THE ECOLOGY OF BIG ROUND TOP

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Big Round Top as a Wilderness Area

A wilderness area represents a territory, large or small, where nature is relatively undisturbed by man. Natural processes proceed much as they did when only Indians occupied the land.

The Big Round Top wilderness area is a close approximation of wilderness; the paths constructed to lead you here and your very presence make true wilderness impossible. If you will leave this area just as you find it, our use of the land will in no way destroy it.

The three most conspicuous features of Big Round Top are (1) the prominent steep rise which sets it apart from the rest of the landscape, (2) the moderately dense cover of trees and shrubs and (3) the seemingly indiscriminate scattered rocks and boulders, some of great size.

Each of these has a basic role in the balance of nature around us.

The steep, stony hillsides from the time of white settlement of the area between 1750 and 1780 to the present, have been unsuited for any kind of agriculture. The original cover of virgin trees: white pine, white oak, black oak and, in places, chestnut, were timbered before 1850. What chestnut remained were completely destroyed by a great epidemic of chestnut blight between 1920 and 1935.

The Balance of Nature

The total spectrum of life occupying a given region may be considered a food or energy pyramid, with intricate interrelations between plants and animals.

The primary producers are green plants which by photosynthesis begin the energy transformations that result in the formation of carbohydrates and ultimately the proteins and lipoids (fats and oil) that support all plant and animal life as well.

While the trees, shrubs and ground cover of herbaceous plants are obviously the principal producers, the importance of mosses on the soil and on rocks and the lichens widely distributed over rock surfaces should not be underestimated.

Supporting the green plant cover are the enormous numbers of microorganisms (bacteria, molds and other fungi) that constantly degrade the dead debris of plants and animals. As indicated earlier, the minerals and organic substances essential to life are returned to the environment to be used over and over again.

The forest floor abounds with insects, spiders, worms, centipedes, millepedes, snails and other animal organisms. These are primary consumers, ingesting bacteria, fungi, leaf tissues and cell sap. They are largely herbivorous, but some are carnivorous, ingesting smaller animals.

Larger herbivores such as many birds, rabbits, squirrels, chipmonks, moles and deer find not only food but also shelter and cover in the vegetation.

Larger carnivores, hawks, owls, occasional eagles, insectivorous birds, snakes, skunks, and occasionally foxes prey upon other animals.

At this point man had permanently interfered with the normal energy pyramid. The large carnivores—wolf, bear and wildcat—have long been exterminated from this area. These animals prey upon deer, rabbit and other medium size animals. Over a period of many years hunters had decimated the deer population, but legal protection and removal of natural animals have allowed the deer to breed in very large numbers.

In a very real sense, then, the Big Round Top area, as any wilderness, is a community, a community of many populations in the soil, on the surface of the ground, encrusted on rocks, in and on trees, in many complicated interdependencies.

One of the most remarkable features of this area is the conservation of the natural processes of decay with its consequent return of mineral and organic materials to the soil.

Scattered throughout the area are felled trees, some lying where they fell 25 to 50 years or more ago. Slowly these are rotting in place, largely through varying degrees of softening and discoloration (as the cellulose of the cell walls is removed and the lignin components become relatively concentrated). The oldest fallen trees are today virtually little more than mounds of barely recognizable wood debris.

Another important aspect or demonstration of the mineral cycles in nature may be observed in the litter which covers much of the forest floor. This is most easily seen in the layers of leaves that accumulate each autumn and which, if undisturbed, show progressive disintegration or decay. The top leaves retain their shapes and structure. They may be readily identified as oak, tulip tree, etc. This *litter* beneath the surface becomes matted together by threads (mycelia) of fungi, slowly loses identity and smells moldy (the result of the waste products of the metabolism of the fungi). This layer is called *"duff."* As one removes this layer or zone, progressively the plant structures become amorphous and grade into *humus.* Thus an extremely slow process of soil formation is continuously going on.

During the warm wet periods of the year, usually July to mid September, several scores of species of fungi—mushrooms, bracket

fungi, puff balls and coral fungi—abound. Many of these are conspicuous and brightly colored but others are hidden among the leaves and would be seen only by the observant.

The Plant Cover

The visible vegetation which covers Big Round Top includes four major components:

(1) The *canopy of trees* (approximately 30 species) of which white pine, white oak, black oak, red oak, hickory, tulip tree and basswood are most common. This is an oak-white pine and mired hardwood association.

(2) The *understory* of shrubs is one of the most striking features of the whole region. The magnificent colorful redbud and dogwood bloom in April before the canopy trees are in leaf. Other members of the understory include viburnum, shadbush and witch hazel.

(3) The *ground cover* is not dense and shows a seasonal progression. In mid April the spring flowers appear in great variety and profusion, with approximately 60 species moderately abundant.

By mid summer less than a dozen species of plants are in bloom, the scarcity of light caused by the canopy prevents development of an extensive ground cover.

Scattered in modest numbers are five species of ferns.

(4) The lichen-moss component inhabiting rock surfaces is remarkable. Lichens contribute substantially to the slow disintegration of rock. Note that most of the lichens and the larger masses of lichens occur on rocks receiving some sunlight and that in the deepest woods few lichens are growing on the rocks.

Note too the meager accumulations of soil in rock crevices and depressions and the plants that populate them.

Disease

Careful observation of the trees and shrubs and even the small herbaceous plants growing in the area will show that disease is rare in an undisturbed situation. Where a tree has a broken limb, fungi may have invaded and begun decay. The brackett fungi on some trees that are still standing and in otherwise healthy condition indicate where a break occurring in the protective tissues, such as the bark, has allowed entry of a parasite. While disease is always a threat to the individual members of a given species in a mixed com-

munity of many different kinds, both the conditions allowing spread of the disease and the heavy infestation of a disease are lacking. (The exact opposite conditions prevail in an agricultural crop such as corn or peaches where the concentration of individuals of the same kind living close together makes infection from one individual to another so easy that measures to protect the health of the plant crop must be maintained carefully.)

*Geological Background**

Big Round Top is a prominent ridge rising above the Gettysburg plain. The ridge is part of the Gettysburg sill, a great medium to coarse grained diabase. The sill represents a deep lava flow of Triassic age which broke through the sediments accumulated earlier in the period. The sill is approximately one mile wide at Gettysburg and forms the prominent ridge which you see extending essentially in a northeast southwest direction. The Gettysburg plain varies in width from a few to twenty miles wide and stands at an elevation approximately 600 feet above sea level. Round Top is 785 feet above sea level and thus its apparent height is accentuated by the flatness of the surrounding terrain.

The plain is highly fertile and has been occupied by the white men since the mid-eighteenth century and developed agriculturally ever since.

The diabase rock which may be seen in the boulders and blocks of rock which are exposed on all of the flanks of Big Round Top and elsewhere on the battlefield. Only two common minerals make up the diabase. The white grains are *plagioclase* and the black grains are *pyroxene.* The rock in some places weathers readily and flakes off in angular grains. In some places the matrix appears to be softer and the bedrock weathers to produce sand of very fine grain.

The restricted area of Round Top presents geologic features of simple structure. The weathered residual mass of an old volcanic sill with rock of monotonously uniform composition.

The steep declevity of the slopes of Round Top have prevented the formation of a deep soil and have tended further to prevent the buildup of extensive humus. In other words between the blocks of diabase there are accumulations of soil and where litter covers the forest floor, soil and humus have been formed to modest thicknesses. One of the results of these circumstances is the relatively thin plant cover, but a cover composed largely of trees, long lived perennials with limited growing requirements. As noted before, the area is unfit for cultivation and thus has been preserved as near wilderness.

*See page 14, Appendix III, for explanation of Geologic Terms.

The extensive red rocks (mostly shales and sandstones) that spread across the Gettysburg plain are of Triassic age, approximately 180 million years old. The Gettysburg sill intruded these red beds, and thus can be dated as late Triassic.

The present landscape is the result of prolonged erosion over many millions of years.

Hydrology

The annual precipitation in the Gettysburg National Military Park falls within the range of 40 to 44 inches, although during the period 1957 to 1967 there was a deficient rainfall in six of ten years. The wettest months of the year are usually August and April, both extremes having an influence on the biological phenomena of the area.

The thin soil is saturated by water from the melting snows and with the usual spring rains, small streamlets have flowing water on all of the flanks of Big Round Top, although some of the smallest temporary tributaries carry a very small volume of water. The streams gather in Rock Creek, which in turn flows into Monocacy Creek, and ultimately the Potomac River.

The meadows in the flat lands in the valley beneath are virtually never dry and the small stream which meanders gently through the valley contains water in all but extreme drought circumstances. The small streams on the flanks of Big Round Top when flowing contain a minimum of algae and other microorganisms. They are too temporary to establish large populations of individuals or species. The stream in the valley, however, contains a considerable variety of algae, protozoa, and small thread worms (nematodes).

The growing season normally extends from approximately March 20 to October 15 but the effective growing season for frost sensitive plants is considerably shorter. The last killing frost in spring falls on an average on May 1, slightly later than the flat farmlands to the south and southeast of Big Round Top. It is not unusual to have a killing frost as late as May 10, although in some years the date may be as early as April 20. Occasionally small patches of slush snow may be observed in some of the shaded parts of Big Round Top as late as May 1 to 5. The first killing frost in fall averages September 20. In some years, it occurs a full week earlier and in other years as late as October 20. The fall coloration of leaves is more brilliant in those years when an early frost followed by a long frost free period occurs. The coloration, however, is not dependent upon frost, but by interruption of water flow into the leaves. During the closing weeks of summer those broad leaf trees that shed leaves develop an abscission layer of shell that effectively cuts off the water supply to a leaf. Prior

to the completion of this abscission elsewhere most of the food materials produced in the leaf have been translocated to other parts of the plant body. The chlorophyll mixture which gives to the leaf its usual main color disintegrates after the source of water is removed. The disappearance of the green chlorophyll exposes yellow and red pigments that have actually been present in the leaf all during the year and in this sense these colors are unmasked. Other colors and shades of orange and red are the result of temporary degradation stages in the chemical change of the plant pigments. When the leaves fall they are little more than vascular skeletons with relatively little stored food materials in them.

The Plants of Big Round Top

The tree cover is made up of thirty species, none of which dominates the landscape. The red, white and black oaks together represent the most numerous group of the woods. These are followed by striped maple, hickory, and the tulip tree. Among the smaller shrubs, dogwood, sassafras and a relatively small number of redbud are particularly common. Among the lesser forms that can be recognized scattered over the terrain are wild grape, witch hazel and, especially near the summit, sumac. Three vines may be observed climbing over living or fallen trees: honeysuckle, Virginia creeper, and poison ivy.

Three ferns, occurring with some abundance, may be found throughout much of the year: the grape fern, the ebony polypody, and Woodwardia. The polypody is remarkable because it will exist in green leaf throughout the winter and can often be observed through or beneath the snow.

Following the very conspicuous and diverse sequence of spring flowers, dimunition in the flowers occurs so that by summer only two or three inconspicuous species can be found. For those who are curious or observant, however, some of the spring flowers are now in fruit while many others have already disappeared completely. A few composites like Joe pye weed (*Eupatorium*) flower in late summer.

There are two common ways by which the small herbaceous plants survive the winter. The most important of these, of course, is the production of seed which will germinate either in summer, producing a new plant which will survive the winter, or germinate in spring when there is a longer growing season for the young plant. The second method is commonly overlooked. Nearly all of the plants you see here are long lived perennials. The principle part of the body is the underground root and stem system. When the spring flower dies it loses its leaves and aerial stem, but the stored food and living buds survive year after year and grow a temporary body above the

ground that lives only long enough to produce food and a new crop of seed. It is this property that presents a serious conservation problem, a small plant pulled out by the roots is destroyed forever and its natural replacement slow, difficult, even at times impossible.

Big Round Top—The Valley Floor

The flat bottom land below Big Round Top, especially to the northeast, has been farmed for more than 150 years. Despite the semi-wilderness of the hillsides in close proximity the cultivated land shows the influence of human occupance. Without continuous cultivation underbrush would invade the exposed land except where the small stream overflows its banks in spring and after heavy rains. The fence rows are lined with specimens of the red cedar, a small tree which in this region is of little commercial value. It is by many considered a weed tree and has an additional objectionable feature, the intermediate host of apple rust fungus. The fence rows are also marked by the presence of wild cherry which though scattered elsewhere in the vegetation frequently grows to considerable size in such an open situation. Poison ivy and Virginia creeper may be observed climbing these trees and the fence posts.

In sharp contrast to the physical features of Big Round Top the valley below is marked by flatness, freedom from boulders, and tree cover. The valley or bottom land has been continuously occupied by white men for more than two centuries and by Indians periodically before them. The natural vegetation has long been destroyed. The broad meadows are covered with a mixture of native grasses but now associated with nearly 50 species of introduced "weeds," mostly of European origin.

Weeds are the tell-tale marks of human occupance. The phenomenon of weed dispersal is of worldwide concern. Wherever man has traveled he has carried plants with him. Usually this has been unintentional, small seeds being transported on his clothing, in his grain, or with his belongings. The dispersal of weeds has been excelerating especially through the use of the automobile. Weed seeds are picked up in tires and dust and are carried hundreds of miles before they are dropped again. Weed species of foreign origin are to be found along every road and path in the Gettysburg National Park and Cemetery, along every road and highway, along every stream of modest size, and on every farm.

The spread of these seed species is a perfectly natural phenomenon. The only difference is the spread by which it now takes place with man and his means of transportation as a prime factor in the process.

The most common of these are species of *Ranunculus* (Buttercups),

a considerable variety of yellow mustards, other crucifers like shepherds purse, composites like dandelion, and many, many more. There is no certain information telling us how early these European weeds were introduced in the immediate vicinity but there can be little doubt that many of them were well established before 1800.

(Botanists have shown that in New England weeds brought by the early Pilgrims between 1620 and 1630 had spread to central Massachusetts and southern Connecticut before 1690. Wherever man has moved and developed the land into farming he has taken the weeds with him.)

A weed is often defined as a plant out of place or again as an unwanted plant. Neither of these definitions is accurate, if indeed a precise definition is possible. We may look upon the dispersal of weeds as a natural process of migration of plants into new situations. Of course man is the agent by which this process is hastened. The invasion and establishment of weeds changes the character of the total flora in many cases by increasing the diversity of plants that occur together. In many cases they crowd out native vegetation but this is not always true.

In sharp contrast to the abundance and variety of weed species in the valley there are almost no introduced weeds on Big Round Top, the only exceptions being small numbers of individuals along the paths and in the cleared summit where the wind, birds, and the dirt on man's shoes have brought in seeds that find a place to germinate.

Indian Occupance

Tradition maintains that the whole area of which the Gettysburg National Military Park is now a part was periodically hunted by Indians, many of whom traveled considerable distances from the vicinity of the Susquehanna River. There is some evidence of Indian occupance of the area as long ago as 8000 B.C. but this has neither been proven nor generally accepted. At many times, particularly several decades ago, arrowheads and other artifacts were turned up by plowing and weathering on the farmland below. Some of these pieces are still preserved in local collections. There are legends also of Indian encampments on the farmlands, but no specific evidence of any type of semi-permanent settlement has been demonstrated. The relative abundance of deer, one of the most important meat producing animals hunted by the Indians, warrants our belief of the presence of Indians all over this countryside during many centuries of time.

APPENDIX I

Approximate Calendar of Seasonal Changes

March 15-20	and following, heavy northward migration of birds
April 5-15	Spring beauty, hepatica, bluet, rue anemone, and jack-in-the-pulpit
April 20-25	Redbud and Dogwood in bloom
May 1-5	Mayapple in flower, the most abundant herbaceous plant among the spring flowers
May 10-15	Nearly all trees in full leaf, followed by rapid disappearance of spring flowers
July 1-August 15	Greatly reduced diversity of flowering plants and active animal life
August, mid to late	Date dependent upon moderate to heavy rainfall, appearance of a large variety of fungi, some of which are quite spectacular
Sept. 15 to Oct. 15	Dependent upon killing frost, defoliation of trees, disappearance of flying insects

It is not uncommon to have a killing frost in mid September, but then have several weeks without another.

APPENDIX II

Wild Flowers—Big Round Top Area, including farmland on flat*

1. Arisaema trifolium (wild ginger)
2. Asarum atrorubum (jack-in-the-pulpit)
3. Symplocarpus foetidus (skunk cabbage)
4. Allium canadensis (wild garlic)
5. Erythronium americanum (dog-tooth violet)
6. Ornithogalum nutans (star-of-Bethlehem)
7. Muscari botryoides (grape hyacinth)
8. Convallaria majalis (lily of the valley)
9. Iris versicolor (iris)*
10. Hepatica americana (hepatica)
11. Anemonella thalictroides (rue anemone)
12. Ranunculus hispidus (buttercup)
13. Ranunculus acris (buttercup)
14. Dicentra cucullaria (dutchman's breeches)
15. Barbarea vulgaris (yellow rocket)*
16. Brassica nigra (black mustard)*
17. Capsella bursa-pastoris (shepherds purse)
18. Thlaspi campestre (pennycress)
19. Dentaria diphylla (toothwort)
20. Arabis hirsuta (tower mustard)*
21. Cardamine bulbosa (spring cress)*
22. Sanguinaria canadense (blood root)
23. Podophyllum peltatum (Mayapple)
24. Alnus serrulata (alder)
25. Sassafras albidum (sassafras)
26. Saxifraga virginiana (saxifrage)
27. Amelanchier canadensis (shad bush)
28. Prunus seratina (wild black cherry)
29. Fragaria virginiana (strawberry)*
30. Potentilla norvegica (cinquefoil)*
31. Claytonia virginica (narrow-leaved spring beauty)
32. Claytonia carolineana (broad-leaved spring beauty)
33. Cercis canadensis (redbud)
34. Strophostyles undulatum (wild bean)
35. Trifolium repens (clover)
36. Geranium maculatum (wild geranium)
37. Oxalis europaea (sour grass, sorrel)
38. Malva neglecta (mallow)

39. Phlox pilosa	(phlox)*
40. Mertensia virginica	(blue bells)
41. Nepeta repens	(ground ivy)
42. Lamium amplexicaula	(horse mint)*
43. Lamium purpurea	(horse mint)
44. Acer negundo	(box elder)
45. Cornus florida	(dogwood)
46. Forwythia viridissima	(forsythia) (escaped)*
47. Stellaria media	(chickweed)*
48. Cerastium vulgatum	(mouse-ear or hairy chickweed)*
49. Galium trifolium	(bed straw)
50. Lysimochia nummularis	
51. Vinca minor	(periwinkle) (escaped)*
52. Houstonia patens	(bluets)
53. Oenothera biennis	(evening primrose) (summer flower)*
54. Solanum virginianum	(ground cherry)*
55. Rhododendron maximum	(rhododendron)
56. Kalmia latifolium	(mountain laurel)
57. Pyrola sp.	(wintergreen) (summer flower)
58. Viola canadensis	(white violet)
59. Viola soraria	(sisterly violet)
60. Viola striata	(cream violet)
61. Viola pubescens	(downy yellow violet)
62. Viola hastata	(halberd-leaved yellow violet)
63. Viola pennsylvanica	(smooth yellow violet)
64. Syringa vulgans	(lilac) (escaped)
65. Lonicera japanica	(honeysuckle) (escaped)*
66. Lonicera morrowi	(honeysuckle)*
67. Viburnum lentago	(virburnum)
68. Achillea millefolium	(yarrow)*
69. Antennaria plantaginifolia	(pussytoes)*
70. Antennaria campestris	(pussytoes)
71. Taraxacum officinale	(dandelion)*
72. Cirsium vulgare	(thistle)
73. Hieracium sp.	(hawk weed)
74. Eupatorium album	(joe pye weed)

APPENDIX III: TECHNICAL NOTES ON GEOLOGY

Several technical terms used in the report are unfamiliar and dictionary definitions are not very helpful. The following notes should clarify the more important questions.

Sill: a body of igneous rock intruded between strata, more or less horizontally. Sills are usually near the surface, hence subsequent erosion exposes this once-buried rock mass.

The *Gettysburg Sill* is simply the proper name for this particular sill, which has intruded Triassic red shales.

Diabase: a fine grained igneous rock which here forms the Gettysburg Sill. The dark gray color is the result of a mixture of the two chief mineral constituent plagioclase (white) and pyroxene (black). *Plagioclase,* a sodium calcium aluminum silicate, is one of the most common rock-forming minerals. *Pyroxene,* another of the most common rock-forming minerals is a complex magnesium aluminum silicate containing also iron and other elements.

Triassic: the earliest of the three time subdivisions of the Mesozoic (age of reptiles). Mesozoic = Triassic, Jurassio, and Cretaceous. The Triassic began about 225 million years ago, enduring 35 million years. The Gettysburg Red Beds (shales and sandstones) that extend southward into Maryland and eastward, discontinuously with the similar Newark Formations of New Jersey, are upper (or late) Triassic age, hence about 190 million years old. Dinosaur footprints and fragments of fossil plant stems and fern leaves have been found in these beds near Dillsburg (Trostle's Quarry).

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