that, in this northerly area, we had found *C. tenuis* but not the expected *C. fragilis*, as well as *Polypodium appalachianum* but not the equally abundant *P. virginianum* (see below). We mailed him a selection of specimens, which he kindly examined. He agreed that most of the *Cystopteris* were *C. tenuis*, but confirmed the identification of the specimen in question to, in fact, be *C. fragilis*, our 28th and. so far, final species.

Recent work strongly favors separation of what we have long called *Polypodium virginianum* into diploid *P. appalachianum* and tetraploid *P. virginianum*. The latter species probably arose from an ancient hybridization of *P. appalachianum* and *P. sibiricum* in the arctic [2]. Characteristics distinguishing the diploid, tetraploid and the relatively frequent hybrid triploid are given in the reference listed as [3].

During the fall of 1996 we collected several fertile specimens each from six *Polypodium* populations at locations spanning our entire vascular plant study area. From each specimen we transferred spores onto a microscope slide and examined their shape and color to eliminate possibility of the triploid. We then measured the spore size and evaluated macroscopic characteristics such as frond tip lobing and blade aspect, length-width ratio and shape to identify the species. The spore data indicated that all or nearly all specimens were of the diploid, *P. appalachianum*, but some of the specimens had macroscopic features suggesting tetraploid *P. virginianum*. Dick Mitchell examined a series of these specimens and felt that at least one was macroscopically characteristic of *P. virginianum*; unfortunately, this particular specimen was collected outside the study circle.

The 28 fern species we found in our fern circle are listed alphabetically at the end of this article. Of the nine *Dryopteris* species known from the state, our total of seven seems particularly notable. The remaining two species, *D. celsa* and *D. fragrans*, are both very rare in New York State. The NYFA atlas shows nine additional fern species in Hamilton County, of which *Polystichum braunii* seems the most likely to be added to our fern circle in the future, given its multiple occurrences at similar altitudes near Paul Smiths, in the northwest Adirondacks [4].

Despite seemingly unfavorable dominant substrates and elevations in our study area, our effort yielded the most fruitful tally so far. It was a lot of fun and

interesting as well, particularly with regard to what we learned about the importance of microhabitats and habitat gradients in determining species diversity.

Literature Cited:

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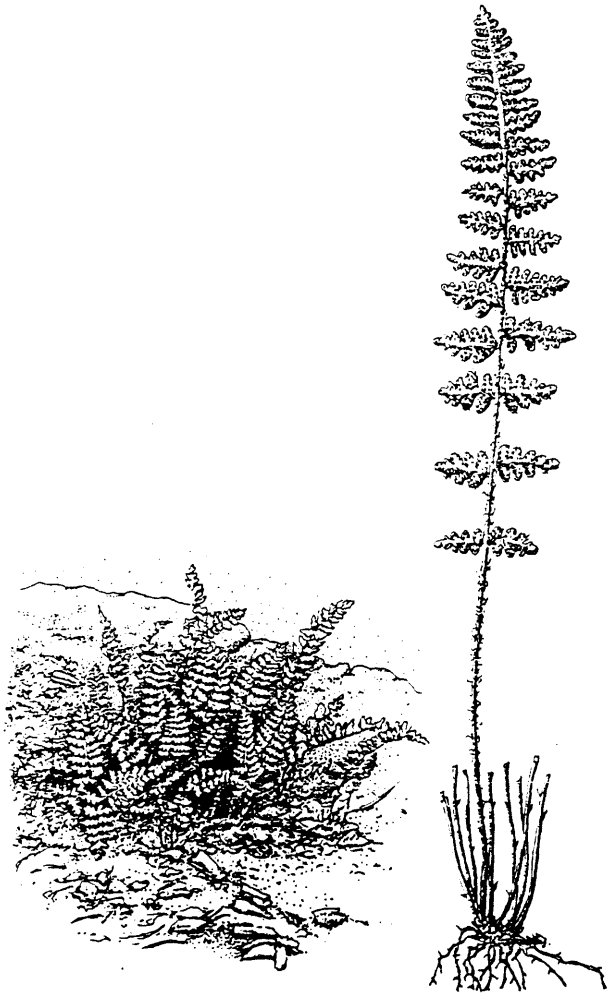

***Woodsia ilvensis* (L.) R.Br.** RUSTY WOODSIA -- one of the more illusive species sought by the Keelans in their successful quest for the "ferniest" spot in New York; these small plants often occur in cracks of boulders and sheer rock faces.

Species List

Adiantum pedatum
Athyrium filix-femina (A. asplenoides)
Botrychium dissectum
B. virginianum
Deparia acrostichoides (Athyrium)
Cystopteris bulbifera
C. fragilis (a single collection)
C. tenuis
Dennstaedtia punctilobula
Dryopteris campyloptera
D. clintoniana
D. cristata
D. intermedia
D. carthusiana
D. goldiana
D. marginalis
Gymnocarpium dryopteris
Matteuccia struthiopteris
Onoclea sensibilis
Osmunda cinnamomea
O. claytonia
O. regalis
Polypodium appalachianum
Polystichum acrostichoides
Phegopteris connectilis
Thelypteris noveboracensis
T. palustris
Woodsia ilvensis

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What is a Native Plant?

by Richard Mitchell

A few years ago, Steve Clemants of the Brooklyn Botanic Garden suggested that he might write an article on the subject of "how to determine the native status of a plant species." I'm sorry now that I discouraged him, and I hope he will offer a rebuttal to these current ramblings, or at least give us an article presenting his point of view.

The reason for this hastily-written article is that I recently received a request for input on the question of defining native status for plant species. The letter was from Truman Young of the Environmental Horticulture Department of the University of California at Davis. I'm sure that I'll soon think of more that I should have said, or find some terrible flaws in my logic and continuity, and I welcome your critical suggestions. For now, I'll share with you the answer I sent to him, in part:

Isn't it all a matter of the history we *can't* know? Being anthropocentric, we tend to define "native" species as those **not** brought to an area by humans, or at least **not** having spread into an area as a result of an

introduction for which people were responsible.

As self-centered North Americans and products of a primarily Euro-derived culture, we tend to define native plants the way we define "Native Americans," as those groups already present on the continent when our ancestors recently arrived. One problem with that: a number of so-called American "native" plant taxa (*eg.* species like *Allium shoenoprasum*, *Humulus lupulus*?, *Plantago rugellii*, etc.) were most likely camp-followers of early migrants across the Bering land bridge.

A Further Question about our Thinking:

Since countless species of plants freely dispersed around the world for millions of years without our help, why do we write ourselves into the dispersal equation above migratory birds, ants, squirrels or other dispersal vectors? I agree that humans have been very influential, but this is only *recent*, and not to the exclusion of other species that have long functioned as dispersal agents.

We are left asking unnecessary questions, like: Who brought this species to Hawaii first... humans or birds, and does a plant's native status actually depend on answering such questions as this? I think not.

- **Major plant migrations are largely driven by geological events that result in climatic changes.**
- **Except in the tropics, most species have probably not evolved in place, but migrated to occupy their present ranges.**
- **Factors leading to migration of a plant species into a new region are: 1) the dispersal of seeds, spores or vegetative propagules; 2) establishment & survival of reproductively successful populations.**

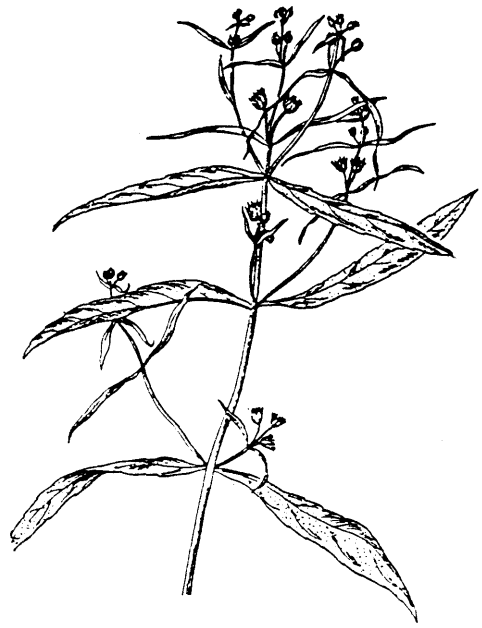
When faced with the question: Is this plant species native here?, pertinent new questions become: when did it arrive? by what agent? and from how far away? Since we often have little or no evidence, we are left largely with conjecture.

Criteria for "nativeness" must be based solely on historical evidence and judged on a species-by-species basis. Taxonomic groups do not migrate -- propagules and individuals do.

GUIDELINES? With regard to any specific geographical region, I offer the following set of comparisons to be used in the evaluation of native status:

Native Species:

- are reported as indigenous by native peoples or by the earliest explorers to the area
- may be verified as native if they are represented in the fossil or pollen record prior to human immigration
- are often endemic to the broad region in question, or have ranges explainable by known historical migration patterns
- are usually members of families or subgroups related to the native flora
- are often (but not always) members of known native communities and plant associations, rather than invaders after disturbance



Native or Not? *Eclipta prostrata* (L.) L. has the exotic common name *Yerba de Tago*, and is a weedy plant of shores and moist waste places from Massachusetts and the Hudson Valley of New York southward to the American Tropics. The older manuals report it as native in the southeastern U. S., but "adventive" further north. Is there a difference in its ecological niche from north to south?

Non-Native Species:

- are not known to native peoples prior to a certain date or reported by early explorers to the region
- appear abruptly in the local macro-fossil or pollen records of the Holocene, especially Post-Columbian
- often have known native ranges in distant lands; clues to their introduction may also be documented
- are often members of families or subgroups known to have evolved elsewhere
- are often (but not always) invaders after disturbance

Before I dig myself any deeper, I'll let it drop, but I *am* concerned with this problem, since I'm faced with decisions on native status in preparing state checklists and flora contributions. And, I don't think that the setting of guidelines (as I have just quickly tried to do) is a futile activity better relegated to armchair botanists. In most of the cases that come up, some proof of native or introduced status can be found, but there *are* those circumboreal and pantropical species that defy definition. I particularly dread the nagging "native weeds," that sometimes get on the Heritage Program's endangered list when they first arrive, but are soon relegated to the noxious pest bin. In New York State these are things like *Chenopodium standleyanum* and *Verbena stricta*."

Editors Note: *I fearlessly stick my neck out this way to encourage letters to the editor, comments and possible articles that you, the members, may want to submit. Let's have a dialogue.* (RSM)

How Many Species of Vascular Plants Grow in the Wild in New York State?

by Richard S. Mitchell

Since the mid-1830s, when John Torrey was first contracted to make a catalog of New York flora and to document each species with representative specimens, the number of vascular plants known in the state has increased dramatically. Knowledge of the native flora has steadily grown through botanical exploration, but the most dramatic increases in species numbers have resulted from the arrival of many hundreds of new weeds and escapes from cultivation. Their sources are world wide, but most of the non-natives that survive well in our climate are from Europe and eastern Asia.

As I've tried to maintain a current state checklist over the years, fluctuations in the tallies of plants reported for New York State have proved a continual fascination. I hope you will be interested to know the latest figures. The tables that follow this article don't always speak clearly for themselves, and some might leave you with questions, so I'll try to answer a few of them up front. The tables largely reflect the numbers of species, hybrids and infraspecific taxa for which there are known voucher specimens in collections.

Several years ago, John Kartesz, who keeps a vascular plant checklist for North America (Kartesz, 1994), was kind enough to send me his own projected tally of New York plants for review. Since then, I have reported back to him on a species-by-species basis, detailing those that we accept as having been reliably reported from the state. This involved deletion of over 200 species, based on known misidentifications published in the literature, as well as misquotes and speculations by authors going back as far as the 18th Century. In addition, there were roughly equal numbers of taxa deleted, based on taxonomic disagreements, reducing the number of reliably reported New York species from his total of nearly 4,000 to just over 3,600. These are all documented in the upcoming state checklist (Mitchell & Tucker, 1997).

The Torrey Legacy

It is amazing that John Torrey, in a six year period (1836-1842), was able to document the state flora in such detail, considering his transportation methods and the general lack of "infrastructure" in the modern sense. The railway system was in its early stages of development at the time, but newly-built canals and buggy roads were extensive in the lowlands; however, montane areas like the Catskills were traversed by a few "turnpikes," that amounted to two-rut (and plank) roads, and over 98% of the Adirondacks (which were as yet unnamed) required bushwhacking.

John Torrey's travels on horseback, by wagon, barge and rail, were extensive, and he was a member of the first exploration party to climb the summit of Mt. Marcy. His five-year tally of native plants reached almost 1,400, roughly 600 below the currently known total. Introduced species were relatively rare at the time, even though some well-known pests of today were around, such as Purple Loosestrife (*Lythrum salicaria*) and Orange Hawkweed (*Hieracium aurantiacum*). It is interesting to read early accounts praising the colorful contribution these garden escapes made to the landscape. But the late 19th century began a deluge of less "desirable" weedy species that invaded freely and became naturalized along canals, railways and roads, as they continue to do today.

The House Legacy

By the time Homer House published his annotated checklist of New York State flora (1924), the number of reported native species had risen to 2,133, which is 55 more than we recognize today. This discrepancy is largely due to the splitting of taxa by taxonomists of House's era (Miller & Mitchell, 1995), especially the naming of hundreds of species of *Rubus* and *Crataegus*, most of which are now considered minor variants of polymorphic species that maintain their identities through cloning and asexual fruit production (apomixis). By current taxonomic standards, House's native species list would stand at around 1,800. His work was scholarly and thorough, but little-used, partly due to the fact that he followed the American Code of nomenclature, which was abandoned in 1932 in favor of an International Code. House listed over 800 species of introduced plants, most of which he considered to be naturalized or frequent escapes from cultivation. His work remains an excellent source of early 20th century data and interpretation, vouchered by over 30,000 of his own specimens.

The Smith Legacy

Although Homer House was the first to start keeping distribution maps of all plant species known in the state, ca. 1915, most major contributions to our knowledge and to this set of files (housed at NYS) were made by Stanley J. Smith. From the time of his youth in the 1930s, Stanley explored Chemung County, and later all of New York, in search of additions to the state flora, and to the known distribution ranges of all plants groups as well. As curator of the State Herbarium from 1947 to 1978, he collected even more specimens than Homer House, and added tens of thousands of observations to the state distribution maps. By the late 1970s, he had reinterpreted the flora in terms of the taxonomy of the era, and his informal tally of reliably reported New York flora stood at about 1,900 native and 1,400 introduced species, for a total of some 3,300.

Modern New York Checklists

An eight year resorting and augmentation of Smith's data was reflected in my first checklist (Mitchell, 1986), and, since that time, ongoing evaluation of the New York State flora has yielded the book from which the following tables are taken (Mitchell & Tucker, 1997). In addition to over a thousand taxa rejected on taxonomic grounds, some 200 more are to be found in a list of excluded species at the end of the book. These are listed based on known cases of misidentification, doubtful reports and listings with insufficient supporting evidence.

The Revised Checklist will be out in May -- just time for the field season -

The new revised checklist of New York State plants by Mitchell & Tucker has long been promised, we know. It was made camera-ready for the printer in June of 1996 and submitted at that time to the State Education Department for publication. Details of bureaucratic gridlock need not be explored here, but it suffices to say that the book will soon be available. There are good aspects to this, despite earlier discomfort. We have added three species and subtracted about half a dozen while waiting for action on publication. I have also made a number of corrections to the manuscript and transferred them to the master copy. All in all, it will be a better book now. I hope all of you who want it will be able to get it soon from: **N. Y. State Museum Publications, 3140 C.E.C, Albany, NY, 12230.** (Sorry, no price yet)

NYFA Field Trips for 1997

TRIP #1 - Rochester & Vicinity

Saturday & Sunday, May 24-25

Join us on our Spring Tour of the botanical wonders of New York State's greatest fens -- Bergen Swamp and Zurich Bog. We will also tour The Rush Oak Openings Preserve and visit the limestone woodlands and cliffs of the Onondaga Escarpment. This is a great opportunity to see some of the state's rarest plants and communities. The trip is limited to 24 participants, so call **Bob Zaremba** to reserve your spot at: **518-463-6133 ext. 226 (or 518-274-7419).**

Trip # 2 - The Montauk Peninsula of Long Island

Saturday & Sunday, Sept. 5-6

We will be exploring the outermost limits of Long Island, an area famous for its unusual flora, including: Napeague Beaches, Walking Dunes, Oyster Pond, Montauk Point, the woodlands at Hither Hills, and grassland restoration burns at Prospect Hill. We may even see the very rare sand plains gerardia (*Agalinis acuta*), which should be in bloom at that time. Even if you must travel a considerable distance, try not to miss this one, as it is a very special tour. We hope to arrange housing for you, for which there will be a charge. Call Bob Zaremba for details (see phone numbers above).

Trip #3 - Shawangunk Mountains

Saturday, September 28th

We will visit rare plant sites at Sam's Point and the ice caves, and see a rare plant community, the dwarf pine barrens. The Gunks are spectacular in the fall! Meet at 10:30 a.m. at the commercial ice cave operation in Cragsmoor above Ellenville. $6.00 admission. For more information, call Robert Zaremba at the number listed above.

Now you can send me your articles and comments via e-mail. **My address is: rmitche3@mail.nysed.gov** (RSM, Editor)