

Natural Communities and Indicator Species of The Quarry Gardens at Schuyler. Executive Summary

Devin Floyd, Center for Urban Habitats. November 4, 2019.

The Natural Plant Communities documented to date at The Quarry Gardens at Schuyler are listed and described here-in. The identifications and names are based on the VA DCR-DNR naming scheme, but also align with the International Terrestrial Ecological Systems Classification maintained by NatureServe and its natural heritage member programs. The names selected are those that arrive at the closest match using comparable multivariate data. As expected on a landscape heavily disturbed by human activity, many of the emergent community types do not align well with the classification and naming scheme. Some are hybrids between two types, and others are close matches. While many of the types represent entirely natural and normal communities for the region, several are more heavily influenced by human activity than others. Of those some are considered ruderal; that is, growing on piles of soapstone quarry dust and debris. Included are the interesting regenerating ultramafic barrens scattered around the center of the property on west-facing slopes, and some of the forested types that co-occur over quarry boulder refuse. The east property upland powerline corridor supports natural grassland regeneration, and provides a glimpse of the unique upland prairies and savannas that would have been more widespread in the past. Small patches of the most diverse community type at the property occurs as a hybrid of two rare communities, not fitting cleanly in state and national classification standards. This Ultramafic Woodland x Southern Piedmont Hardpan Forest grows anywhere there is the combination of flat upland terrain and a break in the canopy. Much of the property suffers from fire exclusion, and on upland terrain that once likely held Ultramafic Woodlands we now find Piedmont Basic Oak- Hickory Forests. Narrow bands of acidic, nutrient-poor bedrock occur along the upper rim of the quarries and extend southwest along the east side of the stream corridor in the drainage. These thin strata support small-patch Mixed Pine-Oak Heath, Mixed Oak, Mixed Mesic, Acidic Oak-Hickory Forests. Many of the stream corridor wetland communities along the west margin of the property are heavily influenced by beaver activity. This creates a mosaic of dynamic and changing impoundment community types that drain northeast into a Basic Mesic Forest community, and then to an Alluvial Floodplain Forest type before arriving again at an enormous impoundment (man-made lake).

The plant communities described in detail below include:

1. Southern Piedmont Hardpan Forest
2. Inner Piedmont / Lower Blue Ridge Basic Mesic Forest
3. Piedmont Basic Oak - Hickory Forest
4. Piedmont Ultramafic Woodland x Southern Piedmont Hardpan Forest
5. Piedmont Ultramafic Prairie/Savanna
6. Southern Piedmont Ultramafic Barren (Ruderal)
7. Piedmont Acidic Oak - Hickory Forest and Mixed Pine-Oak Heath Woodlands

8. Northern Piedmont Small-Stream Floodplain Forest
9. Smooth Alder Impoundment Swamp
10. Arrow-Arum Impoundment Marsh

Southern Piedmont Hardpan Forest

This plant community occurs in the north flat woods area of the property and covers about 5 acres. The soils here are notoriously poorly drained, clayey, magnesium-rich, topped with a thick mat of organics, and support a dense mix of vegetation expected of both wetland and upland habitats. Acidophiles grow with alkaliphiles, placing Ericaceous species right next to species like redbud, ash, hackberry, and cedar. The forest here is stunted by the magnesium saturation of the soil, and the poor drainage creates a mosaic of wet and dry terrain. Important species in this community type at Quarry Gardens include *Magnolia tripetala* (umbrella magnolia), *Quercus alba* (white oak), *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), *Fraxinus americana* (white ash), *Cercis canadensis* (eastern redbud), *Carpinus caroliniana* (American hornbeam), *Ilex verticillata* (winterberry), *Smilax* species (*S. hispida*, *S. rotundifolia*, *S. bona-nox*, *S. glauca*), *Botrypus virginiana* (rattlesnake fern), *Adiantum pedatum* (maidenhair fern), *Phegopteris hexagonoptera* (broad beech fern), *Maianthemum racemosum* (eastern Solomon's-plume), *Passiflora lutea* (yellow passion flower), *Uvularia sessilifolia* (sessile bellwort), *Liparis liliifolia* (lily-leaved twayblade), *Lycopus virginicus* (Virginia bugleweed), and *Matelea obliqua* (climbing milkvine).

Inner Piedmont / Lower Blue Ridge Basic Mesic Forest

This rich forest type occurs as a scattered mosaic among other more extensive communities, in perhaps 4-5 locations on the property. In each case it occupies fertile, sheltered, north-facing toe slopes, either above southern hardpan forest or alluvial floodplain forest. The total combined size of the type is less than 5 acres. Perhaps the easiest places to observe this type are along the slopes north of the whispering waters spur trail, and along a spur trail in the area called "pawpaw grove". The community type is also present as small regenerating forest patches among heaps of boulders in the north facing uplands at the north and south ends of the Quarry pits.

Typical species for this community type Quarry Gardens include *Liriodendron tulipifera* (tulip poplar), *Fraxinus americana* (white ash), *Quercus rubra* (northern red oak), *Magnolia tripetala* (umbrella magnolia), *Morus rubra* (red mulberry), *Tilia americana* (American basswood), *Ulmus rubra* (slippery elm) *Cercis canadensis* (eastern redbud), *Viburnum prunifolium* (blackhaw), and *Asimina triloba* (pawpaw). The herbaceous layer includes *Dryopteris marginalis* (marginal wood fern), *Deparia acrostichoides* (silvery spleenwort), *Actaea racemosa* (black cohosh), *Cystopteris protrusa* (lowland bladder-fern), *Tiarella cordifolia* (foam-flower), *Hepatica americana* (round-leaved hepatica), *Uvularia puberula* (mountain bellwort), *Galearis spectabilis* (showy orchis), *Passiflora lutea* (yellow passionvine), *Polygonatum biflorum* (Solomon's seal), *Maianthemum racemosum* (false Solomon's seal), *Eurybia divaricata* (white wood aster), *Podophyllum peltatum* (may apple), and *Thalictrum thalictroides* (rue anemone).

Piedmont Basic Oak - Hickory Forest

This forest is an unusual regional variant, occurring entirely over ultramafic bedrock and thereby hosting species not always typical of the type. Occupying gentle slopes and being a relatively widespread forest type at Quarry Gardens, this community owes its existence here to a long history of fire exclusion. Historically and prehistorically the woodlands of this gently sloping upland terrain on the property would have been maintained by periodic natural fires. Sweeping through every 5-10 years these fires maintained an open canopy and what would have been a woodland/savanna like appearance. In the absence of these natural fires the forest has shifted to having more mesic shade-like conditions. The basic oak-hickory forests here are placeholders for when the natural disturbance regimes return.

Some areas still have trees that reach or exceed 175 years of age or more that exhibit growth habits of the old grasslands. As the land flattens again on hilltops in the central and east portions of the property the forest transitions to species more typical of southern hardpan. Species typical of the Piedmont's basic oak-hickory forest canopy are prevalent and include *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Pinus strobus* (white pine), *Quercus velutina* (black oak), *Carya glabra* (pignut hickory), *Carya tomentosa* (mockernut hickory), *Fraxinus americana* (white ash), *Cornus florida* (flowering dogwood), *Nyssa sylvatica* (black gum), *Cercis canadensis* (eastern redbud), and *Lindera benzoin* (spicebush). However, "ultramafic" species co-occur in areas with more light, with remnants of the old woodland, or any place with conditions in that spectrum. Included are *Quercus stellata* (post oak), the hybrid *Quercus x. Fernowii* (Fernow's oak), *Quercus marilandica* (blackjack oak), *Juniperus virginiana* (eastern red cedar), Red hickory (*Carya ovalis*), *Pinus echinata* (short-leaf pine), and *Celtis tenuifolia* (dwarf hackberry). The herb layer hosts *Polystichum acrostichoides* (Christmas fern), *Solidago caesia* (bluestem goldenrod), *Endodeca serpentaria* (Virginia snakeroot), *Carex blanda* (eastern woodland sedge), *Viola palmata* (wood violet), *Stellaria media* (star chickweed), *Vicia caroliniana* (wood vetch), *Viburnum acerifolium* (maple-leaved viburnum), and *Smilax rotundifolia* (round leaf greenbrier). Like we see in the canopy, the herb layer assumes an ultramafic grassland appearance when it receives more light in canopy breaks.

Piedmont Ultramafic Woodland x Southern Piedmont Hardpan Forest

This open-canopy / reduced-canopy forest occurs in the flat, east upland areas of the property, particularly in the areas around the parking lot and Visitor Center. The mix of plants observed here were once more widespread in the area. Many of the canopy trees are 200 years old or more, despite their often stunted stature. The soils in this part of the landscape have more magnesium than calcium. These conditions are noted from only one community type in Virginia, the Ultramafic woodland. Several of the canopy trees are old "savanna" trees, with one low growing post oak pushing the 400 year old mark. Diversity is highest in portions of the parking lot with the most sun exposure, and one can easily imagine a similar sunny grassland spread across the hilltop far to the north and south a few hundred years ago. A goal of the gardens is to restore these forests to maximize their biodiversity, with prescribed burning and select thinning of woody species being the primary restoration tools. This community type is perhaps 10 acres in size on the property, and includes significant patch-dominance among several species. The landscape is very poorly drained, and thus the forest ends up being firmly between an ultramafic

woodland and southern hardpan forest type. The hybrid community hosts wetland species and montane species, often growing next to one another. As described earlier, the hardpan characteristics over ultramafic bedrock soils also results in acidophiles and alkaliphiles growing with one another.

Diversity is extremely high in sunny areas, with often more than 100 species occurring in a 100 sq. meter area. That number is reduced somewhat in deeper shade, but the richness and diversity are still substantial. The average canopy of this forest type includes a preponderance of *Quercus stellata* and *alba* (post oak, white oak), *Pinus echinata* (short-leaf pine), *Juniperus virginiana* (eastern red cedar), *Fraxinus americana* (white ash), and *Quercus rubra* (northern red oak). Important shrubs include *Viburnum prunifolium* (blackhaw), *Celtis tenuifolia* (dwarf hackberry), *Rosa carolina* (pasture rose), *Ceanothus americanus* (new jersey tea), *Euonymus americanus* (American strawberry shrub), and *Smilax rotundifolia* (roundleaf greenbrier). The herb layer contains a great number of interesting species including *Scleria oligantha* (few-flowered nutrush), *Salvia urticifolia* (nettle-leaf sage) *ageratina aromatica* (small white snakeroot), *Pycnanthemum incanum* (hoary mountain-mint), *Piptochaetium avenaceum* (black needlegrass), *Clematis ochroleuca* (curlyheads), *Silene caroliniana* (wild pink), *Eupatorium saltuense* (pasture thoroughwort), *Dichanthelium linearifolium* (slim-leaf panic grass), and *Desmodium rotundifolium* (round-leaf panic grass), *Panicum philadelphicum* (Philadelphia panicgrass), and *Asclepias viridiflora* (green milkweed). Locally rare and/or disjunct species occurring in this community type include *Eupatorium capillaris* (dog-fennel), *Calystegia spithamea* ssp. *Spithamea* (low bindweed), and *Vitis cinerea* var. *baileyana* (possum grape). Due to the hardpan soils this community supports species not typical of hilltops in the region, including *Carex vulpinoidea* (fox sedge), *Chasmanthium latifolium* (river oats), *Scirpus cyperinus* (woolgrass), and *Juncus effusus* (soft rush).

Piedmont Ultramafic Prairie/Savanna

This plant community type occurs as a long, narrow, 2-acre corridor down the east margin of the property. At the entrance gate one has the best view to the north down the powerline right-of-way, and will immediately notice the native-dominated grassland off in the distance. Like many other utility easements in our area, this one is maintained free of tree growth, and those easements that cross ultramafic bedrock in the area, and that have been spared herbicide treatment, tend to establish quite well. The grassland at Quarry Gardens is regionally unique because of the bedrock. The residual soils of this bedrock recruit for alkaliphiles. Woody species of the canopy and shrub layers of the surrounding forest exert some influence on this community type as they reach from the edges and advance into the grassland in the years between mowing. Those at the leading edge include *Pinus echinata* (short-leaf pine), *Pinus virginiana* (Virginia pine), *Quercus stellata* (post oak), *Quercus alba* (white oak), and *Juniperus virginiana* (eastern red cedar). There is patch dominance of a great number of species, but those readily observed in the corridor include *Eragrostis hirsuta* (big-top lovegrass), *Ageratina aromatica* (small white snakeroot), *Achillea borealis* (common yarrow), *Smilax rotundifolia* (round-leaf greenbrier), *Solidago nemoralis* (gray goldenrod), *Pseudognaphalium obtusifolium* (rabbit tobacco), *Pycnanthemum incanum* (hoary mountain-mint), *Dichanthelium depauperatum*

(starved panicgrass), *Tridens flavus* (purpletop), *Schizachyrium scoparium* (little bluestem), and *Scleria oligantha* (few-flowered nutrush), *Andropogon virginicus* (broomsedge), *Agrostis perennans* (upland bentgrass), and *Clematis ochroleuca* (curlyheads), *Aristida purpurascens* (purple three-awn grass), and *Galactia volubilis* (downy milkpea).

Southern Piedmont Ultramafic Barren (Ruderal)

This globally rare community type occurs naturally in only five states, and at only five locations in Virginia. Communities that may be considered remnant or emergent do occur on landscapes that historically held the community type. Many of the best examples were extirpated by quarry activity in the 20th century. These emergent examples retain much of the vegetative character of the old communities, but tend to be more enclosed and light-starved due to unnatural forest regeneration and fire exclusion. They also tend to have less richness and diversity when compared to their natural counterparts. But, none-the-less, these ruderal communities are note-worthy for their resilience and tendency to regenerate in a predictable manner over ultramafic substrate. The beauty of this community type is that it tends to emerge on the most challenging and heavily impacted landscapes at Quarry Gardens. Scattered around the property are heaps of soapstone dust, gravel, cobbles, and boulders. Some of them are so extensive and exposed that edaphic conditions prevent forest regeneration. They there-by resemble sites with natural barrens. An interesting facet of these ruderal landscapes at Quarry Gardens is that in all examples that have a westerly aspect, the expected indicator species of classic Piedmont Ultramafic Barrens dominate. The globally rare community makes a run for it, and even in the short decades since the piles were created, the trajectory of the flora makes a nice fit for the community type. Because they host mostly native species, and a mix that fits the globally rare community type, these barren/glade areas have been identified as conservation areas and will be maintained as such, rather than planted. New species show up each year through natural recruitment. The best places to observe the community type are along the spur trails at the southwest and west margins of the south Quarry area. Here one will find open ground dominated by soapstone dust and pebbles on a westerly slope, with an open canopy of scattered *Juniperus virginiana* (eastern red cedar), *Pinus virginiana* (Virginia pine), and *Pinus echinata* (short-leaf pine). *Cercis canadensis* (eastern redbud), *Fraxinus americana* (white ash), and *Platanus occidentalis* (American sycamore) are also common in the stunted shrub layer. Among the fine talus of fully exposed areas grow *Solidago nemoralis* (gray goldenrod), *Schizachyrium scoparium* (little bluestem), *Sabatia angularis* (rose-pink), *Spiranthes lacera* (Southern slender Ladies'-tresses), *Solidago odora* (sweet-scented goldenrod), *Antennaria plantaginifolia* (plantain-leaved pussytoes), *Eupatorium hyssopifolium* (hyssop-leaved thoroughwort), *Packera anonyma* (Small's ragwort), and *Pycnanthemum incanum* (hoary mountain-mint), and *Clematis ochroleuca* (curlyheads).

Piedmont Acidic Oak - Hickory and Mixed Pine-Oak Heath Forests and Woodlands

These community types, while being widespread in the Virginia Piedmont, are rare at Quarry Gardens. Combined they occupy less than a couple acres. They always occurs over nutrient-poor soils in association with quartz dominated metamorphic bedrock such as granite, gneiss, and meta-siltstones and sandstones, and typically in association with hills, ridges, and

upland slopes and flatwoods on those bedrock types. They contain fewer species than “Basic” Oak-Hickory forests, and tend to have more Ericaceous species such as *Vaccinium pallidum* and *Kalmia latifolia*. The ultramafic bedrock at Quarry Gardens contains small segregations of these community types, supported by metasiltstone that is more typical of the geology that occurs immediately to the west. This bedrock is of the Lynchburg Group, a series of formations and strata known locally for their “devil’s-dice” bearing meta-siltstone and blue-quartz pebble conglomerate. These bedrock types tend to erode to produce nutrient-deficient, acidic soils, and indeed, in the small seams where they occur on the property, they impart an “acidic” bent on the otherwise “basic” landscape. Strands of *Kalmia latifolia* (mountain laurel) and scattered examples of *Vaccinium x marianum* (highbush blueberry), *Rhododendron periclymenoides* (wild azalea), *Oxydendrum arboreum* (sourwood), and other acidophiles are clues to the anomalous bedrock below. The best place to see these small “acidic” community patches is along the main trail loop in the southeast area of Quarry Gardens where the stone steps carry the visitor from the upper quarry rim to the mid-slope. The largest example of the Acidic Oak-Hickory forest type occurs at the southeast tip of the property, and is easily recognized by its depauperate understory and high canopy dominated by *Quercus* spp. (oaks), *Carya* spp. (hickories), and *Fagus grandifolia* (American beech). This is but the tip of an iceberg that extends west, as the entire slope forest adjoining Quarry Gardens along the west margin is underlain by meta-sedimentary rocks. It hosts hundreds of acres of the Acidic Oak-Hickory type in various stages of succession. The dominant herbs that occur in some of the small patch Heath and Acidic Forest areas at Quarry Gardens include *Chimaphila maculata* (striped wintergreen), *Polystichum acrostichoides* (Christmas fern), *Hypoxis hirsuta* (eastern yellow star-grass), *Goodyera pubescens* (downy rattlesnake plantain), and *Vaccinium pallidum* (hillside blueberry). They occur below *Kalmia latifolia* (mountain laurel) and *Pinus virginiana* (Virginia pine) in early forest succession areas. In one remarkable area, this acidic heath type blends with the ultramafic species nearby to create a Reindeer lichen dominated woodland. Where once giant machines exposed bare bedrock, a most unusual blending of species has repopulated. It is generated by having near-vertical exposed layers of acidic and ultramafic bedrock types, occurring in close proximity to one another. The assemblage is anomalous throughout, with species such as sourwood, mountain laurel, and deerberry growing in close association with ash and hackberry.

Northern Piedmont Small-Stream Floodplain Forest

At the northwest corner of the Quarry Gardens property, a creek reaches a flat floodplain area just before an old road crossing. The narrow floodplain is in the location of the upper reaches of the drainage and is now separate from the Rockfish river floodplain by more than ½ mile. This small alluvial forest likely generated directly upon the sediment that once filled an impoundment/pond. Most impoundment species have departed but some linger as the soil drainage regime and sediment characteristics make their final adjustments to those of a small stream floodplain. While floodplain plant community elements are well-developed, it is clear that the forest and its plants find themselves only part way through the process of transitioning from being that of pond to floodplain forest. Included there-in are the last remnants of several pond-margin specimens of *Alnus serrulata* (smooth alder), *Cornus amomum* (silky dogwood),

Salix nigra (black willow). The upper canopy is dominated by *Platanus occidentalis* (American sycamore). A single large *Betula nigra* (river birch) was rooted along the edge of the stream, and represents a very rare and unusual example for a species that usually grows in association with rocky riverbanks and gravel bars. *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), and *Juglans nigra* (black walnut) are typical in the canopy of the community, and *Asimina triloba* (pawpaw), *Alnus serrulata* (smooth alder), *Acer negundo* (ash-leaved maple), and *Lindera benzoin* (spicebush) dominate the shrub layer. The native herb layer species occurring here include *Verbesina alternifolia* (wingstem), *Amphicarpa bracteata* (hog-peanut), *Boehmeria cylindrica* (false nettle), *Impatiens capensis* (jewelweed), *Onoclea sensibilis* (sensitive fern), *Persicaria sagittata* (arrow-leaved tearthumb), *Pilea pumila* (clearweed), and *Teucrium canadense* (American germander).

Smooth Alder Impoundment Swamp

This natural community is one that establishes in dynamic settings often involving beaver or human activity. At Quarry Gardens a small example of this type is found in a small abandoned quarry pit inside the main loop trail along the west side, between the two large quarry pits. A more extensive and more representative example occurs in the stream corridor along the west margin of the property. Beaver activity in the larger corridor has resulted in a long history of pond-making, dam-breaching, and a great patch-work of varied impoundments, ponds, pools, runs, and swamps. With all the variety noted there-in, there are two dominant sub-types of impoundment. The first, ½ acre swamp, is described here, and the second (a marsh) is described in the next section.

The Smooth Alder Impoundment swamp is entirely treeless but does have small colonies of the shrub-sized *Alnus serrulata* (smooth alder) and *Salix nigra* (black willow). The herbaceous layer is very dense and lush, and dominant native species include *Carex lurida* (sallow sedge), *Sagittaria latifolia* (broad-leaved arrowhead), *Scirpus polyphyllus* (leafy bullrush), *Leersia oryzoides* (rice cutgrass), *Scirpus cyperinus* (woolgrass), *Eupatorium perfoliatum* (boneset), and *Sparganium americanum* (american bur-reed), *Cicuta maculata* (water-hemlock), and *Lobelia cardinalis* (cardinal flower).

Arrow-Arum Impoundment Marsh

Despite having no examples of the species that give this community its name, the community type at Quarry Gardens most closely the “arrow-arum impoundment marsh” classification. This community type occurs upstream of the swamp described, and offers another variation in the shoreline and semi-aquatic vegetation that follows on the heels of the beaver activity at Quarry Gardens. The marsh is about 1 acre in size, and can be seen from the south barren overlook spur trail. The landscape here is notably flat and poorly drained. Heavy saturated soils restrict tree and shrub growth, but the herbaceous component is robust, thick, and tall in most places. The harsh conditions have recruited a small set of well-adapted flora, with only 29 species occurring in the 1-acre community at the time of survey. A small streamlet winds its way through the meadow and spreads out in several locations to create large marshes. This stream channel carves a rather deep line through the wet meadow, the channel itself being densely populated

by *Sparganium americanum* (American bur-reed). The herbaceous layer has four co-dominant native species: *Leersia oryzoides* (rice cutgrass), *Sparganium americanum* (American bur reed), *Scirpus polyphyllus* (leafy bullrush), and *Persicaria hydropiper* (marsh-pepper smartweed). Other common species include *Persicaria sagittata* (arrow-leaf tearthumb), *Boehmeria cylindrica* (false nettle), *Carex lurida* (sallow sedge), *Dichanthelium clandestinum* (deer-tongue grass), *Apios americana* (groundnut), *Mimulus ringens* var. *ringens* (square-stemmed monkey-flower), *Bidens connata* (purple-stem beggar-ticks), *Solidago gigantea* (late goldenrod), *Penthorum sedoides* (ditch stonecrop), and *Carex crinita* var. *crinita* (long-fringed sedge).