Ferns and Fern Allies of the Garden Canyon Area of the Huachuca Mountains, Cochise County, Arizona[1]

George Yatskievych
Department of Plant Sciences
University of Arizona

Introduction

The Pteridophytes of southeastern Arizona are an interesting and diverse group of plants that have received little study in the recent past. Although several botanists have made collections in this area, beginning with J. G. Lemmon in the 1880s, there are few publications describing the Pteridophytes there, and most of these are outdated. The species are, however, all included in Morton's treatment of Pteridophytes in *Arizona Flora* by Kearney and Peebles (1960). Ferriss (1909) published a nontechnical article on fern species that might be found in Cochise County. Goodding (1912) published a short article describing some species of ferns from the area. Phillips (1945, 1946) published some notes on Arizona ferns and (1946a, 1947) a checklist of Arizona ferns. The Arizona Game and Fish Commission surveyed some of the plants, including Pteridophytes, of the Fort Huachuca Military Reservation in Cochise County, as part of a Wildlife Area Investigation (1949–1951). More recently, Reeves (1976) included the Pteridophytes in a flora of the Chiricahua National Monument.

The purpose of this present project was to survey the ferns and fern allies occurring in Garden Canyon, a rich canyon area of the Huachuca Mountains in southeastern Arizona, to ascertain which species were growing there and to provide information on the habitats and distributions of these plants.

The Area

Garden Canyon and its tributaries are located on the northeastern side of the Huachuca Mountains, in Cochise County. The area has received little attention in the past 25 years because it is located on the Fort Huachuca Military Installation. It includes what J. G. Lemmon called Tanner Canyon, the source of many of his Huachuca Mountain collections.

Garden Canyon is an open canyon about 4⅓ miles long that drains toward the northeast. The elevational change is from 5100 feet to 7750 feet. There are 3 major vegetation zones in the canyon. At the mouth is a desert-grassland zone, with scattered *Agave*, Mesquite *(Prosopis)*, Cholla *(Opuntia)* and Prickly Pear *(Opuntia)* in a flat, dry, grassy area. This quickly grades into an Oak/Manzanita zone that might best be termed a Chaparral. The zone is characterized by dense stands of mixed shrubs, predominantly Scrub Oak *(Quercus)* and Manzanita *(Arctostaphylos)* with occasional cacti and larger *Juniperus*. Finally, toward the upper end of the canyon, there is a gradual transition to a conifer forest, with *Pinus* and Douglas Fir *(Pseudotsuga)*

[1]The author wishes to thank Dr. Charles T. Mason, Jr. for much help and many suggestions during the course of this project.

the dominant vegetation. This zone occurs as low as 5900 feet. A stream that is intermittent with perennial flow in some areas is found throughout the canyon bottom.

The study area also included the 3 primary tributary canyons of Garden Canyon. The uppermost of these is Sawmill Canyon, which branches toward the southeast near the upper end of Garden Canyon. This tributary canyon is about 2¼ miles long, with an elevational change from 5900 feet to well over 7750 feet. It is characterized by many open, barren outcroppings of dolomitic limestone, on which few plants grow. The predominant vegetation zone is the conifer forest but there are many scattered patches of Chaparral. A perennial spring is located about ¾ mile from the canyon mouth.

Also in the upper half of Garden Canyon, is Scheelite Canyon, which branches toward the southeast and is about 2¼ miles long. Its elevation is 5800–7250 feet, with a box at the upper end. This narrow, rocky canyon is walled by high cliffs, making it a very sheltered habitat. An intermittent stream runs in the canyon bottom. The third major tributary of Garden Canyon is McClure Canyon, which branches toward the northwest at 5500 feet. This tributary is about 2½ miles long and climbs to the ridge at 6750 feet. It is one of the wettest areas in the Huachuca Mountains, with a large series of perennial springs and a perennial stream in the upper half. The rest of the canyon is dry Chaparral, however.

The Garden Canyon area is rich in Pteridophytes because it contains many different exposures in a variety of habitats. Of particular importance are the smaller isolated habitats that are scattered through the canyon system. These account for the limited distributions of some species as well as the Pteridophyte diversity. One of the commonest isolated habitats is that of the limestone cliff which occurs below the ridge in several areas throughout the canyon system. The limestone substrate seems to allow good seepage and the craggy nature offers both good protection and good anchorage for the plants. Greater numbers of plants were found on cliffs with a northern exposure than on comparable sites with other exposures.

Another common smaller habitat is that of the steep and very dry rocky hillside. This occurs in a few locations in Garden Canyon and lower McClure Canyon. The most xerophytic of the Pteridophytes of the study area grow in this exposed habitat. Such plants are usually dormant, with brown, curled, dry fronds during the drier portions of the year. The Pteridophytes are generally found growing from under the larger rocks; they seldom grow in open soil.

A third major isolated habitat is that of the riparian zone which occurs in the canyon bottoms throughout the Garden Canyon area. It is restricted to the areas immediately bordering the streams, except in upper McClure Canyon where there are large riparian groves. The dominant riparian vegetation is Cottonwood *(Populus)*, Sycamore *(Platanus)*, Walnut *(Juglans)* and Maple *(Acer)*, with a dense, varied understory. The Pteridophytes that occur in this habitat are confined to the areas where the stream flow is perennial. They are becoming more widely distributed as the water re-routing by the U.S. Army brings more water to the surface.

Methods

For this study, the Garden Canyon area was roughly divided into 15 sections. Each section was examined several times. The bulk of the field work was accomplished from January to July of 1978, with periodic trips afterward to verify some of the findings. Each section was thoroughly searched and all likely habitats for Pteridophytes were examined. The survey area extended from the canyon bottom to the nearest ridge on each side and included all tributaries and ravines. The only exception to this procedure was in upper Sawmill Canyon, where the survey ended at the Fort Huachuca boundary fence, about 100 feet (in elevation) below the ridge.

Collections were made of each species found. Voucher specimens were deposited at the University of Arizona Herbarium (ARIZ) and at the field herbarium of the Fort Huachuca Game Management Office. Specimens were identified using *Arizona Flora* by Kearney and Peebles (1960), and where necessary the names were brought up to date. Specimens were examined at the University of Arizona Herbarium, particularly the numerous Huachuca Mountain collections of Goodding, in order to pinpoint the locations of some of the less common species in the canyon system.

Results

During the course of the survey 33 different Pteridophytes were collected, comprising 13 genera and 32 species. One additional species was found during the herbarium search, which could not be located in the field. The genera and species in the

Cheilanthes fendleri.

Notholaena sinuata.

following list have been alphabetized to facilitate species location.

SELAGINELLACEAE

Selaginella underwoodii Hieron var. ***dolichotricha*** Weatherby. Found at only one location in the study area, but locally common there. This spikemoss grows at 6700 feet, on rock faces at the upper end of a steep ravine, located at the head of a small side canyon that branches southward near the mouth of Garden Canyon. This ravine was found to be especially rich in Pteridophyte diversity, harboring 6 species of ferns and fern allies uncommon in the Garden Canyon system. The ravine is moist with seepage year-round and is relatively sheltered by the surrounding cliffs. The substrate is mainly limestone, with several large granitic outcroppings. The topography is such that a series of ledges is formed in the middle.

EQUISETACEAE

Equisetum hiemale L. var. ***affine*** (Engelm.) A. A. Eaton. Found growing semi-aquatically in sandy soil in riparian areas where the stream flow is perennial. This species occurs throughout Garden Canyon, above 5400 feet, in scattered colonies. A large stand is also located in a marshy area, in mucky soil, at McClure Springs.

Equisetum laevigatum A. Braun. Collected at the same locations in Garden Canyon as the previous species, but absent in McClure Canyon. Where the 2 species grow together, this is invariably the more abundant one. It also seems to form more extensive colonies than *E. hiemale,* with the plants growing further from the surface of the water. The hybrid between *E. hiemale* and *E. laevigatum (E. Xferrissii* Clute*),* common elsewhere in southern Arizona, was not found in the Garden Canyon system.

POLYPODIACEAE

Adiantum capillus-veneris L. Limited to one location in the Garden Canyon area. This species was found only in the vicinity of McClure Springs, at 6250 feet. It grows on elevated stream banks below the springs and on moist cliff overhangs, in mucky soil. It is also confined to relatively shady locations. The fronds seem to die back every winter.

Asplenium exiguum Bedd. Included in the survey on the basis of a single specimen (*Goodding 142-52,* ARIZ). The label on this sheet reads "Steep side canyon; Garden Canyon, Huachuca Mountains." The collection date is December 26, 1952. No plants of this species were seen in the Garden Canyon system during this survey.

Asplenium monanthes L. Uncommon in the study area. A few plants were found in a very sheltered rock crevice, with mosses, at 6600 feet in the same ravine described earlier for *Selaginella underwoodii.*

Asplenium resiliens Kunze. Collected in moist areas, in and around Scheelite Canyon, between 5800 and 7000 feet. This species grows from cracks in rocks and on limestone cliff faces, near streams and seepage areas. It is fairly common in protected areas of the Scheelite Canyon stream bed, but its range does not extend to the box at the head of the canyon, probably because the wet areas become more localized and less permanent as the canyon widens into the box.

Boomeria hispida (Mett.) Underw. One of the commoner ferns in the Garden Canyon area, below 6000 feet. It is abundant under shrubs in the Chaparral habitat, but may also be found on partially shaded rock ledges.

Cheilanthes alabamensis (Buckl.) Kunze. Restricted to moist, rocky situations. A small colony of this fern was found near the mouth of Scheelite Canyon, at the 6000 foot level, where it was growing in the canyon bottom with Asplenium resiliens.

Cheilanthes eatoni Baker. A common fern of rocky situations, throughout the Garden Canyon area. It grows abundantly in moister situations, and is replaced on the driest, most exposed cliffs by *Cheilanthes lindheimeri.* Forma *castanea* (Maxon) Correll is much more abundant than f. eatoni, which grows in scattered locations, throughout the range.

Cheilanthes feei Moore. Widely distributed in the survey area, but nowhere abundant. This fern is restricted to the limestone cliff habitat, growing from cracks in the cliffs, and is less common in exposed situations.

Cheilanthes fendleri Hook. Abundant in the Chaparral habitat, often growing with *Boomeria hispida* and *Cheilanthes wootoni.* It grows from under rocks, and in rocky soil, often shaded by trees and shrubs.

Cheilanthes lendigera (Cav.) Swartz. Restricted to a single location in the survey area. A colony of this species was found growing at the 6500 foot level in the same steep ravine described earlier for *Selaginella underwoodii* and *Asplenium monanthes.* It was locally common there.

Cheilanthes lindheimeri Hook. Found in several habitats, throughout the survey area. It grows in large patches in the Chaparral habitat, and from exposed cliff faces. It is one of the most xerophytic of the area Pteridophytes, and may even be found growing from under rocks on the exposed, dry, rocky hillsides.

Cheilanthes villosa Davenp. Uncommon in the Garden Canyon area. This species was found on a south-facing, dry, steep, rocky hillside, at 5900 feet, across from the mouth of Scheelite Canyon, in Garden Canyon. It also occurs in this habitat below 6000 feet at a few other locations in Garden Canyon.

Cheilanthes wootoni Maxon. Abundant in the Chaparral habitat, usually growing with *Boomeria hispida* and *Cheilanthes fendleri.*

Cheilanthes wrightii Hook. Restricted to one locality in the survey area. A small colony of this species was found growing on a rocky slope near the canyon bottom, in lower Garden Canyon, at 5300 feet. The fronds of this small xerophyte dry up and become inconspicuous fairly early in the year and it is possible that the species is more widely distributed in the survey area than the collections indicate.

Cyrtomium auriculatum (Underw.) Morton. = *"Phanerophlebia auriculata* Underw." Restricted to a

single location in the survey area. A colony of this species was found at the same location earlier described for *Selaginella underwoodii.* The plants grow in moist soil with the rhizomes deeply recessed at the base of an overhanging terrace.

Cystopteris ***fragilis*** (L.) Bernh. var. ***tenuifolia*** (Clute) Brown. Abundant in Sawmill Canyon, above 7200 feet. This species grows in moist, loamy soil, under conifers. The deciduous fronds do not appear until late May.

Notholaena aschenborniana Klotzsch. Restricted to one locality in the survey area. A colony of this species was found on the south-facing, dry, steep, rocky hillside in Garden Canyon, across from the mouth of Scheelite Canyon, between 5800 and 5900 feet. Some of the plants were growing with *Cheilanthes villosa.*

Notholaena aurea (Poir.) Desv. Found at the mouth of Garden Canyon, under trees and shrubs near the edge of the Chaparral zone. This species inhabits the opener sections of the Oak/Manzanita habitat and was also found on an open hillside in middle McClure Canyon. It grows below the 6000 foot level.

Notholaena cochisensis Goodding. A common inhabitant of the steep, dry, rocky, exposed hillsides, throughout the Garden Canyon area.

Notholaena grayi Davenp. Restricted to steep, dry, rocky, exposed hillsides below 5700 feet. This species was found in both lower Garden Canyon and lower McClure Canyon.

Notholaena integerrima Hook. Uncommon on steep, dry, rocky, exposed hillsides throughout Garden Canyon. This species is much less common than related species *N. sinuata* and *N. cochisensis* and is less widely distributed. It is more frequent in the upper half of Garden Canyon than the lower half, but is nowhere abundant.

Notholaena limitanea Maxon var. ***limitanea.*** Found throughout the Garden Canyon area, but nowhere abundant. This species is found in moist situations, growing from under rocks or from cracks in cliff faces. It is most common in shady areas, adjoining the riparian zone.

Notholaena sinuata (Lag.) Kaulf. A common inhabitant of the steep, dry, rocky, exposed hillsides, throughout the Garden Canyon area.

Pellaea atropurpurea (L.) Link. Frequent in moist, rocky situations, throughout the survey area. This species is frequently found growing with *Notholaena limitanea,* but is more abundant.

Pellaea intermedia Mett. Found on steep, dry, exposed, rocky hillsides and cliffs below 6500 feet, in Garden Canyon and McClure Canyon. This species is not very abundant in the survey area.

Pellaea ternifolia (Cav.) Link var. ***wrightiana*** (Hook.) A. F. Tryon. = *"Pellaea wrightiana"* Hook. Abundant throughout the survey area. This species was found in every habitat in the Garden Canyon area, except on the most exposed cliffs. It was less common in very moist, riparian situations. The individual plants were widely scattered.

Pityrogramma triangularis (Kaulf.) Maxon var. ***maxonii*** Weatherby. Restricted to one location in the survey area. This species was found in a dense colony in the microhabitat created by the sheltering over-hang of a large boulder, just below the ravine described earlier for *Selaginella underwoodii* and *Asplenium monanthes.* The pocket was densely shaded and the plants were growing in very moist, fine, sticky soil. This is the first published report of *Pityrogramma triangularis* var. *maxonii* from Cochise County, although this population was previously collected from by Goodding (163–50, 139–52, 11–53) in 1950–1953.

Polypodium thyssanolepis Klotzsch. Restricted to very sheltered, moist situations. This species was found in two locations in the survey area, growing in overhanging limestone cliff areas. The first was in the ravine previously discussed for *Cheilanthes lendigera* and *Selaginella underwoodii.* The second was in a short series of cliffs just above the canyon bottom, in lower Garden Canyon, in the riparian zone, at 5300 feet.

Woodsia mexicana Fee. Widely distributed in Garden Canyon, below 6500 feet. This species occurs in moist, rocky areas, and on moist limestone cliffs. It is able to grow in fairly exposed situations, and the deciduous fronds appear as early as March.

Woodsia plummerae Lemmon. Widely distributed between 5300 and 7750 feet in Garden and Sawmill Canyons. This plant is found in the habitat previously described for *Woodsia mexicana,* as well as growing with *Cystopteris fragilis,* in moist soil under trees in the confier forest. It also has deciduous fronds that appear as early as March.

Literature Cited

Arizona Game and Fish Commission, Wildlife Restoration Division. 1949–1951. *Fort Huachuca Wildlife Area Investigations—Job Completion Reports of the Charles T. Vorhies Game Habitat Research Project.* pp. 1–28.

Ferriss, J. H. 1909. Ferns of Cochise County, Arizona. *Fern Bull.* 17: 1–7.

Goodding, L. N. 1912. New Southwestern ferns. *Muhlenbergia* 8: 92–94.

Kearney, T. H., R. H. Peebles and Collaborators. 1960. *Arizona Flora.* 2nd ed. University of California Press. Berkeley. pp. 27–49.

Phillips. W. S. 1945. Some notes on Arizona ferns. *Amer. Fern Journ.* 35: 58–60.

Phillips, W. S. 1946. Additional notes on Arizona ferns. *Amer. Fern Journ.* 36: 58–60.

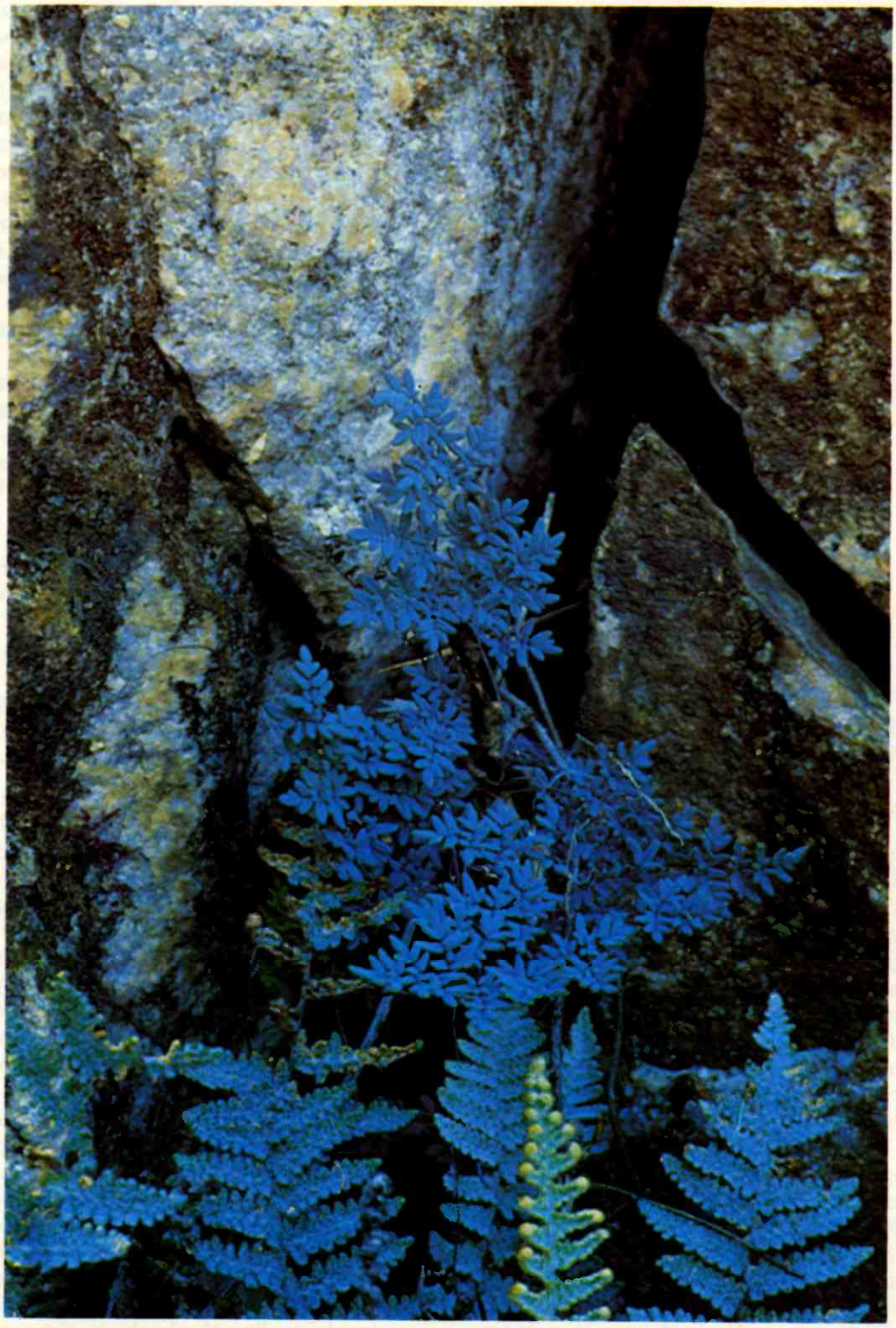
Phillips, W. S. 1946a. A checklist of the ferns of Arizona. *Amer. Fern Journ.* 36: 97–108.

Phillips, W. S. 1947. A checklist of the ferns of Arizona, cont. *Amer. Fern Journ.* 37:13–20, 39–51.

Reeves, T. 1976. *Vegetation and Flora of Chiricahua National Monument, Cochise County, Arizona.* MS thesis. Arizona State University. Tempe. pp. 99–102.

Cheilanthes lindheimeri.

Cheilanthes eatoni.



Notholaena limitanea (upper) with Cheilanthes lindheimeri.