MOHONK PRESERVE, INC.

Research Report

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Shawangunk Plant Species: Decreases and Increases During 100 Years

by

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and

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Abstract: Decreases and increases of populations of Shawangunk plant species are of interest in connection with understanding the changing ecosystem of this Hudson Valley range. While reviewing observational records for a "Flora of the northern Shawangunks," covering in some cases 100 years, we chose 39 species of vascular plants, representing 24 families, that had shown a change in status. This amounts to approximately 5 percent of the vouchered species now found in the Preserve herbarium. Twenty-four of these (21 native, 3 introduced or naturalized) were listed as having suffered a population decrease. Fifteen of them (2 native, 13 introduced or naturalized) showed an increase in numbers. Reasons for the changes (known or hypothetical) are discussed in detail for each species.

INTRODUCTION

Concern is being expressed by ecologists about the decline in diversity of plant communities because of the loss of species. In this connection, while recording observations of individual species of plants in the Shawangunks, covering up to 100 years, we became aware of changes in status of some of these--both increases and decreases. This report will record those that have come to our attention thus far. Reasons for the changes are considered where known or may be inferred.

In the discussion of species the following terms are used: native, those plants that occur naturally and historically in this region; introduced, plants that have been either originally planted here, i.e. in horticulture, or those arriving inadvertently or accidentally by whatever means; naturalized, introduced plants that have become widespread or completely established by regular reproduction; escapes, localized plants that are found originating from planted, reproducing colonies or individuals, which are not as yet thoroughly established.

The family numbers are those in use in arranging the Mohonk Preserve herbarium, following the order of Gleason's "Britton and Brown Illustrated Flora," 1952.

DISCUSSION OF SPECIES

11. Ostrich Fern. (*Matteuccia struthiopteris* var. *pensylvanica*). Native.

This species is not listed in the "Flora of Mohonk," 1895, or "Minnewaska's Flora," 1896. Our only record in the vicinty of Mohonk Lake dates from 1940 at a single station 1¼ miles north of Mohonk Lake. As of 1981, a search of this station showed that it had disappeared. An introduction of this species along a Mohonk Garden Fern Trail has been thriving for several years.

Gleason's "Britton and Brown Illustrated Flora," 1952, lists this plant's habitat preference as "swamps and moist wooded slopes and flats in circumneutral soil." When examing the site in 1981, it was noted that this station was on the fault line between conglomerate and shale. Soils over the former substrate rock are

acid (pH 4.7±), while soils over the shale are nearer neutral (pH 5.3, range 5.0 to 5.5).

Our pH testing of precipitation at Mohonk Lake does not go back far enough to indicate whether acid rain might have been a factor in the disappearance of the plant from this station.

12. American Yew (Ground Hemlock). *(Taxus canadensis)*. Native.

In the vicinity of Mohonk Lake, it has been known only from Rhododendron Swamp. A marked decline there has been noted over the last five years. Typical deer nipping has been observed. Rhododendron Swamp is a known winter deer yard. In some places where there are small plants remaining, they are between boulders where one can imagine a snow blanket protecting the plants. In 1980, several plants were noted on top of a large conglomerate boulder inaccessible to deer. In 1954, Henry Dunbar noted that "continual cropping by deer keeps it down so that a good enough twig for mounting hardly exists" (Catskills).

13A. Red Cedar. *(Juniperus virginiana* var. *crebra)*. Native.

With minor exceptions, the presence of this species at any place at any one time is the resultant of the factors of suitable germination site, seed source, and various inadvertent human and natural influences. On the slopes of the mountain adjacent to Mohonk, nearly pure stands of Cedar developed after the abandonment of farming some 50 years or more ago. These have mostly succumbed to crowding by deciduous competitors, or harvesting for Mohonk rustic work. The presence of widely scattered, large, dead or nearly dead Cedar trees in a hardwood forest today usually indicates that the area was once in an open condition. This cycle is continuing at a lesser rate today.

The minor exceptions mentioned above, consist of individual trees; presumably bird seeded, along the shoulders of carriage roads and on conglomerate, which have survived in a depauperate state. We presume that their immediate habitat allowed them to persist because of its relative openness.

13B. Norway Spruce. *(Picea abies)*. Introduced and escaped. Native in northern central Europe.

In 1948, the junior author first noted seedlings apparently self-seeded from mature trees nearby. In May 1955, a seedling about one foot tall was found in the area of Pine Grove Picnic area. This is some 100 m. from the nearest large mature trees at Home Farm. Henry Dunbar, in 1959, noted the species was speading from plantings and becoming established in this area. A count by the junior author in 1974, recorded 11 seedlings and saplings, from 1.5 to 2.4 feet tall. One of these, a 9 foot specimen, was dead.

13C. Scotch Pine. *(Pinus sylvestris)*. Introduced and escaped. Native of Europe Siberia.

In 1924, Homer D. House, in his Annotated List of Ferns and Flowering Plants of New York State, noted that Scotch Pine was "common in cultivation and extensively used in forest plantations. Natural reproduction sometimes occurs and will doubtless become common as existing young plantations approach maturity." In the 1960's, Henry Dunbar noted that in some areas of Ulster County it was spreading spontaneously at plantings. At least three stations in the northern Shawangunks are now known where

this is occurring, in soils over both conglomerate and shale bedrock.

13D. Douglas-Fir. *(Pseudotsuga taxifolia)*. Introduced and escaped. Native in western mountains of U.S.

This tree is listed in Ulster County Flora as a local escape at Mohonk Lake. Specimens were planted in the Mohonk Garden and, it is believed, in the former Mountain Rest nursery. Evidence that the species was present in the nursery is that three seedlings have been known for some years at the edge of adjacent woods on a roadside shale bank.

16. Broad-leaved Cat-tail. *(Typha latifolia)*. Native.

This plant has been considered common in suitable habitats through the record period. Such habitat seems to be where the substrate is shale. In the 1920's there was a stand of this species along the northerly shore of Duck Pond. It was gradually replaced by Purple Loosetrife. The invasion may have been selectively hastened by muskrat preference for cat-tails. (See Purple Loosetrife, No. 128).

23A. Orchard Grass. *(Dactylis glomerata)*. Introduced and naturalized from Europe.

Probably in the first third of this century, Orchard Grass was planted on Mohonk farms. The junior author remembers in the 1940's, it was considered to be a problem species in hayfields, because of its early maturity (due to it then becoming tough and woody before its companion, Timothy, was ready to be harvested). It has become a common species along edges of Mohonk carriage roads and in abandoned fields.

23B. Phragmites. (Common Reed). *(Phragmites communis)*. Native.

This is a very common plant along the Hudson River and quite numerous in adjacent valleys. Our limited study of its distribution on the Shawangunk ridge suggests that it appears only on soils whose pH is influenced by shale. Listing this as a species that has increased may be due either to the chance of seed dispersal or insufficient observation. In support of the former, three of the four sites are where machinery from the Hudson Valley had been involved with powerline or concrete work.

42A. Pink Lady-slipper. *(Cypripedium acaule)*. Native.

In 1895, this species was listed in the "Flora of Mohonk." From 1931 to the mid 1960's, it was looked on as a common spring flower. Since 1964, a certain stand near Home Farm was visited yearly for count of blossoms and plants. In 1964, there were 85 blossoms. Numbers of blossoms decreased to 28 in 1968 and 1970, to 8 in 1971, and none in 1974. Since that date there continued to be no blossoms. During these years there were 10 to 20 plants without blossoms, which tended to be small in size. In this period of decline, the canopy has remained much the same--White Pine and one White Birch--and has not changed significantly as to closure. There is a minor deer trail through the stand. The junior author, in a Mohonk Trust Research Report (1977), suggested the following possibilities to account for the decline:

1. increasing competition from other plants,
2. climatic fluctuations (1965 was the end of a 5-year growing season drought),
3. acid rain or pollutants in air or precipitation,

4. stand "running out,"
5. deer browse

A similar decline in the limited number of albinos is also noted at this and other sites.

42B. Yellow Lady-slipper. (Moccasin flower). *(Cypripedium calceolus* var. *pubescens).* Native.

In 1895, this species was listed in the "Flora of Mohonk." During the last 50 years it has been found at seven sites. Of these, two, near together, have been observed intensively from 1967 to the present. These are lumped together in the following summary, as updated from a Mohonk Trust Research Report, May 1977:

Year	No. Blossoms	No. Plants	Remarks
1967	172	-	-
1968	(95)		bloom over
1969	144	-	-
1970	-	-	only buds at count time
1971	75	-	-
1972	46	-	-
1973	9	28	-
1974	4	11	-
1975	2	35	-
1976	0	26	-
1977	0	53	two probably browsed
1978	0	42	mostly small plants, one browsed
1979	0	14	one bitten off
1980	0	11	-
1981	0	18	-

The junior author, in 1969, recorded that about one-tenth of the 144 plants were two-flowered, and in 1972, none of the 46 blooming were two-flowered. Could this apparent decrease be related to a decline in vigor of this station?

At another site that has been watched since 1964, there were 5 blossoms in 1968, 1 in 1975, and since then, no plants were found.

The assumption that deer may have been adversely influencing Yellow Ladyslippers dates from 1950 when the junior author noted at the principle stand "leaves apparently eaten by deer." As recorded in the above table, in 1977 two of the larger plants of this stand had upper portions missing and apparently bitten off. In 1978 and 1979 there was additional evidence of browse. Finally, we recorded that a regularly used deer trail goes through this site.

It has been reported to us that a cottontail rabbit has been observed eating these plants and that chipmunks or voles had disturbed the roots of transplanted Yellow Lady-slippers.

42C. Whorled Pogonia. *(Isotria verticillata).* Native.

This plant has been known at Mohonk since 1957 at six stations, two of these numbering only a few plants. One of these has disappeared completely. In 1974, 5 blossoms were counted in a stand of 85 plants. No blossoms have been seen at that station since 1979. Whether the decline in bloom is due to some periodicity* within

this perennial species, or if it is affected by drought or acid rain, or is suffering from deer browse, as are other members of this family, is unknown.

49. Chestnut. *(Castanea dentata)*. Native.

In 1913, a record tells of the removal of live trees of this species along a carriage road at Mohonk on account of fast spreading blight through the country. We have no written record of when the blight began to take affect at Mohonk. By the 1920's, the mature Chestnut trees were dead and were being harvested for lumber and fuel wood.

As of 1970, Chestnut sprouts surviving from the original stand were frequent in mixed deciduous woods, except in the very driest rocky sites. No seedlings have been found. Chestnuts are not found in the former fields that were coming up to forest at the time of onset of the blight. In 1979, Robert Whittaker told the junior author that it was his subjective judgment that Chestnut sprouts were more abundant in the Mohonk area than any of the forests he had visited along the Appalachians between the Great Smoky Mountains and northern New England.

In 1977, a baseline study was started, with 10 plots laid out and all Chestnut stems on each were measured. This in part was to see if there was a trend in change in basal area toward a fewer number of larger saplings. It is assumed that some of the original tree root systems may be gradually loosing their suckering ability due to death. This study is scheduled to be repeated after the growing season in 1982. Records of the 1977 survey are found in the Preserve files.

Several trees of fairly good size, some producing sound nuts, are being watched. These include the following:

Location	dbh	Height	Remarks
Mountain Rest	7.9 in.	40 ± ft.	few burrs.
S. of Copes Lookout Path	8.0 in.	50 ± ft.	many small burrs; few nuts appear sound.
Copes Lookout Path	6.1 in.	40 ± ft.	dead Oct.'80, 25 yrs. old by core.
Laurel Bed, N. of Garden	6.8 in.	40 ± ft.	few burrs 1980, dead Oct.'81.
Peterskill Road (Minnewaska State Park)	4.4 in.	21 ± ft.	sound nut found.

Over 25 years of observations of several pole size trees for several miles of the Shawangunk ridge may be a hopeful sign that some degree of immunity is being developed by individual trees of the original genetic stock. This raises the interesting question as to whether such immunity would be carried over to seedlings growing from nuts from these trees. Ruth and Keith Smiley have told us of their several attempts to germinate chestnuts from sound nuts. As yet they have not had success due to rot, presumably because nuts were confined over winter in containers to prevent rodent damage.

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* from Gleason's "Britton and Brown Illustrated Flora," 1952--"Orchids depend on mycorrhizal fungi for at least part of their food; some are wholly devoid of chlorophyll, and some are known to exist underground for a considerable period before producing stems and green leaves."

83. Garden Red Currant. *(Ribes sativum).* Introduced and naturalized. Native in Old World, long in cultivation in North America.

This species was listed in "Minnewaska's Flora," 1896. The following information comes from files about White Pine Blister Rust control and the memory of the junior author.

For many years a patch of Red and Yellow Currants was maintained in the Mohonk gardens for the enjoyment of guests. These were probably planted about 1901. We believe that this patch was removed in the late 1920's by Daniel Smiley, Sr., because of his concern about the spread of White Pine Blister Rust. This disease was identified in 1941 in specimens from Mohonk forests by the State Conservation Department foresters.

Apparently the birds, as well as resort guests, had made good use of the currants and other fruits in the Mohonk "berry patch," having succeeded in distributing currant seeds throughout the area, within approximately ½ mile radius. On the slopes of the mountain this species was a common inclusion in farmstead gardens. We have records of its spread from these plantings into adjacent forest land.

From the late 1920's to the early 1940's, the junior author regularly eradicated escaped currants as the patches were found. Between 1943 and 1952, he recorded pulling 74 single plants and patches within the above ½ mile radius.

As of 1981, Red Currants are still found persisting in the vicinity of the Mohonk Garden. These are often depauperate. In the latter period (1952-1981) no effort has been made to eradicate currants, as White Pine Blister Rust is not considered a problem.

84. Pink-flowered Witch Hazel. *(Hamamelis virginiana* forma *rubescens* Rehd.*)*. Native.

This form has been noticeable at Mohonk for many years, represented by three stations. The only place in the literature where we find it divided is in Rehder's "Manual of Cultiviated Trees and Shrubs," 1958. A specimen at Rhododendron Swamp was observed regularly between 1938 and 1958. It was noted that the last time the plant fruited was in 1943. It died sometime after 1958. A station near the junior author's home, discovered in 1958, is still in vigorous condition.

89A. Bird's-foot Trefoil. *(Lotus corniculatus).* Naturalized. Native of Europe.

In the 1950's, the junior author was told by Mohonk head farmer, Lester Harvey, that Trefoil first appeared in a field east of the Testimonial Gateway in the 1920's. A specimen was sent by Al Kurdt, County Agent, to Cornell for identification. It was later planted as a hay and forage crop (Empire strain), with use of innoculant. It was relished by cows and horses, who were observed to pick it out of mixed hay.

As of 1981, it is found commonly along carriage roads and in old fields (presumably spread through animal manure). Some of these sites are in acid soil areas (such as Lake Awosting), but where we presume shale has neutralized the roadbed.

89B. White Sweet Clover. *(Melilotus alba).* Naturalized. Native of Europe and western Asia.

From recollections of the junior author, it was a common roadside plant along roads in the farm area on the east slope of the mountain, as well as more limited distribution at the top of the mountain over conglomerate substrate. He has the definite

impression that as of 1981, there is much less of this species at both of the above locations. We are not aware of a change in habitat to account for this decrease. Could acid rain be an unrecognized factor?

96. Ailanthus. (Tree-of-Heaven). *(Ailanthus altissima)*. Introduced and naturalized. Native of eastern Asia.

This species was first noted at two adjacent locations at Mohonk in 1932, beside a building and probably not planted. Currently, several sites are known along road shoulders. It is spreading mostly by root sprouts, and to new sites as a result of excavation and filling from road work.

102. Broom Crowberry. *(Corema conradii)*. Native.

According to our research, the only inland site of this plant occurring in New York State on rocks in the Shawangunk mountains, on land now a part of Minnewaska State Park. The discovery and first collection at this site was by Alfred H. and Edward A. Smiley, relatives of the junior author, in 1881. Details of the history of this station are recorded in a Preserve Research Report--"Chronology of Corema conradii in the Shawangunk Mountains--the only New York State location--1881-1981," March, 1982.

From 1881 to at least the early 1930's, it was recorded as abundant in a restricted micro-habitat. From 1957 to 1981 dead plants were observed and the live ones noted as being in poor shape. In 1976 and 1981 vigorous healthy stands were noted on inaccessible ledges of the Palmaghatt facing cliff. The authors hypothesize that it has been deer browse that has been the major cause of the decline of *Corema* at this location. Human foot disturbance and the absence of forest fire to control competing ericads may have been minor adversity factors. The major drought of the 1960's apparently was not significantly damaging.

107. Bittersweet. A. *(Celastrus scandens)*--Native.
B. *(C. orbiculata)*--Introduced and naturalized. Native of eastern Asia.

Up to 1975, it was assumed that only one species was present in Ulster County. At that time, on a Torrey Botanical Club field trip to Mohonk Lake, a question was raised as to which species was seen on the walk. The co-leader explained that in the area around New York City, the introduced species, *C. orbiculata*, was replacing *C. scandens*. Subsequent checking for the Preserve herbarium by the senior author revealed that both species were present at Mohonk, with an indication that the plants closest to the Garden or dwellings were *C. orbiculata*. Old Mohonk Garden records state that *C. scandens* had at one time been ordered. There is no record of what was actually received.

112A. Orange Jewelweed. *(Impatiens biflora)*. Native.

This species was listed in the "Flora of Mohonk" in 1895, and "Minnewaska's Flora," 1896. M.L. Fernald's Gray's Manual of Botany, 1950, gives its habitat as "wet or springy places, even in acid or subacid swamps." As of 1981, the junior author feels that its overall status in the vicinity of Mohonk has not changed. However, at one station, Rhododendron Swamp Bridge, between 1968 and 1981, this species has disappeared. Record photographs taken in 1968 and repeated in 1981, show a thickening of shrub layer

vegetation. Also this is an area frequented by deer. During the last 5 years deer have been seen feeding extensively on this plant, even within a few feet of the junior author's house.

112B. Yellow Pale Jewelweed. *(Impatiens pallida)*. Native.

In 1895, this species was listed in the "Flora of Mohonk." It was not found in "Minnewaska's Flora," 1896, as was *I. bicolor*. This suggests to us the possibility that *I. pallida* was less widespread in the Shawangunks at that time. M.L. Fernald's "Gray's Manual of Botany," 1950, gives its habitat as "wet or springy places, often in shade and chiefly in calcareous areas" (see discussion of soil preference under Orange Jewelweed).

In 1928, it was recorded as abundant at one station in a small wooded swamp. It was not found there in 1980. A possible reason for this might have been closure of canopy. A nearby charcoal pit suggests that at an unknown date in the past, the immediate area might have been clear cut. Deer browse is also a possibility, as there are trails closeby, and extensive browse on *I. bicolor* has often been observed. In the light of Fernald's reference to calcareous soil, we wonder if acid rain might have been a factor.

128. Purple Loosestrife. ("Rebel Weed"). *(Lythrum salicaria)*. Introduced and naturalized. Native of Eurasia.

In 1931, J. Wilson Poucher in "Stories of Wild Flowers" noted that Loosestrife "made its appearance in this locality in the 1860's along the Wallkill where it thrived and filled the marshes and swamps...There is a prevailing tradition that it was in some way brought home by the returning soldiers of the Civil War...I am inclined to believe that this is simply coincidence." M.L. Fernald's "Gray's Manual of Botany" notes that it has become "locally abundant, often too aggressive in choking out our native vegetation."

In the 1920's there was a stand of Broad-leaved Cat-tails on the north and northwest sides of Duck Pond. It was gradually replaced by Purple Loosestrife. Fred Ford (DEC) suggests that as the Loosestrife started to invade, the process was selectively hastened by muskrat preference for cat-tails. From this replacement, an example of ecosystem ramifications has been noted. Purple Loosestrife comes up later in the spring than cat-tails. This timing difference has apparently caused Redwing Blackbirds to go elsewhere in the vicinity (to hay fields) to nest, since their urge to nest does not synchronize with the growth of the Loosestrife.

Throughout the area this plant has become a nuisance to farmers due to its invasion in wet portions of hay fields.

136A. Bunchberry (Dwarf Cornel). *(Cornus canadensis)*. Native.

This species was recorded in "Minnewaska's Flora," 1896. In the 1960's Henry Dunbar wrote that it is found in the "Canadian Zone, both Shawangunks and Catskills, rare below 1000 feet."

Between 1940 and 1981 various stations were recorded from the Palmaghatt (el. 1500 feet) to Sam's Point (el. 2250 feet)--Minnewaska State Park vicinity. No records of relative abundance over this period are available.

One station on Mohonk Preserve land (el. 950 feet) was recorded in 1951. A decline at this site from 100 plants in 1970 to 5 in 1980, was not accompanied by any apparent change in canopy or competing herbaceous plants. It was noted that these plants were progressively smaller. The last bloom was seen here in 1979. We do not know the reason for the decline of this station. Since it is an herbaceous perennial, deer browse seems unlikely, although growing season cropping could occur. It also seems unlikely that mycorrhizal problems due to acid rain would affect this stand and not others at higher elevations in the Shawangunks. Since this stand is at the edge of a swamp, droughts would not seem a likely cause.

This station is at the edge of a former carriage road, for the last several decades used only as a horseback and hiking trail, so the possibility of root competition by woody plants could be a factor. Might this be another example of the gradual decline of a relic boreal population due to long range ecological changes at this latitude and elevation?

136B. Flowering Dogwood. *(Cornus florida)* Native.

From 1931 to the late 1960's, Flowering Dogwood was enjoyed as a localized understory tree in deciduous woods, mostly over shale substrate. The most abundant stand was along part of Oakwood Drive. By the late 1960's, bloom was sparse at this site. In June, 1979, leaves of this species were found shrivelled and dropped at the same location. In 1980, the trees seemed partially dead with few leaves showing. On a 1980 Mohonk Nature Walk, a guest from New Jersey related to the junior author that "dieback" was occurring there. At the County Extension Office he had learned that it was a combination of factors--two unusually cold winters, two wet weeks in August, a borer, and normal age for decline of 35 to 40 years.

As of 1981, Dogwood trees in other areas, over conglomerate substrate, seemed healthy with normal foliage and floral display. At this time, we do not know if it would be soil or age differences that favored the latter trees.

138A. Trailing Arbutus. *(Epigaea repens)*. Native.

The blooming dates and abundance have been recorded for over 50 years. A decline in numbers of stations has been noted. A Preserve Research Report--"Arbutus Habitat," July 1976, proposes an interpretation of this change. This report suggests that Arbutus needs recently uncovered but undisturbed mineral soil for germination, such as an abandoned field, carriage road bank, or deer trail. But once established, the plants need freedom from competition of other plants, above or below ground, in order to continue to exist. This condition is found along Mohonk carriage roads (some a hundred years old) where Arbutus is still abundant. As far as we know, deer do not feed on Arbutus since it is found along their actively used trails.

138B. Large Cranberry. *(Vaccinium macrocarpon)*. Native.

This species was listed in "Minnewaska's Flora," 1896. Of several records in the Shawangunks from appropriate habitats, one is of particular interest. In November 1947, Don Eves and the junior author noted the plant in a vernal pool on the Dickie Barre ridge. In October 1952, a few fruits were found on plants at this site. In connection with field work in preparation of a "Flora of the Northern Shawangunks," we visited this vernal pool in July, 1981, and found the Cranberry had disappeared. The loss of the species from this site could be a result of the prolonged drought conditions during the growing season in the early 1960's, as the pool is fairly

shallow in a depression in the conglomerate bedrock. Since this is an acid tolerant plant, acid rain is not thought to be a factor. In our experience, deer browse is minimal on this species. The isolated location of this pool probably precludes human disturbance at this station.

148A. Closed Gentian. *(Gentiana clausa)*. Native.

In 1895, this species was listed in the "Flora of Mohonk." In 1938, Don Eves (a competent botanist) listed it as common. In 1979, Ruth Smiley reported that none were present at a site where she had known it in the past. She observed many deer tracks in the area at that time. Since 1978, the junior author has been suspicious of the disappearance of this plant from most of its former stations in the vicinity of Mohonk. Discovery in 1980 of a small stand at a site not readily accessible to deer, has raised the question in his mind of the role of deer in the presumed reduction of numbers of this species.

148B. Ague-weed. *(Gentiana quinquefolia* var. *quinquefolia)*. Native.

In 1895, this species was listed in the "Flora of Mohonk," and also in "Minnewaska's Flora," 1896. In 1938, Don Eves listed it as common hereabouts. A station near the shore of Mohonk Lake was recorded in bloom from 1954 to 1960. In 1979, no plants were found at that site. No direct reason for this loss, such as human disturbance, is known. A stand at another location, known for a number of years, is still present, but in fewer numbers.

154. Vipers Bugloss. *(Echium vulgare* var. *vulgare)*. Naturalized. Native of southern Europe.

The early history of this species in New York State was summarized by Homer D. House, in his "Annotated List of Ferns and Flowering Plants of New York State," 1924, as being considered rare by Torrey in 1843, and listed by Paine in 1865 in only Rockland County and Schenectady. He goes on to say that "within the past two decades it has spread with great rapidity, especially on dry, sterile, stony or sandy soils."

At Mohonk in 1954, it was considered to be a common plant along roads and in farm fields. In 1980, we had a problem to find a single plant to put in collection. We do not know what the special habitat needs are for this plant. It is our guess that such requirements are no longer being created by human land management procedures. Farming practices have changed greatly during the time of our records. We believe there is less clipping of carriage road shoulders than in the past, and there is no longer progressive field abandonment.

156A. Bugleweed. *(Ajuga reptans)*. Naturalized. Native of Eurpoe, western Asis and northern Africa.

This plant made its appearance at Mohonk some 20 years ago as a "weed" in poor quality lawns. It has continued to exist there. Our records do not show whether it has been spreading locally.

156B. Pennyroyal. *(Hedeoma pulegioides)*. Native.

For many years Pennyroyal was recognized as a locally common plant on the shoulders of Mohonk carriage roads. It is the impression of the senior author that by 1981, it

was less common than formerly in these sites. We each have recorded it within the track of long abandoned wood roads and paths, but not in the woods immediately to the side. Its decline alongside the Mohonk carriage roads might be due to some change in maintenance procedures, such as less frequent mowing in recent years. This formerly perhaps discouraged plants that now offer root competition to the Pennyroyal. This hypothesis might account for the persistence of the plant in the disturbed soil of the wood roads and paths.

159. Catalpa. (Catawba tree). *(Catalpa speciosa)*. Introduced and escaped. Native in U.S., south and east.

According to Harley Bishop, a local resident, in 1916 or 1917, Herbert Carl of Kingston, then Commissioner of Schools in Ulster County gave every school child in Ulster County a Catalpa seedling to plant. At Mohonk, two stations are known, one probably planted, the other definitely not planted. In both neighboring valleys it has been noted that self-seeded trees occur in abundance in some areas.

167. Wild Madder. *(Galium mollugo)*. Naturalized from Europe.

The first record in the Mohonk area was in 1938, several miles south of the lake in a former farm field. The junior author recalls that when he was responsible for Mohonk farm operations in the 1940's, farm workers complained of it as a "weed" in hayfields, that was increasing in abundance. At the same time, he noticed this plant was frequent in deciduous woods, but only those on former cultivated fields, as indicated by stone walls. As of 1981, it is abundant generally in the vicinity of Mohonk.

168. Yellow-fruited Elderberry. *(Sambucus pubens* forma *xanthocarpa)*. Native.

Our records are of only two shrubs of this form. One was on shale on the cut bank of a much travelled road. It probably succumbed to necessary road improvement. The second was on a dirt fill above a water line and was probably discouraged by crowding from adjacent planted garden shrubs. We have not discovered other plants in this area. Apparently this is an extirpation due to human influences.

175A. Knapweed. *(Centauria* spp.). Naturalized. Ours native of Europe.

The junior author remembers that in the 1920's or '30's, a Knapweed appeared in a former field, then rough lawn, at Mountain Rest. In the intervening years, Knapweed has spread widely in the vicinity of Mohonk, along carriage roads, in waste places, and old fields. Specimens of species are in the Preserve herbarium.

175B. White Snakeroot. *(Eupatorium rugosum)*. Native.

At Mohonk this species is found on disturbed, reasonably rich soil under fairly open canopied deciduous woods. It appears commonly along carriage roads and shaled paths. One site where it has increased in abundance during the last two decades is along a wood road where there was clearing for a powerline in 1958. The impression of the junior author and his brother, as of 1981, is that this plant has increased in abundance where the habitat is suitable for it.

175C. Fall Dandelion. *(Leontodon autumnalis)*. Naturalized. Native of Eurasia.

In 1924, Homer D. House, in his "Annotated List of Ferns and Flowering Plants of New York State," listed the species, calling it "infrequent or locally abundant, especially about cities." Gleason's Britton and Brown Illustrated Flora, 1952, recorded that it was becoming established along the eastern seaboard, and rarely inland to Michigan.

The first record at Mohonk was on the Athletic Field in 1978, by the junior author, who had become familiar with the plant 10 years earlier on Long Island. As of 1970, there was only one other record of this species in Ulster County. We surmise that the introduction at Mohonk could have been by seed carried on athletic equipment or automobiles that are parked on that field.

SUMMARY

The complexity of possible causes of change in plant populations in the Shawangunk ecosystem often makes it impossible to assign one or more specific reasons for the change in the species being considered. However, it seems desirable to indicate possible factors that were suggested to us by the available records. These are summarized in Table 1, below.

Table 1. Suggested Causes of Increases and Decreases in Shawangunk Plant Species.

Family No.	Plants	Causes of Decrease									Causes of Increas		
		Browse	Drought	Soil Disturb.	Change Land Manage.	Compet.	Insect	Disease	Acid Rain	Unknown	Escape	Habitat Available	Introd. Intent. Accid.
148 B	Ague-weed									?			
96	Ailanthus										✓	✓	planted?
138 A	Arbutus			lack of	✓	✓							
89 A	Birds-foot Trefoil										✓	✓	planted
107	Bittersweet:												
	C. scandens									lack record			
	C. orbiculata										✓	✓	planted?
102	Broom Crowberry	deer		human						decline relic popul.			
156 A	Bugleweed											✓	✓
136 A	Bunchberry	deer?				root ?				decline popul.?			
159	Cattail										✓	✓	planted
16	Cat-tail, Broad L.	muskrats				Loosestrife							
49	Chestnut							blight					
89 B	Clover, White S.				✓				?	?			
138 B	Cranberry, Large		✓							fire ?			
83	Current, Red				eradication						via birds		
175 C	Dandelion, Fall											✓	planted?

Table 1, cont'd.

Family No.	Plants	Causes of Decrease									Causes of Increase		
		Browse	Drought	Soil Disturb.	Change Land Manage.	Compet.	Insect	Disease	Acid Rain	Unknown	Escape	Habitat Available	Introd. Intent. or Accid.
136 B	Dogwood, Flowering		?				✓	?	?	Ageing popul.?			
13 D	Douglas Fir										✓	✓	planted
168	Elderberry, Yellow Fr			human	✓	✓							
11	Fern, Ostrich								?	?			
148A	Gentian, Closed	deer?								?			
23A	Grass, Orchard										✓	✓	planted
112A	Jewelweed, Orange	deer				shrubs close canopy							
B	" , Yellow	deer?							?	?			
175A	Knapweed											✓	✓
42A	Ladyslipper, Pink	deer?	?			?			?	loss of vigor?			
B	" , Yellow	deer?	?			?			?	loss of vigor?			
128	Loosestrife, Purple											✓	✓
156B	Pennyroyal				?								
23B	Phragmites											✓	native
13C	Pine, Scotch										✓	✓	planted
42C	Pogonia, Whorled	deer?	?						?	periodicity?			
13A	Red Cedar			✓	fewer old fields						via birds		
175B	Snakeroot, White											?	
13B	Spruce, Norway										✓	✓	planted
154	Vipers Bugloss			?	✓					✓			
167	Wild Madder											✓	✓
84	Witch Hazel, Pink Fl.									?			
12	Yew	deer											