

The Vascular Flora of Five Newly Discovered Granite Flatrocks in Virginia's Southern Piedmont

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INTRODUCTION

Granite flatrocks of the southeastern Piedmont and their associated plant communities have long been studied by botanists and ecologists. These outcrops of smooth, infrequently broken bedrock are located from Virginia through North Carolina, South Carolina, and Georgia into eastern Alabama. They range in size from a few square meters to many hectares (McVaugh, 1943). Quarterman et al. (1993) emphasized that these outcrops are often not true granite, but rather other granitic rocks such as granite gneiss or biotite granite. Schafale & Weakley (1990) described North Carolina granitic flatrocks as "outcrops of smooth exfoliating granite, adamellite, syenite, or related rocks, level or gently sloping, at about the same elevation as the surrounding land." Thus, these authors differentiated granitic flatrocks from granitic domes, which are characterized by steeper inclinations where vegetation mats are often less easily established.

Granite flatrocks are generally stressful environments for plant habitation. Factors which contribute to this include shallow soils, soil erosion, high levels of solar irradiance, extreme and rapidly fluctuating temperatures, and frequent xeric or droughty conditions (Quarterman et al., 1993). Vascular plant species are restricted to depressions, crevices, moss mats, and edge habitats with sufficient soil accumulation to support this vegetation. A variety of plant habitats are associated with granite flatrocks. These are briefly discussed later in this paper.

In his comprehensive monograph on granite flatrocks, McVaugh (1943) listed 17 vascular plant taxa believed at that time to be endemic to granite flatrock plant communities. Although many of these endemics have subsequently been found on other types of bedrock outcrops, most are still primarily associated with granite flatrocks. The center of endemism for granite flatrocks is

the upper Piedmont of Georgia, east of Atlanta. The number of endemic species decreases as one moves northeast or southwest from this center (Murdy, 1968).

In Virginia, most granite flatrocks are small, rarely reaching 0.5 ha in size. Most are found in the eastern portion of the Piedmont from the James River south. Three vascular plant species strongly affiliated with granite flatrocks further south are known from Virginia flatrocks: *Portulaca smallii* (Small's purslane), *Cyperus granitophilus* (granite-loving flatsedge), and *Diamorpha smallii* (Small's stonecrop). These species were first reported from Virginia by A.M. Harvill, Jr. (Harvill, 1976).

In this paper, five new flatrock sites located by the author in 1996 are described. Information is provided on bedrock geology, microhabitats, floristics, and site significance. Lists of plant species observed at each site are provided in Appendix 1, where the authors of all species are cited.

METHODS

Known granite flatrocks in Virginia were located on leaf-off color-infrared photographs taken in 1981-83 under the U.S. Geological Survey's National High Altitude Photography Program (NHAP). These aerial photographs were examined to determine distinguishing features (signatures) of known flatrocks. Flatrocks characteristically appear in these photographs as bright white, irregularly-shaped patches edged with scattered evergreen trees, particularly *Juniperus virginiana* (Eastern redcedar). Small islands of woody vegetation are often observed. To search for new potential flatrocks, these features were sought on NHAP photographs of Brunswick, Lunenburg, and Mecklenburg Counties. In many instances, difficulties were encountered differentiating

rock outcrops from agricultural fields, other human environments, and floodplain wetlands. To help solve this problem, Virginia Department of Transportation black and white aerial photographs were examined. Many of these photographs were taken several years before or after the NHAP photographs. Thus, the signatures of potential flatrocks could often be compared over time. The signatures of undisturbed flatrocks maintain a generally constant appearance over a several-year interval, whereas those of human-influenced environments often show marked changes over time. Through this method, many sites were eliminated from further consideration.

At the completion of the aerial photograph review, county courthouse records were researched to determine the names and addresses of landowners of potential flatrocks. Landowners were contacted to verify the presence of flatrocks on their properties and to obtain access permission. Landowners were sometimes useful in providing leads to other flatrocks in their areas.

By this method, five new granite flatrock sites were located in the Spring of 1996 in Brunswick and Lunenburg counties. One of these sites, Dundas Granite Flatrocks, was visited five times during 1996: 16 April, 1 May, 16 May, 7 August, and 29 October. Two sites, Seepy Granite Flatrock and Cedar Creek Granite Flatrock, were visited three times during 1996: 1 May, 18 July, and 29 October. The fourth and fifth sites, Golf Course Granite Flatrock and Big Hounds Creek Granite Flatrock, were visited twice each during 1996: Golf Course on 2 May and 30 October and Big Hounds Creek on 6 June and 30 October. For each flatrock community, a list of all vascular species observed was taken. Where identifications could not be made with confidence in the field, collections were made.

In order to record a species list for each flatrock community, it was necessary to determine the boundary between the flatrock community and adjacent communities. Schafale & Weakley (1990) placed this boundary where "shallow soil conditions and associated vegetation give way to the prevalent surrounding forest vegetation." This boundary definition was generally followed for this study, and transition habitats were included within the study areas. Where flatrocks were bisected by streams, associated riparian habitats were included to the extent to which they were surrounded by flatrock areas. The most difficult site at which to determine the community boundary was Golf Course, where a portion of the flatrock grades into the manicured lawn of a golf course green. A liberal boundary was used here because the granite flatrock near-endemic, *Portulaca smallii*, also extends onto the green.

Description of Sites

Seepy Granite Flatrock (Fig. 1)

This linear-shaped flatrock is located in northeastern Lunenburg County approximately 25 m east of an intermittent, unnamed tributary of Cedar Creek. The flatrock is approximately 0.24 ha in size and slopes gently to the west towards the stream. The rock is surrounded by a young pine plantation, and other signs of disturbance are apparent. Mounded earth, apparently in conjunction with past timbering, is found along the edges of the rock. Trash has been dumped at the southern edge of the rock along a road. *Lonicera japonica* (Japanese honeysuckle) is well-established along the edges of the rock, and several other exotic species are present.

Dundas Granite Flatrocks (Fig. 2)

This site, located in northwestern Brunswick County, contains a series of flatrocks on slopes east of an unnamed tributary of the South Branch of Cedar Creek. The principal flatrock in the group is approximately 0.50 ha in size and rises rather steeply (at an inclination estimated at 20°) from the floodplain of the small stream. Aspect is west by northwest. Because this western portion of the flatrock rises more steeply from the floodplain than the contour of the adjacent slopes, this portion of the rock has a domed appearance. The eastern portion of the rock levels off to nearly flat.

Six smaller flatrocks are located nearby. The largest of these is approximately 0.10 ha in size. These rocks are located from 0.35 km north to about 40 m south of the principal rock. Two of these smaller rocks rise steeply from the floodplain of the tributary. The others have gentle westerly inclinations in conformity with the contours of the adjacent slopes.

For the most part, the Dundas flatrocks are surrounded by well-drained, open oak-hickory forests dominated by *Quercus prinus* (chestnut oak) and *Carya glabra* (pignut hickory). The southernmost rock in the complex abuts a *Pinus taeda* (loblolly pine) plantation. This rock is also crossed by an old logging road, and aggressive non-native plant species, such as *Belamcanda chinensis* (blackberry lily), *Centaurea biebersteinii* (spotted knapweed), and *Lonicera japonica*, are well-established here. The remaining flatrocks in the complex, however, are impressive for their lack of disturbance, intact surrounding forests, and relative scarcity of exotic species.

Cedar Creek Granite Flatrock (Fig. 3)

This site encompasses approximately 0.50 ha of



Fig. 1. Seepy Granite Flatrock. Note *Grimmia laevigata* mats in foreground. The disturbed flatrock edge at left is dominated by *Lonicera japonica*.

flatrock and other closely related bedrock habitats along Cedar Creek in northwestern Brunswick County. Rock outcrops here comprise a linear strip about 160 m long which is bisected by the creek. In one area, the creek

flows through an impressive chute carved by water into the bedrock.

Bedrock outcrops at this site are associated with a series of stream terraces which flank the creek. Expanses



Fig. 2. The principal flatrock at Dundas Granite Flatrocks site. Note *Grimmia laevigata* mats in the foreground. In the middle ground, a large crevice contains soil deep enough to support *Pinus taeda*.

of smooth flatrock are broken by boulders and small ledges. Much of the area is subject to inundation during periods of high water.

A woodland with *Juniperus virginiana*, *Carya glabra*, and *Quercus alba* (white oak) is located on slopes above the main flatrock area on the northwestern side of the creek. The substrate here is a series of small scattered outcrops a few square meters each in size with intervening areas of thin soil. Herbs found in this area include *Cheilanthes lanosa* (hairy lipfern), *Clematis ochroleuca* (curly-heads), and a *Matelea* (anglepod) species (vegetative in 1996).

Cedar Creek Granite Flatrock is surrounded on both sides of the creek primarily by mixed forests on well-drained, moderately steep slopes above the outcrops. Some recent timber harvest was noted here. Other disturbances include a dirt road which crosses the flatrock

at its southwestern end and a recently constructed house and large picnic shelter on slopes above the flatrock to the southeast. Non-native plant species are prevalent in the vicinity of the road, but are scarce elsewhere on the rock.

Big Hounds Creek Granite Flatrock (Fig. 4)

This flatrock is located northwest of Kenbridge in eastern Lunenburg County near the junction of two tributary streams of Big Hounds Creek. Approximately 0.30 ha in size, the flatrock slopes gently to the southwest towards the smaller of the end of the flatrock through a shallow, poorly defined channel.

Big Hounds Creek Granite Flatrock is separated from a pasture upslope by a narrow strip of woodland buffer. While a fence keeps livestock off of the flatrock, pasture weeds, such as *Festuca pratensis* (meadow fescue) and

Dactylis glomerata (orchard grass), have invaded. *Rosa multiflora* (multiflora rose) and *Ligustrum sinense* (Chinese privet) are also present. In addition, vehicle ruts were observed, but these were not recent.

Golf Course Granite Flatrock (Fig. 5)

This L-shaped granite flatrock, located in southern Brunswick County southeast of Gasburg, is approximately 0.12 ha in size. The flatrock is bisected by Cold Spring Branch, which divides the rock into two approximately equal sections and whose narrow channel is etched into the bedrock. This low gradient small stream flows to the southeast from the flatrock to join Lake Gaston in about 0.1 km.

This flatrock is surrounded, for the most part, by disturbed habitats. The northern end of the rock grades into the manicured lawn of a golf course green. A maintenance road for the golf course is located a short distance to the south, and much of the intervening land has been cleared. To the west, thickets provide some buffer from other cleared areas. Most of the intact natural habitat lies to the east and consists of bottomland forest along Cold Spring Branch.

Lawn weeds, such as *Poa annua* (annual bluegrass), *Eleusine indica* (India goosegrass), and *Aphanes microcarpa* (parsley-piert), are found at this site in areas where the flatrock grades into the golf course green. More characteristic flat rock exotics, such as *Lonicera japonica* and *Ligustrum sinense* are also present.



Fig. 3. Cedar Creek Granite Flatrock. The flatrock is bisected by the creek, which flows through a chute carved into the bedrock. Moss mats on the rock on the right side, middle ground, support *Talinum teretifolium* and *Minuartia glabra*.

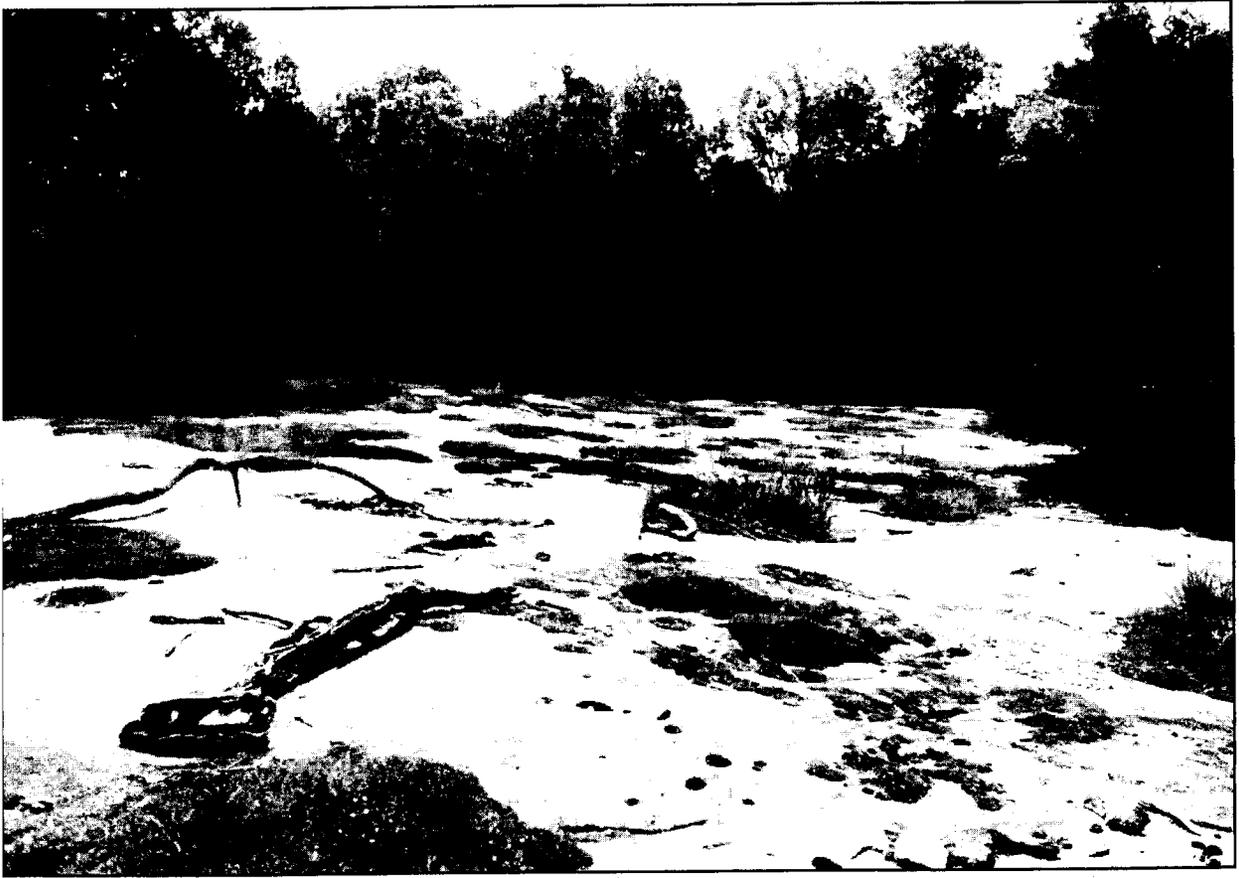


Fig. 4. Big Hounds Creek Granite Flatrock. Note vegetation "islands" representing various stages of succession.

Bedrock Geology

Based on the Geologic Map of Virginia (Virginia Division of Mineral Resources, 1993), flatrocks at Seepy, Dundas, Cedar Creek, and Golf Course are porphyroblastic granite gneiss of an undetermined age. This is a "light-gray, medium- to coarse-grained compositionally-layered, well-foliated, commonly lin-eated gneiss composed of metamorphosed granite, leucogranite, and granodiorite which locally contains feldspar megacrysts" (Radar & Evans, 1993). Big Hounds Creek Granite Flatrock is part of the Buggs Island pluton, which is "light-gray medium- to coarse-grained massive to strongly-foliated biotite-muscovite granite" (Radar & Evans, 1993).

Microhabitats

Granite flatrock plant habitats and their associated

communities have been described by several authors, including McVaugh (1943), Burbank & Platt (1964), Berg (1974), Wyatt & Fowler (1977), Barry (1980), and Quarterman et al. (1993). These include bare rock colonized only by crustose lichens, vegetation mats, shallow depressions, pools, seeps, and marginal (edge) habitats. Granite flatrock communities have been described by Barry (1980) as "a study in succession." Quarterman et al. (1993) divided flatrock community types into "stable plant communities" and "successional plant communities." Other authors who have studied succession on granite flatrocks include Oosting & Anderson (1939), McVaugh (1943), and Burbank & Platt (1964). Berg (1974) studied succession specifically on Virginia flatrocks.

Many of the plant communities and successional stages which have been documented elsewhere on granite flatrocks are represented at the five new sites. Large areas of exposed bedrock colonized only by crustose lichens

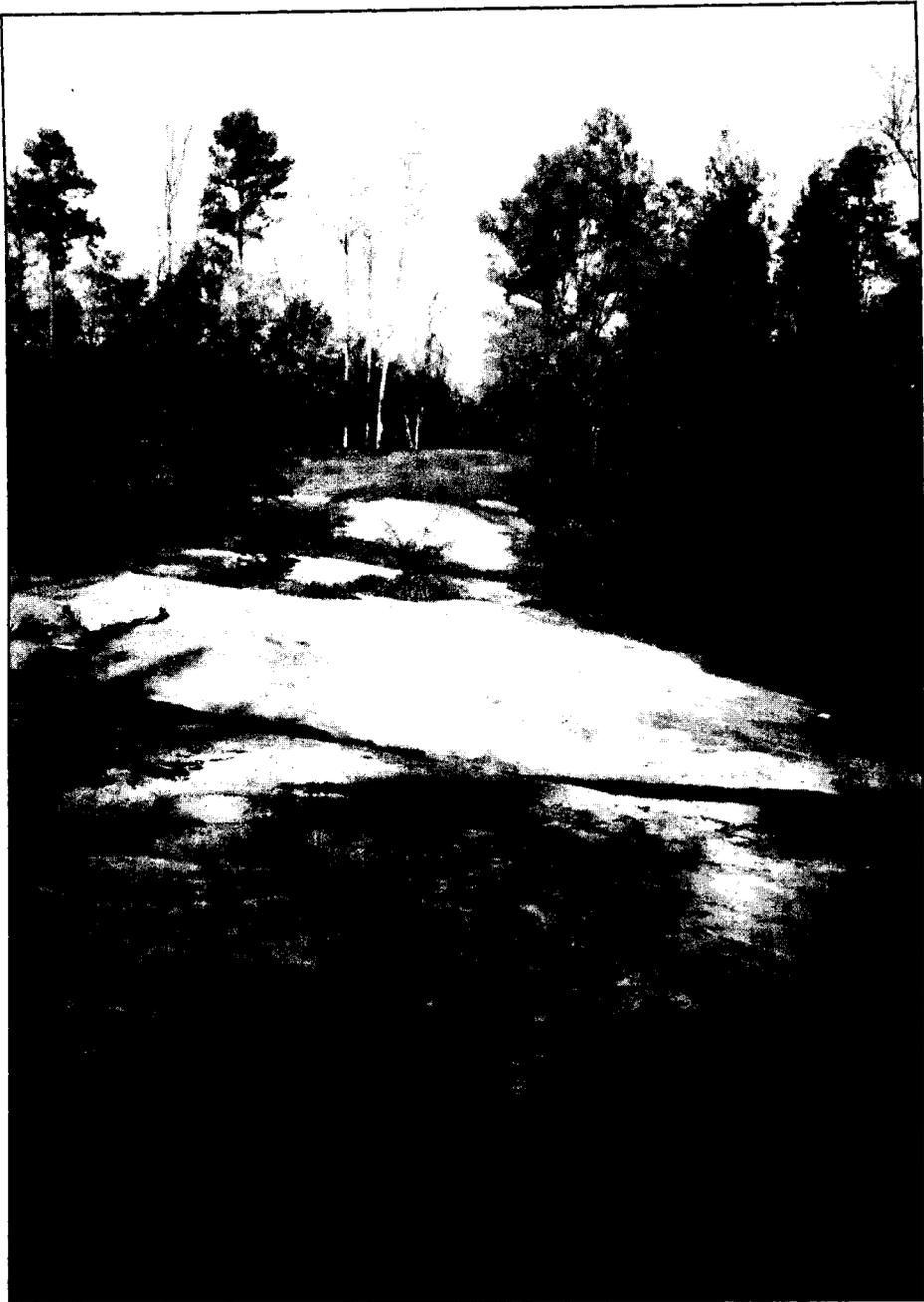


Fig. 5. Golf Course Granite Flatrock. The flatrock is bisected by Cold Spring Branch, located in the middle ground. Note the golf course green in the background.

are a predominate type at all five sites. This is a stable community type, with little, if any, opportunity for the

soil accumulation necessary for succession to take place. Two other stable communities discussed by Quarterman

et al. (1993), marginal communities and seepage areas, are also represented at the new sites. Marginal communities are located at the edge of flatrocks in a zone between exposed rock and surrounding forest (or disturbed areas). Soil depth increases from the flatrock edge to the adjacent forest with a corresponding shift in vegetation. Quarterman et al. (1993) reported that marginal communities are relatively stable because soil erosion and accumulation are in close balance. These transitional communities are prominent at all five of the new sites and contain the greatest diversity of plant species.

Well developed seepage areas are located at the southern end of Seepy Granite Flatrock, the northern edge of the principal rock at Dundas Granite Flatrocks, and one of the smaller flatrocks within the Dundas complex. This groundwater seepage typically emerges from an upslope flatrock edge and provides moisture throughout all or much of the growing season to flatrock vegetation mats located lower on the slope. Species associated with seepage at Seepy Granite Flatrock include *Rhexia mariana* (Maryland meadow-beauty), *Eupatorium perfoliatum* (common boneset), *Impatiens capensis* (spotted jewelweed), and *Spiranthes cernua* (nodding ladies'-tresses).

Berg (1974) described a non-successional flatrock community which he refers to as a dry depression. These are shallow, well-drained depressions with little water retention where fine soil particles are washed away, leaving a coarse sandy grit with little organic matter. This community type is absent or poorly developed at the new flatrock sites. Shallow pool communities, another stable community type described by Quarterman et al. (1993), are also absent from the new sites. These are shallow soil communities subject to cycles of submergence to a maximum depth of 15 cm followed by total desiccation. Deeper pools, which retain moisture through all or nearly all of the growing season, however, are found at the Cedar Creek and Golf Course flatrock sites. These pools are fed by groundwater seepage and/or overland flow across sloping bedrock and have soil deep enough to support a lush growth of wetland herbs, such as *Juncus effusus* (soft rush), *Carex intumescens* (bladder sedge), *R. mariana*, *Ptilimnium capillaceum* (mock bishopweed), and *Ludwigia alterniflora* (winged seedbox), and sometimes woody species, particularly *Alnus serrulata* (smooth alder). These pools have many species in common with seepage areas.

Vegetation "islands" comprise the principal successional communities on flatrocks and have been well-documented in the literature. These islands may begin as mats of the moss *Grimmia laevigata*, which are able to retain mineral soil which washes or blows on them (Quarterman et al., 1993). Alternatively, they may begin

in depressions with sufficient depth to allow soil accumulation and water retention after rains. Again, however, *G. laevigata*, is the characteristic pioneer species (Berg, 1974). Subsequent early invaders may include *Cladonia* lichens, *Selaginella rupestris* (rock spike-moss), *Talinum teretifolium* (roundleaf fame-flower), and a few annuals such as *Minuartia glabra* (Appalachian sandwort). As soil development continues, *Polytrichum* moss and other annual herbs appear, to be followed by perennial herbs and, finally, by woody species. A number of variations on this basic theme have been reported (Quarterman et al., 1993; Berg, 1974). Because soils underlying well-developed vegetation islands tend to be deepest in the center and shallowest along the edges, vegetation tends to follow a pattern of concentric rings. Woody species, which require deep soils, are found in the center, while species such as *T. teretifolium*, which are adapted to moss mats, are found around the edges (Berg, 1974). Vegetation islands representing various successional stages are found at all five of the new flatrock sites and are particularly well-represented at Big Hounds Creek Granite Flatrock.

Flora

Appendix 1 shows the vascular plant taxa recorded for each of the five flatrock sites. A total of 314 taxa were recorded for the five sites collectively. These lists should be considered preliminary, particularly for Big Hounds Creek and Golf Course granite flatrocks, which were each visited only twice. Nomenclature follows Kartesz (1994) except for the genus *Rubus* (bramble), which follows Gleason & Cronquist (1991). Varieties and subspecies were determined only for selected species. Each taxon was determined to be either native or exotic (non-native) based on Gleason & Cronquist (1991). Approximately 14 percent of the 314 taxa recorded are exotic species.

Twenty-three native species were recorded from all five sites. Herbaceous species in this category are: *Ambrosia artemisiifolia* (common ragweed), *Andropogon virginicus* (broom-sedge), *Asplenium platyneuron* (ebony spleenwort), *Dichanthelium laxiflorum* (open-flower panic grass), *Dichanthelium scoparium* (velvet panic grass), *Diodia teres* (buttonweed), *Krigia virginica* (dwarf-dandelion), *Minuartia glabra*, *Nuttallanthus canadensis* (common toadflax), *Talinum teretifolium*, *Tridens flavus* (redtop), and *Triodanis perfoliata* (Venus'-looking-glass). Woody species recorded from all five sites are: *Acer rubrum* (red maple), *Campsis radicans* (trumpet-creeper), *Crataegus uniflora* (dwarf hawthorne), *Juniperus virginiana*, *Parthenocissus quinquefolia* (Virginia creeper), *Quercus alba*, *Quercus falcata* (Southern red oak), *Quercus rubra* (Northern red oak), *Smilax glauca* (whiteleaf greenbrier), *Smilax rotundifolia*

(common greenbrier), and *Ulmus alata* (winged elm). Forty-nine species were recorded from four of the five sites.

Ten exotic species were recorded from three or more of the five sites. These species are: *Allium vineale* (field garlic), *Bromus* cf. *racemosus* (spiked brome grass), *Cardamine hirsuta* (hairy bittercress), *Commelina communis* (Asiatic dayflower), *Digitaria ischaemum* (smooth crabgrass), *Kummerowia stipulacea* (Japanese bushclover), *Ligustrum sinense*, *Lonicera japonica*, *Rumex acetosella* L. (sheep sorrel), and *Stellaria media* (common chickweed).

Site Significance

Two species of conservation concern were located on flatrocks visited during this study. These are *Portulaca smallii* and *Cyperus granitophilus*. Both species were located near the northern limits of their ranges. *Diamorpha smallii*, previously known from one Virginia site, was not found.

Portulaca smallii, the range of which is restricted to the Piedmont of Georgia, South Carolina, North Carolina, and Virginia, was, until recently, believed to be a strict granite flatrock endemic (Ware, 1991a; S.Q. Croy, unpubl. data). It has now been located on diabase at one site in North Carolina (LeGrande, 1988). Prior to this study, it was known in Virginia from four sites in three counties: Brunswick, Dinwiddie, and Mecklenburg (Harvill, 1976; Ware, 1991a; Harvill et al., 1992; G.P. Fleming, unpubl. data). It is ranked G3 (globally rare) and S1 (extremely rare in Virginia) on the Virginia rare vascular plant list of the Virginia Department of Conservation and Recreation, Division of Natural Heritage (Ludwig, 1997). This species was found at three of the sites visited during this study: Dundas Granite Flatrocks, Big Hounds Creek Granite Flatrock, and Golf Course Granite Flatrock. A collection made at Big Hounds Creek in Lunenburg County represents a county record for this species (Harvill et al., 1992).

Cyperus granitophilus is a wide-ranging southeastern species known from Georgia, Alabama, Tennessee, South Carolina, North Carolina, and Virginia (Kral, 1983; E. Bridges, unpubl. data; Chester et al., 1993). Although most closely associated with granite outcrops, it has been found on a variety of outcrop types, including sandstone (Kral, 1983; E. Bridges, unpubl. data). Prior to this study, it was known in Virginia from four sites in three counties: Brunswick, Mecklenburg, and Nottoway (Harvill, 1976; Ware, 1991b; Harvill et al., 1992; G.P. Fleming, unpubl. data). It is ranked G3Q (a globally rare species of questionable taxonomic status) and S1 (extremely rare in Virginia) on the Virginia rare vascular plant list (Ludwig,

1997). This species was found at two of the sites visited during this study: Dundas Granite Flatrocks and Golf Course Granite Flatrock.

Portulaca smallii and *C. granitophilus* appear to tolerate or even thrive in disturbed areas at the new sites. At Dundas Granite Flatrock, several hundred individuals each of these two species were found in the bed of an old logging road on the southernmost flatrock in the complex. Approximately 25 additional plants of *C. granitophilus* were located within a few square meter area on the principal flatrock at this site, but again in a weedy area which appeared to have past disturbance. No individuals of these species were located on extensive areas of relatively pristine flatrock at the site. At Big Hounds Creek Granite Flatrock, approximately 20 individuals of *P. smallii* were located within a four square meter area on a vegetation mat of moss and *Selaginella rupestris* at a rather weedy corner of the flatrock. Several more individuals were located to the north within a grazed and very weedy woodland of *Juniperus virginiana*. At Golf Course Granite Flatrock, several hundred individuals of *P. smallii* and 50-100 individuals of *C. granitophilus* were located on a small flatrock adjacent to a golf course and other cleared lands. The *Portulaca smallii* population here extends into the frequently mowed lawn of the green, where it appears to be thriving.

Dundas Granite Flatrocks may be the finest known example of an extant granite flatrock in Virginia. This site is comparable in terms of total flatrock acreage to the two largest known flatrocks in the state – Gasburg Granite Flatrock in southern Brunswick County (consisting of three separate flatrocks) and Fine Creek Mills Granite Flatrock in northern Powhatan County. Dundas Granite Flatrock, however, has both fewer invasive exotic species and less overall disturbance than either of these two sites.

ACKNOWLEDGMENTS

Many thanks to J. Christopher Ludwig, whose keen spotting of Dundas Granite Flatrocks on an aerial photograph of Brunswick County led to the inception of this project. His enthusiasm and support for the project are also appreciated. I wish to thank Chris Ludwig, Gary P. Fleming, Nancy E. Van Alstine, and Thomas J. Rawinski for assistance with specimen identifications; Chris Ludwig and Nancy Van Alstine for field assistance; and Gary Fleming, Chris Ludwig, Joseph C. Mitchell, Tom Rawinski, Thomas L. Smith, Leslie D. Trew, Nancy Van Alstine, and two anonymous reviewers for assistance with and/or review of the manuscript. Finally, I wish to thank the landowners of the five sites for permission to access their properties.

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Appendix 1. Vascular plant taxa recorded from five granite flatrock sites in Virginia's southern Piedmont.

Taxon	Seepy	Dundas	Cedar Creek	Big Hounds	Golf Course	Exotic? Y=Yes
<i>Acalypha gracilens</i> Gray	X	X	X	--	X	--
<i>Acer rubrum</i> L.	X	X	X	X	X	--
<i>Achillea millefolium</i> L.	X	--	X	X	--	--
<i>Agalinis purpurea</i> (L.) Pennell	--	--	X	--	--	--
<i>Agrostis hyemalis</i> (Walt.) B.S.P.	X	X	X	X	--	--
<i>Agrostis perennans</i> (Walt.) Tuckerman	X	X	X	X	--	--
<i>Allium vineale</i> L.	X	X	--	X	X	Y
<i>Alnus serrulata</i> (Ait.) Willd.	--	--	X	--	X	--
<i>Ambrosia artemisiifolia</i> L.	X	X	X	X	X	--
<i>Amelanchier arborea</i> (Michx. f.) Fern.	--	--	X	--	--	--
<i>Andropogon ternarius</i> Michx.	X	--	X	--	X	--
<i>Andropogon virginicus</i> L.	X	X	X	X	X	--
<i>Antennaria parlinii</i> Fern. ssp. <i>fallax</i> (Greene) Bayer and Stebbins	--	X	--	--	--	--
<i>Antennaria parlinii</i> Fern. ssp. <i>parlinii</i>	X	X	X	--	X	--
<i>Anthoxanthum odoratum</i> L.	--	X	--	--	--	Y
<i>Aphanes microcarpa</i> (Boiss. & Reut.) Rothm.	--	--	--	--	X	Y
<i>Arabidopsis thaliana</i> (L.) Heynh.	X	--	X	--	--	Y
<i>Aristida dichotoma</i> Michx. var. <i>curtissii</i> Gray ex S. Wats. & Coult.	--	X	--	--	--	--
<i>Aristida dichotoma</i> Michx. var. <i>dichotoma</i>	X	--	X	X	X	--
<i>Aristida purpurascens</i> Poir. var. <i>purpurascens</i>	X	X	X	--	X	--
<i>Asclepias verticillata</i> L.	--	X	--	--	--	--
<i>Asimina triloba</i> (L.) Dunal	--	--	--	X	--	--
<i>Asplenium platyneuron</i> (L.) B.S.P.	X	X	X	X	X	--
<i>Aster lateriflorus</i> (L.) Britt.	X	--	X	X	X	--
<i>Aster paternus</i> Cronq.	X	--	X	--	--	--
<i>Aster pilosus</i> Willd. var. <i>demotus</i> Blake	X	--	--	--	--	--
<i>Aster pilosus</i> Willd. var. <i>pilosus</i>	--	X	X	--	--	--
<i>Aster solidagineus</i> Michx.	--	--	X	--	--	--
<i>Athyrium filix-femina</i> (L.) Roth ssp. <i>asplenioides</i> (Michx.) Hulten	--	--	X	--	--	--
<i>Barbarea verna</i> (P. Mill.) Aschers.	--	X	--	--	--	Y
<i>Belamcanda chinensis</i> (L.) DC.	--	X	--	--	--	Y
<i>Betula nigra</i> L.	--	--	X	--	--	--
<i>Bidens bipinnata</i> L.	--	X	--	X	--	--
<i>Bidens connata</i> Muhl. ex Willd.	--	--	--	--	X	--
<i>Boehmeria cylindrica</i> (L.) Sw.	--	--	--	X	--	--
<i>Bromus</i> cf. <i>racemosus</i> L.	X	--	X	X	X	Y
<i>Bulbostylis capillaris</i> (L.) Kunth ex C.B. Clarke	X	X	--	X	X	--
<i>Callitriche heterophylla</i> Pursh	--	--	--	--	X	--
<i>Campsis radicans</i> (L.) Seem. ex Bureau	X	X	X	X	X	--
<i>Cardamine hirsuta</i> L.	X	X	X	X	--	Y
<i>Carex albicans</i> Willd. ex Spreng.	X	--	--	--	--	--
<i>Carex atlantica</i> Bailey	--	--	X	--	X	--
<i>Carex cephalophora</i> Muhl. ex Willd.	--	--	X	X	--	--
<i>Carex crinita</i> Lam.	--	--	X	--	X	--
<i>Carex hirsutella</i> Mackenzie	X	X	--	X	--	--
<i>Carex intumescens</i> Rudge	--	--	X	--	--	--
<i>Carex longii</i> Mackenzie	--	--	--	X	X	--
<i>Carex lurida</i> Wahlenb.	--	--	X	--	--	--
<i>Carex swanii</i> (Fern.) Mackenzie	--	--	--	X	--	--
<i>Carex umbellata</i> Schkuhr ex Willd.	X	X	X	X	--	--
<i>Carpinus caroliniana</i> Walt.	--	--	X	X	X	--
<i>Carya alba</i> (L.) Nutt. ex Ell.	--	X	X	X	--	--

Appendix 1 (continued). Vascular plant taxa recorded from five granite flatrock sites in Virginia's southern Piedmont.

Taxon	Seepy	Dundas	Cedar Creek	Big Hounds	Golf Course	Exotic? Y=Yes
<i>Carya glabra</i> (P. Mill.) Sweet	X	X	X	X	--	--
<i>Ceanothus americanus</i> L.	--	X	--	--	--	--
<i>Celtis occidentalis</i> L.	--	X	X	X	--	--
<i>Centaurea biebersteinii</i> DC.	--	X	--	--	--	Y
<i>Cephalanthus occidentalis</i> L.	--	--	X	--	--	--
<i>Cerastium semidecandrum</i> L.	--	--	--	X	--	Y
<i>Cercis canadensis</i> L.	--	--	X	--	--	--
<i>Chaerophyllum tainturieri</i> Hook	--	--	--	X	--	--
<i>Chamaecrista nictitans</i> (L.) Moench	X	X	X	--	--	--
<i>Chasmanthium laxum</i> (L.) Yates var. <i>laxum</i>	--	X	X	--	X	--
<i>Cheilanthes lanosa</i> (Michx.) D.C. Eat.	--	--	X	--	--	--
<i>Chionanthus virginicus</i> L.	X	--	X	X	--	--
<i>Chrysopsis mariana</i> (L.) Ell.	X	--	X	--	--	--
<i>Cicuta maculata</i> L.	--	--	X	--	--	--
<i>Clematis ochroleuca</i> Ait.	--	--	X	--	--	--
<i>Clitoria mariana</i> L.	--	X	X	X	--	--
<i>Commelina communis</i> L.	--	X	X	X	X	Y
<i>Conyza canadensis</i> (L.) Cronq.	X	X	--	--	X	--
<i>Cornus florida</i> L.	--	--	X	--	X	--
<i>Crataegus uniflora</i> Muenchh.	X	X	X	X	X	--
<i>Crotalaria sagittalis</i> L.	X	--	--	--	--	--
<i>Croton glandulosus</i> L. var. <i>septentrionalis</i> Muell.-Arg.	--	--	--	X	--	--
<i>Croton willdenowii</i> Webster	X	X	X	X	--	--
<i>Cunila origanoides</i> (L.) Britt.	--	X	--	--	--	--
<i>Cuscuta compacta</i> Juss. ex Choisy	--	--	X	--	--	--
<i>Cyperus granitophilus</i> McVaugh	--	X	--	--	X	--
<i>Cyperus pseudovegetus</i> Steud.	--	--	X	--	--	--
<i>Cyperus strigosus</i> L.	--	X	X	X	X	--
<i>Dactylis glomerata</i> L.	--	--	--	X	--	Y
<i>Danthonia sericea</i> Nutt.	--	--	--	X	--	--
<i>Danthonia spicata</i> (L.) Beauv. ex Roemer & J.A. Schultes	X	X	X	X	--	--
<i>Desmodium paniculatum</i> (L.) DC.	--	--	X	--	--	--
<i>Dichanthelium acuminatum</i> (Sw.) Gould & C.A. Clark var. <i>acuminatum</i>	--	X	X	--	--	--
<i>Dichanthelium acuminatum</i> (Sw.) Gould & C.A. Clark var. <i>fasciculatum</i> (Torr.) Freckmann	--	X	X	X	--	--
<i>Dichanthelium boscii</i> (Poir.) Gould & C.A. Clark	--	X	X	X	--	--
<i>Dichanthelium clandestinum</i> (L.) Gould	X	--	X	X	X	--
<i>Dichanthelium sabulorum</i> (Lam.) Gould & C.A. Clark var. <i>thinium</i> (A.S. Hitchc. & Chase) Gould & C.A. Clark	--	--	--	--	X	--
<i>Dichanthelium commutatum</i> (J.A. Schultes) Gould	--	X	X	--	--	--
<i>Dichanthelium depauperatum</i> (Muhl.) Gould	X	X	--	X	--	--
<i>Dichanthelium dichotomum</i> (L.) Gould var. <i>dichotomum</i>	X	X	X	--	X	--
<i>Dichanthelium laxiflorum</i> (Lam.) Gould	X	X	X	X	X	--
<i>Dichanthelium scoparium</i> (Lam.) Gould	X	X	X	X	X	--
<i>Dichanthelium sphaerocarpon</i> (Ell.) Gould var. <i>isophyllum</i> (Scribn.) Gould	X	X	X	--	--	--
<i>Dichanthelium sphaerocarpon</i> (Ell.) Gould var. <i>sphaerocarpon</i>	X	X	--	--	--	--
<i>Digitaria ischaemum</i> (Schreb.) Muhl.	X	X	--	X	X	Y
<i>Diodia teres</i> Walt.	X	X	X	X	X	--
<i>Diospyros virginiana</i> L.	--	X	X	--	--	--
<i>Eleocharis</i> cf. <i>tenuis</i> (Willd.) J.A. Schultes	X	--	--	--	--	--
<i>Eleocharis obtusa</i> (Willd.) J.A. Schultes	--	--	X	--	X	--
<i>Elephantopus carolinianus</i> Raeusch.	--	--	--	X	--	--
<i>Elephantopus tomentosus</i> L.	X	--	X	X	--	--

Appendix 1 (continued). Vascular plant taxa recorded from five granite flatrock sites in Virginia's southern Piedmont.

Taxon	Seepy	Dundas	Cedar Creek	Big Hounds	Golf Course	Exotic? Y=Yes
<i>Eleusine indica</i> (L.) Gaertn.	--	--	--	--	X	Y
<i>Elymus virginicus</i> L.	X	--	X	--	--	--
<i>Eragrostis capillaris</i> (L.) Nees	--	X	--	--	--	--
<i>Eragrostis hirsuta</i> (Michx.) Nees	--	X	--	X	X	--
<i>Erechtites hieraciifolia</i> (L.) Raf. ex DC.	X	X	X	X	--	--
<i>Erigeron strigosus</i> Muhl. ex Willd.	X	X	X	X	--	--
<i>Erythronium umbilicatum</i> Parks and Hardin	--	X	X	--	--	--
<i>Eupatorium capillifolium</i> (Lam.) Small	X	--	X	--	X	--
<i>Eupatorium fistulosum</i> Barratt	--	--	X	--	X	--
<i>Eupatorium godfreyanum</i> Cronq.	--	X	X	--	--	--
<i>Eupatorium hyssopifolium</i> L.	X	X	X	--	--	--
<i>Eupatorium perfoliatum</i> L.	X	--	X	X	--	--
<i>Eupatorium rotundifolium</i> L. var. <i>ovatum</i> (Bigelow) Torr.	X	X	--	--	--	--
<i>Euphorbia corollata</i> L.	--	X	--	--	--	--
<i>Euthamia tenuifolia</i> (Pursh) Nutt.	--	X	--	--	--	--
<i>Evonymus americana</i> L.	X	X	X	--	X	--
<i>Festuca pratensis</i> Huds.	--	--	--	X	--	Y
<i>Fimbristylis autumnalis</i> (L.) Roemer & J.A. Schultes	X	X	--	--	--	--
<i>Fraxinus americana</i> L.	--	X	--	X	--	--
<i>Galium aparine</i> L.	--	X	X	X	--	--
<i>Galium pilosum</i> Ait.	X	X	X	--	--	--
<i>Galium tinctorium</i> (L.) Scop.	--	--	X	--	--	--
<i>Gamochaeta purpurea</i> (L.) Cabrera	X	--	--	X	X	--
<i>Gaylussacia baccata</i> (Wangenh.) K. Koch	--	X	--	--	--	--
<i>Gelsemium sempervirens</i> St.-Hil.	--	--	--	--	X	--
<i>Geranium carolinianum</i> L.	X	--	X	X	X	--
<i>Geranium dissectum</i> L.	--	--	--	X	--	Y
<i>Glechoma hederacea</i> L.	--	--	--	X	--	Y
<i>Gnaphalium obtusifolium</i> L.	X	X	--	--	--	--
<i>Gymnopogon ambiguus</i> (Michx.) B.S.P.	--	--	X	--	--	--
<i>Hedeoma pulegioides</i> (L.) Pers.	--	X	--	X	--	--
<i>Helenium amarum</i> (Raf.) H. Rock	--	--	--	--	X	--
<i>Helenium flexuosum</i> Raf.	X	--	--	--	--	--
<i>Helianthus divaricatus</i> L.	--	--	--	X	--	--
<i>Heuchera americana</i> L.	--	--	X	--	X	--
<i>Hexastylis</i> sp.	--	--	X	--	--	--
<i>Hieracium gronovii</i> L.	--	--	X	--	--	--
<i>Hieracium venosum</i> L.	--	X	--	--	--	--
<i>Houstonia caerulea</i> L.	X	X	X	--	--	--
<i>Houstonia longifolia</i> Gaertn. var. <i>longifolia</i>	--	--	X	--	--	--
<i>Houstonia longifolia</i> Gaertn. var. <i>tenuifolia</i> (Nutt.) Wood	X	X	X	--	--	--
<i>Hypericum gentianoides</i> (L.) B.S.P.	X	X	X	--	X	--
<i>Hypericum hypericoides</i> (L.) Crantz ssp. <i>hypericoides</i>	--	--	--	--	X	--
<i>Hypericum hypericoides</i> (L.) Crantz ssp. <i>multicaule</i> (Michx. ex Willd.) Robson	X	X	X	--	--	--
<i>Hypericum mutilum</i> L.	--	--	X	--	--	--
<i>Hypericum nudiflorum</i> Michx. ex Willd.	--	--	X	--	--	--
<i>Hypericum punctatum</i> Lam.	X	--	X	--	--	--
<i>Ilex opaca</i> Ait.	--	X	X	X	X	--
<i>Impatiens capensis</i> Meerb.	X	--	X	X	X	--
<i>Juglans nigra</i> L.	--	X	--	X	--	--
<i>Juncus acuminatus</i> Michx.	X	--	X	--	X	--
<i>Juncus biflorus</i> Ell.	X	--	--	--	X	--

Appendix 1 (continued). Vascular plant taxa recorded from five granite flatrock sites in Virginia's southern Piedmont.

Taxon	Seepy	Dundas	Cedar Creek	Big Hounds	Golf Course	Exotic? Y=Yes
<i>Juncus canadensis</i> J. Gay ex Laharpe	--	--	X	--	--	--
<i>Juncus coriaceus</i> Mackenzie	X	--	X	--	X	--
<i>Juncus dichotomus</i> Ell.	--	X	X	X	X	--
<i>Juncus effusus</i> L.	--	--	X	--	X	--
<i>Juncus marginatus</i> Rostk.	X	--	X	--	--	--
<i>Juniperus virginiana</i> L.	X	X	X	X	X	--
<i>Krigia dandelion</i> (L.) Nutt.	--	X	--	X	X	--
<i>Krigia virginica</i> (L.) Willd.	X	X	X	X	X	--
<i>Kummerowia stipulacea</i> (Maxim.) Makino	X	X	X	--	--	Y
<i>Kyllinga pumila</i> Michx.	--	--	--	--	X	--
<i>Lamium amplexicaule</i> L.	--	--	--	--	X	Y
<i>Lechea racemulosa</i> Michx.	X	X	X	X	--	--
<i>Leersia virginica</i> Willd.	--	X	--	--	--	--
<i>Lepidium virginicum</i> L.	--	X	--	X	--	--
<i>Lespedeza cuneata</i> (Dum.-Cours.) G. Don	--	X	X	--	--	Y
<i>Lespedeza repens</i> (L.) W. Bart.	X	X	X	--	--	--
<i>Leucanthemum vulgare</i> Lam.	--	X	--	X	--	Y
<i>Leucothoe racemosa</i> (L.) Gray	--	--	X	--	--	--
<i>Ligustrum sinense</i> Lour.	--	X	--	X	X	Y
<i>Lindernia dubia</i> (L.) Pennell var. <i>dubia</i>	--	--	X	--	--	--
<i>Linum striatum</i> Walt.	--	--	X	--	--	--
<i>Liquidambar styraciflua</i> L.	X	X	X	--	X	--
<i>Liriodendron tulipifera</i> L.	--	X	X	--	--	--
<i>Lithospermum canescens</i> (Michx.) Lehm.	--	--	--	X	--	--
<i>Lonicera japonica</i> Thunb.	X	X	X	--	X	Y
<i>Lonicera sempervirens</i> L.	--	--	--	--	X	--
<i>Ludwigia alternifolia</i> L.	--	--	X	--	X	--
<i>Ludwigia decurrens</i> Walt.	--	--	X	--	--	--
<i>Ludwigia palustris</i> (L.) Ell.	--	--	X	--	--	--
<i>Luzula bulbosa</i> (Wood) Smyth & Smyth	X	--	X	--	--	--
<i>Lycopus virginicus</i> L.	--	--	X	--	--	--
<i>Matelea</i> sp.	--	--	X	--	--	--
<i>Melica mutica</i> Walt.	--	--	--	X	--	--
<i>Microstegium vimineum</i> (Trin.) A. Camus	--	--	X	--	--	Y
<i>Minuartia glabra</i> (Michx.) Mattf.	X	X	X	X	X	--
<i>Mollugo verticillata</i> L.	--	X	--	--	--	Y
<i>Morus rubra</i> L.	--	X	--	--	--	--
<i>Muhlenbergia schreberi</i> J.F. Gmel.	X	--	--	X	--	--
<i>Murdannia keisak</i> (Hassk.) Hand.-Maz.	--	--	X	--	--	Y
<i>Nuttallanthus canadensis</i> (L.) D.A. Sutton	X	X	X	X	X	--
<i>Nyssa biflora</i> Walt.	--	X	X	--	--	--
<i>Oenothera laciniata</i> Hill	--	--	--	X	--	--
<i>Opuntia humifusa</i> (Raf.) Raf.	X	X	X	X	--	--
<i>Oxalis dillenii</i> Jacq.	X	X	--	--	X	--
<i>Oxalis stricta</i> L.	X	X	--	X	--	--
<i>Oxalis violacea</i> L.	X	X	X	--	--	--
<i>Oxydendrum arboreum</i> (L.) DC.	--	--	X	--	--	--
<i>Panicum anceps</i> Michx.	X	X	X	--	X	--
<i>Panicum dichotomiflorum</i> Michx.	X	X	X	--	X	--
<i>Panicum philadelphicum</i> Bernh. ex Trin.	X	X	--	--	--	--
<i>Parthenocissus quinquefolia</i> (L.) Planch.	X	X	X	X	X	--
<i>Paspalum laeve</i> Michx.	X	--	--	X	X	--
<i>Paspalum setaceum</i> Michx.	--	X	X	--	--	--

Appendix 1 (continued). Vascular plant taxa recorded from five granite flatrock sites in Virginia's southern Piedmont.

Taxon	Seepy	Dundas	Cedar Creek	Big Hounds	Golf Course	Exotic? Y=Yes
<i>Peltandra virginica</i> (L.) Schott	X	--	X	--	--	--
<i>Penstemon laevigatus</i> Ait.	X	--	--	--	--	--
<i>Phytolacca americana</i> L.	--	X	X	X	--	--
<i>Pinus taeda</i> L.	X	X	X	--	X	--
<i>Pinus virginiana</i> P. Mill.	X	--	X	--	--	--
<i>Piptochaetium avenaceum</i> (L.) Parodi	--	X	--	X	--	--
<i>Plantago aristata</i> Michx.	--	X	--	--	--	Y
<i>Plantago virginica</i> L.	X	X	--	X	X	--
<i>Platanus occidentalis</i> L.	--	--	X	--	--	--
<i>Poa annua</i> L.	--	--	X	--	X	Y
<i>Poa compressa</i> L.	--	--	--	X	--	Y
<i>Poa pratensis</i> L.	--	--	--	X	--	Y
<i>Polygonatum biflorum</i> (Walt.) Ell.	--	X	X	--	--	--
<i>Polygonum caespitosum</i> Blume var. <i>longisetum</i> (de Bruyn) A.N. Steward	--	--	X	X	--	Y
<i>Polygonum punctatum</i> Ell.	--	--	X	--	--	--
<i>Polygonum sagittatum</i> L.	--	--	X	--	X	--
<i>Polypodium virginianum</i> L.	--	--	X	--	--	--
<i>Portulaca smallii</i> P. Wilson	--	X	--	X	X	--
<i>Potentilla canadensis</i> L.	X	X	X	X	--	--
<i>Potentilla simplex</i> Michx.	--	--	--	--	X	--
<i>Prunella vulgaris</i> L.	X	--	--	--	--	Y?
<i>Prunus serotina</i> Ehrh.	X	--	X	--	X	--
<i>Ptilimnium capillaceum</i> (Michx.) Raf.	--	--	--	--	X	--
<i>Pycnanthemum tenuifolium</i> Schrad.	X	--	X	--	--	--
<i>Quercus alba</i> L.	X	X	X	X	X	--
<i>Quercus falcata</i> Michx.	X	X	X	X	X	--
<i>Quercus prinus</i> L.	--	X	X	--	--	--
<i>Quercus phellos</i> L.	--	X	--	X	X	--
<i>Quercus rubra</i> L.	X	X	X	X	X	--
<i>Quercus stellata</i> Wangenh.	X	X	X	--	--	--
<i>Ranunculus pusillus</i> Poir.	--	--	--	--	X	--
<i>Rhexia mariana</i> L. var. <i>mariana</i>	X	--	X	X	X	--
<i>Rhododendron periclymenoides</i> (Michx.) Shinners	--	--	X	--	--	--
<i>Rhus aromatica</i> Ait.	--	X	X	X	--	--
<i>Rhus copallinum</i> L. var. <i>latifolia</i> Engl.	X	X	X	X	--	--
<i>Rhynchospora capitellata</i> (Michx.) Vahl	X	--	X	--	X	--
<i>Rhynchospora globularis</i> (Chapman) Small var. <i>globularis</i>	X	X	--	--	--	--
<i>Rosa carolina</i> L.	X	X	X	X	--	--
<i>Rosa multiflora</i> Thunb. ex Murr.	--	--	--	X	--	Y
<i>Rubus allegheniensis</i> Porter	--	X	--	--	--	--
<i>Rubus argutus</i> Link	X	--	--	--	X	--
<i>Rubus enslenii</i> Tratt.	X	--	X	X	X	--
<i>Rubus occidentalis</i> L.	X	X	--	--	--	--
<i>Rubus pensilvanicus</i> Poir.	--	X	--	X	--	--
<i>Ruellia caroliniensis</i> (J.F. Gmel.) Steud.	X	--	--	--	--	--
<i>Rumex acetosella</i> L.	X	X	X	X	--	Y
<i>Rumex crispus</i> L.	--	--	--	X	--	Y
<i>Salix sericea</i> Marsh.	--	--	X	--	--	--
<i>Salvia lyrata</i> L.	X	--	X	--	--	--
<i>Saxifraga virginiana</i> Michx.	--	X	X	X	--	--
<i>Schizachyrium scoparium</i> (Michx.) Nash	X	X	X	X	--	--
<i>Scirpus georgianus</i> Harper	X	--	--	--	--	--

Appendix 1 (continued). Vascular plant taxa recorded from five granite flatrock sites in Virginia's southern Piedmont.

Taxon	Seepy	Dundas	Cedar Creek	Big Hounds	Golf Course	Exotic? Y=Yes
<i>Scleranthus annuus</i> L.	--	--	X	--	--	Y
<i>Scleria oligantha</i> Michx.	--	X	--	--	--	--
<i>Scleria pauciflora</i> Muhl. ex Willd. var. <i>pauciflora</i>	--	X	--	--	--	--
<i>Scutellaria integrifolia</i> L.	X	X	X	--	X	--
<i>Selaginella rupestris</i> (L.) Spring	--	X	--	X	--	--
<i>Senecio anonymus</i> Wood	X	X	X	--	X	--
<i>Setaria glauca</i> (L.) Beauv.	X	--	--	--	--	Y
<i>Silene caroliniana</i> Walt. ssp. <i>pennsylvanica</i> (Michx.) Clausen	--	X	X	X	--	--
<i>Silene virginica</i> L.	--	--	--	X	--	--
<i>Smilax bona-nox</i> L.	--	X	--	X	X	--
<i>Smilax glauca</i> Walt.	X	X	X	X	X	--
<i>Smilax rotundifolia</i> L.	X	X	X	X	X	--
<i>Solanum carolinense</i> L.	X	--	--	X	--	--
<i>Solidago caesia</i> L. var. <i>caesia</i>	--	--	X	--	--	--
<i>Solidago nemoralis</i> Ait.	--	X	--	--	--	--
<i>Solidago pinetorum</i> Small	X	X	X	--	--	--
<i>Solidago rugosa</i> P. Mill.	X	--	X	--	X	--
<i>Solidago speciosa</i> Nutt. var. <i>erecta</i> (Pursh) MacM.	--	X	X	--	--	--
<i>Sorghastrum nutans</i> (L.) Nash	--	X	X	--	--	--
<i>Spiranthes cernua</i> (L.) L.C. Rich.	X	--	X	--	--	--
<i>Stellaria media</i> (L.) Vill.	X	--	X	X	X	Y
<i>Stylosanthes biflora</i> (L.) B.S.P.	X	X	X	--	--	--
<i>Symphoricarpos orbiculatus</i> Moench	--	--	--	--	X	--
<i>Talinum teretifolium</i> Pursh	X	X	X	X	X	--
<i>Thalictrum</i> sp.	--	--	X	--	--	--
<i>Tipularia discolor</i> (Pursh) Nutt.	--	--	X	--	--	--
<i>Toxicodendron radicans</i> (L.) Kuntze	X	--	X	X	X	--
<i>Trichostema dichotomum</i> L.	--	--	--	X	X	--
<i>Tridens flavus</i> (L.) A.S. Hitchc.	X	X	X	X	X	--
<i>Trifolium arvense</i> L.	--	--	--	X	--	Y
<i>Trifolium campestre</i> Schreb.	--	--	--	X	--	Y
<i>Trifolium dubium</i> Sibthorp	--	--	--	X	--	Y
<i>Triodanis perfoliata</i> (L.) Nieuwl.	X	X	X	X	X	--
<i>Typha</i> sp.	--	--	--	--	X	--
<i>Ulmus alata</i> Michx.	X	X	X	X	X	--
<i>Uvularia sessilifolia</i> L.	--	X	--	X	--	--
<i>Vaccinium corymbosum</i> L.	X	--	X	--	X	--
<i>Vaccinium pallidum</i> Ait.	--	X	X	--	--	--
<i>Vaccinium stamineum</i> L.	X	X	X	--	X	--
<i>Valerianella radiata</i> (L.) Dufur.	--	--	X	--	X	--
<i>Verbascum thapsus</i> L.	--	X	X	--	--	Y
<i>Verbesina occidentalis</i> (L.) Walt.	--	--	--	X	--	--
<i>Veronica arvensis</i> L.	--	X	X	--	--	Y
<i>Veronica peregrina</i> L.	--	--	X	--	X	--
<i>Viburnum prunifolium</i> L.	--	X	X	X	--	--
<i>Vicia</i> sp.	--	--	--	X	--	?
<i>Viola arvensis</i> Murr.	--	X	--	--	X	Y
<i>Viola bicolor</i> Pursh	X	X	--	--	X	--
<i>Viola palmata</i> L. var. <i>triloba</i> (Schwein.) Gingins ex DC.	X	--	--	--	--	--
<i>Vitis cinerea</i> (Engelm.) Millard var. <i>floridana</i> Munson	--	X	--	--	--	--
<i>Vitis rotundifolia</i> Michx.	X	X	X	--	X	--
<i>Vulpia octoflora</i> (Walt.) Rydb.	--	--	--	X	--	--
<i>Woodsia obtusa</i> (Spreng.) Torr.	--	X	X	X	--	--
<i>Yucca filamentosa</i> L.	--	--	X	--	--	?
TOTALS: 314	135	159	194	128	112	ca. 45