

# **The Forests of Ivy Creek**

## **Past, Present, and Future**



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## **Purpose of Study**

I hope that the report which follows will be helpful and interesting to folks who want to learn more about the forests of Ivy Creek: how human activities in the past, together with natural processes of succession, have molded them into what we see today - and how they might continue to change in the future.

## **Acknowledgements**

The first person I called after deciding to do the study was Tex Weaver, and asked if he would be interested in preparing the maps that would be essential. He was. Three of his coworkers, Elise Hackett, Derek Bedarf, and Michaela Accardi also helped. Elise was present on 12 of 14 GPS field days and has done most of the office map work. With the help of Phil Stokes, Dan Nissen, Vic Parmalee, Marilyn and David Smith, and Frank Biasioli we obtained GPS coordinates on 152 trees plus a variety of cultural and natural features. Nancy Weiss, Vic Parmalee, Brenda Hyson, and Tatyanna Patten were invaluable in the final preparation of this report, editing drafts and helping me insert aerial and digital photos and maps.

I also want to recognize and thank my wife Marguerite (front cover). When we started this project she had no idea how much time I would spend on it over more than a year, and she has been patient and supportive.

## **Human History Prior to Ivy Creek Natural Area**

Hugh Carr – Hugh Carr began purchasing land for his own farm in 1870, when he purchased 58 acres. By 1890 he had acquired 125 acres. We don't know what shape his land was in before he purchased it, but it is likely that much of it was already cleared and being farmed or grazed, as settlers were moving into Albemarle before 1750. His farm eventually became known as Riverview.

Conley Greer – Conley Greer purchased the farm from his father-in-law, Hugh Carr, in 1914. By the time he died in 1956 he had enlarged the farm to 230 acres. The present Ivy Creek Natural Area is 215 acres. The rock check dams in gullies are almost certainly his work, and in the late 1930's he constructed the cow barn using wood harvested from the farm. A great amount of timber harvesting occurred during his tenure. All of the present hardwood dominated stands show evidence of harvesting during his time, both partial harvests and clearcuts. During the 1950's, when he became ill and died, cultivation seems to have ceased, but grazing of the open fields seems to have continued as they gradually grew up in forests.

Owners following Conley Greer – gradual abandoning of fields continued, along with grazing and timber harvesting, right up to the time the ICNA was established in 1979.

## Description of Study

I have been studying the forests of Ivy Creek for at least 25 years, and have been collecting increment cores for 20 years. On January 27 of this year, a beautiful cold day after a light snowfall (Figure 1), I began the study by coring a couple pine trees in a large clearcut along the Orange Trail. I collected 9 more cores on February 2 and 7 (Figure 2).



Figure 1. Day one of the study.



Figure 2. Coring a Virginia pine on the School Trail.

We GPS'd all the trails to be sure of their accuracy, as all of the maps Elise prepared are tied to the trail system. We obtained copies of the 1937 (the first ever taken), 1957, 1966, 1974, 1980, and 2013 aerial photographs, which have been very helpful in tracking the changes that have occurred in the forests at Ivy Creek over those years.

With the help of Phil Stokes, Dan Nissen, Vic Parmalee, Marilyn and David Smith, and Frank Biasioli we GPS'd 152 trees. These trees were accurately measured at 4.5 feet (DBH, i.e. diameter at breast height) and the position of the diameter tape was marked with spray paint so future measurements can be made at exactly the same place on the trunk. We also GPS'd 19 wind-thrown or broken off trees that were cross sectioned. We also located and mapped the numerous old fence lines, rock piles, gullies, historic roads, charred remains of trees, chestnut stumps, springs, an old house site, and other notable cultural and natural features. We also mapped **forest stands**.

## Forest Stands

Forest stands are areas of trees that differ from adjacent areas of trees because of differences in age, logging history, species composition, or site quality. Site quality depends on moisture supply and fertility, which in turn are determined by geology, soils, slope, and aspect. Some forest stands have clear and easily delineated boundaries, such as on either side of a fence line, or an old-field pine stand next to a hardwood stand. Other stand boundaries are transitional and fuzzy, and we have struggled to separate some stands that over-all seem different enough

to be described separately. To help us identify stands we looked for several different kinds of evidence.

## **Evidence from the Past**

**Logging** - We found widespread evidence of past logging, all over Ivy Creek. A lot of logging, both partial harvests and clearcuts, occurred during Conley Greer's tenure. Much logging was done in the 1920's, 1930's, and 1960's. We can only speculate about logging during Hugh Carr's time, because later logging removes evidence of earlier logging. All of the present hardwood stands show evidence of being logged.

**Clearcutting** – In this report we talk about a number of clearcuts made at Ivy Creek from the 1930's through the 1960's. Clearcutting greatly increases the amount of sunlight at ground level, enough for seedlings and small sprouts of shade intolerant species like pines, oaks, and yellow poplar to grow well and attain a place in the canopy. Not all trees are cut down in the kind of heavy harvest cut commonly called clearcutting. Scattered large trees are almost always left. They are trees that were not quite big enough to harvest, or were crooked, knotty, low value species, or otherwise defective. These trees are always recognizable in the new forest that grows up around them, and are commonly called "residuals". Other trees that are left after logging tend to blend in with the new forest. Small trees in the sub-canopy, and understory trees, often become hard to distinguish, over time, from trees that arise after the harvest. Trees that arise after the harvest can be either seedlings, or sprouts from trees of all sizes that are cut down or broken during the harvest. Consequently, after a clearcut the only really new trees are seedlings, because all sprouts arise from already existing trees that can predate the harvest by many years. Over time, only the "residuals" can be identified with any confidence, and the even-aged appearing part of a stand contains trees of somewhat varying ages. When aging a clearcut stand, the ideal trees to increment core, or cross section, are seedlings, and the best trees to core are species that do not sprout, so they must be seedlings. Virginia pine, shortleaf pine, and white pine do not sprout, they are easy to core, and their cores are usually easy to count.

**Stumps** are helpful in detecting past logging. Oak stumps will last about 50 years (just the heartwood, as sapwood decays much more rapidly), and oak stumps are widely scattered through most of the older forest stands at Ivy Creek, telling us that partial harvesting was widespread in the 1960's and possibly the later 1950's (Figure 3). Conversely, the absence of oak stumps indicates stands that were not partially harvested during those years, and that is also useful information. The resin soaked heartwood of pine, called litewood, is much more decay resistant than oak heartwood. The widespread occurrence of litewood stumps tells us that some forest stands now dominated by hardwoods were once dominated by pines which grew up in abandoned fields and pastures.

**Stump sprouts** are very helpful, and they also are widespread in the older, hardwood dominated forest stands. When hardwood trees are cut down their stumps commonly sprout, with usually two or more sprouts per stump (Figure 4). Hardwoods under 60 or 80 years of



Figure 3. Oak stump from partial harvesting in the 1960's.



Figure 4. Yellow poplar stump sprouts.

age almost always sprout. Sprouting frequency drops off with size and age, but even very large stumps sometimes sprout. Stump sprouts also arise from the base of trees killed by very hot fires. Severe fires certainly burned over Ivy Creek before Europeans arrived, but no evidence for early severe fires exists today, and all stump sprouts present today originated after logging.

**Size of logging areas** - Tree harvests were frequently done on small areas, both partial harvests and clearcuts. Consequently, some of the individual forest stands we can detect today are quite small. The older, hardwood-dominated stands were cut through more than once, probably gradually or sporadically, as wood or income was needed.

**Pines** are extremely helpful. The so-called yellow pines at Ivy Creek (Virginia, shortleaf, pitch, and loblolly) are very intolerant of shade. They do not grow up under a hardwood forest canopy. They come in after heavy disturbances that let in considerable sunlight. These disturbances include clearing and abandoning fields and pastures, which is the primary cause of pine stands at Ivy Creek. Heavy logging is the secondary cause. In the Piedmont, pines are transitional – as they die from old age, shading-out, bark beetles, or blow-down, they don't come back, but are replaced by hardwoods. When you see a hardwood forest with scattered pines in the canopy, it usually means that the pines and hardwoods originated at the same time following a timber harvest. Hardwood canopy trees growing close around a pine, also in the canopy, are no older than the pine. White pine is an exception, because it is quite shade tolerant.

Pines are also helpful because they are easy to core and their annual rings are easy to count. In mixed pine-hardwood forests the pines tend to be smaller, so that they can be aged with an 8 inch increment borer, which is what I happen to have.

**Red cedar** trees are helpful because they, like pines, usually come in abundantly on abandoned fields and pastures. They are somewhat more shade tolerant than pines and sometimes persist in the understory for years. When you see a large dead cedar in the understory of a hardwood dominated stand, you can be almost certain that the stand was once quite open, probably a field or pasture, or possibly heavily logged.

**Tree ring counts** from increment cores and cross sections from fallen trees have been extremely helpful in detecting and describing stands, and understanding the history of the forests of Ivy Creek. Ring counts can tell us approximately when a tree originated. They also sometimes reveal when harvest cuts occurred by revealing "release events", periods in the life of a tree when a long period of slow growth suddenly changes to a long period of much more rapid growth. A tree is released when some or all of its nearby competitors are cut down. Severe wind storms also release trees, but the tip-up mounds that usually accompany wind-throw persist for a long time. Consequently logging release can be distinguished from wind throw release.

We have 98 ring counts. There are 79 increment cores (Figure 5), 60 obtained during the present study and 19 from earlier coring I have done. There are also 19 cross sections (Figure 6) cut during the present study. Phil Stokes cut all of the cross sections, and lugged them back to



Figure 5. The 79 increment cores.



Figure 6. 15 of the 18 cross sections.

the parking lot, and also sanded or planed them, a big contribution to the study. Growth rings are easier to count on cross sections than increment cores, which are only 1/4 inch wide. Rings are easiest to count on the yellow pines (Virginia, shortleaf, and loblolly).

**Agriculture** – Rock piles, gullies, linear soil ridges, and litewood pine stumps are all evidence of past cultivation, and the 1937 aerial photo shows clear evidence of it. The Parking Lot Field and the fields in and around the building complex seem to be all in cultivation in 1937. The Barn Field also shows a large cultivated field to the west of an orchard. There also appear to be cultivated fields around the tenant house (described later under Area 4). In the 1957 and later aerial photos there is no clear evidence of cultivation, even though all the fields are still open. This is probably because Conley Greer became ill in the 1950's and died in 1956, and cultivation may have ceased several years before the 1957 photo was taken. All the fields appear to be just as open in 1957 as in 1937, suggesting they were being heavily grazed.

Grazing continued right up to the time the ICNA was created. The fields did not grow up all at once, but pines and red cedars, and other species, seeded in gradually over a period of more than 20 years in some fields, as can be seen by comparing the 1957, 1966, 1974 and 1980 aerial photos. Grazing would have contributed to the slow development of forests on the abandoned fields.

**Rock piles** are evidence of cultivation. Rocks were picked up and piled to make plowing and cultivation easier. Most of the formerly cultivated areas at Ivy Creek did not have much surface rock, and so rock piles are infrequent, but still can be found widely scattered over most of Ivy Creek, with the greatest concentration in Area 5.

**Gullies** are also evidence of cultivation. The greatest number of gullies, and the deepest gullies, occur in Area 4, but gullies also occur in the other five areas. This mention of widespread gullies is in no way criticism of Conley Greer, Hugh Carr, and any farmers that preceded them. If you owned a hilly farm such as River View, and had to make a living by farming it, soil erosion and gullies were unavoidable. They are universal in the Virginia Piedmont.

**Fence lines** are extremely helpful because so many forest stands are bounded by fences. Many of the largest and oldest trees at Ivy Creek are on fence lines. Fence lines are easy to find where wire was nailed to trees and over-grown wire still protrudes from them. They are also easy to find where posts were used, and the posts and wire are still present. Lacking posts and wire, we have to look for one-sided, field-edge trees and linear soil ridges. The latter are created in two ways, by plowing repeatedly toward a fence with a turning plow, and by eroding soil accumulating on the upper side of cross-slope fence lines. Fence lines used to be brushy and weedy, and made good sediment traps. These linear soil ridges are common at Ivy Creek, and the most prominent one is in Area 4 and follows the Brown Trail between the mowed field and Stand 5 and Stand 4. There are several very long fences at Ivy Creek. The best known one runs from the pipeline on the western boundary to Martin's branch, and includes a section of rock

wall that starts at the Orange Trail and runs just above the Red Trail (Figure 7). We found and plotted most of the fences at Ivy Creek, but there is still more work that can be done.



Figure 7. Rock wall above Red Trail and east of Orange Trail.

Fences were constructed to control livestock. They all either “close-the-loop” or connect to another fence. Our maps show many fences that end without closing or connecting to another fence. This means we didn’t find the complete, original fence. It may have been removed, rotted away (wooden fences), washed away (in Martin’s Branch), or buried under the leaves (we “dug-out” a number of sections). In the future we may find some of these missing fences. A metal detector would be helpful. Also, we found remnants of fences, late

in the study, which we didn't have time to map out. Finally, some Ivy Creek fences are probably submerged in the reservoir, or buried by sediments that have been deposited since the reservoir was created.

**Size of fields** - Cultivated fields and pastures were often small in the early years (unlike today), even as small as an acre or less. This accounts for at least some of the heterogeneity in the old field stands that grew up on fields abandoned starting in the 1950's.

**Geology** - Geology and soils account for some of the differences that can be observed in the forests of Ivy Creek. The geology of Ivy Creek has not been specifically mapped. In Wilbur A. Nelson's "Geology and Mineral Resources of Albemarle County", Bulletin 77, 1962, Virginia Division of Mineral Resources, the Lovingston gneiss formation is mapped in the northern part of Ivy Creek, the Rockfish conglomerate in the southwest (Green Trail), and the Lynchburg gneiss in the southeast. Judging from outcrops and surface rocks, much of Ivy Creek is underlain by granite gneiss of Grenville age (Lovingston gneiss). These rocks usually produce soils of average fertility, but mineral composition can vary considerably from place to place. Where calcium-rich plagioclase feldspars are more abundant, as well as pyroxenes and amphiboles, more fertile soils result. The best clue to differences in mineral composition and fertility is the vegetation. Black walnut and ash, and a number of herbaceous species, require fertile soils. One of the most useful indicators of richer soils at Ivy Creek seems to be black cohosh (*Cimicifuga racemosa*). It usually (but not always) grows on base rich soils, and we have noticed colonies at numerous places scattered about Ivy Creek.

Along the Green Trail, where Wilbur Nelson mapped Rockfish conglomerate, sandstone is abundant in places, and seems to have had a noticeable effect on the forests growing on it. Forests growing on this kind of rock are discussed later in the report in Area 3. We have not observed any rocks indicative of the Lynchburg gneiss.

In Areas 1 and 6, within the area mapped as Lovington gneiss by Wilbur Nelson, we have observed unusual, light-colored (felsic) rocks that have not yet been identified. These rocks deserve further study, as they seem to affect the trees and other plants growing on them, which will also be discussed later in the report.

## **Forest Succession and Ecology**

**Tree species in the canopy** - Oaks dominate the canopy of most hardwood and mixed, pine-hardwood stands. Of four red oaks present, black, southern red, and scarlet are widespread and common. Northern red oak is also widespread, but less common, and occurs mostly on the more moist and more fertile lower slopes and north to east aspects. Of three white oaks present, white, chestnut, and post, white oak is most common and widespread. Chestnut oak is next in abundance, and is most common on dry ridges, the dryer south to west aspects, and soils derived from sandstone. Post oak is scarce and usually occurs on dry sites. Hickories, yellow poplar, red maple, beech, and black gum are also common and widespread, with red maple, black gum, and beech often occurring as small trees in the sub-canopy or understory. Black walnut and ash require more fertility than other hardwoods, and are less common, especially ash. Black walnut comes up mostly in old pastures. Black cherry and black locust are also less common, but are often present in abandoned fields and pastures and heavily-cutover areas. Black birch occurs mostly on northerly aspects at Ivy Creek, and is abundant in places, which is discussed later in the report under Areas 1, 2, 5, and 6. Hackberry, persimmon, paulownia, sassafras, ailanthus, and sycamore occur occasionally, although sycamore is dominant in a new forest on recently emerged land in Area 6.

Pines dominate, at least initially, most of the stands that grew up on fields abandoned in the 1950's, 60's, and even 70's. Virginia pine is most abundant with shortleaf pine somewhat less abundant. Red cedar, often in the understory, is also common. Hardwoods also occur along with pines, in old field pine stands. They eventually become abundant in the understory, but even occur in the canopy, especially on northerly aspects and more fertile soils. Yellow poplar occurs most often in the canopy, but black cherry, black locust, and occasionally scattered oaks also occur. The occasional oak tree in the canopy of an old field pine stand is often southern red oak.

Abandoned fields may seed in to pines quickly and become dense, heavily stocked pine stands with well pruned trees. Pruning refers to the natural shedding of lower branches while they are still small, as a result of mutual shading. On the other hand, abandoned fields may seed in slowly and gradually, as most of the old fields at Ivy Creek seem to have done. The evidence for this is the frequent and wide-spread occurrence of pine trees with very large

branches close to the ground (Figure 8). Large lower branches can occur only on trees that grow without side-shading for many years. When fields seed in gradually there is also more opportunity for hardwoods to become established along with the pines. Consequently, some of the abandoned fields at Ivy Creek have as many, and sometimes more, hardwoods than pines. And finally, where pines are slow to seed in there are often more large red cedars.



Figure 8. Pine tree that grew up under completely open conditions.

In addition to the widespread and abundant Virginia and shortleaf pines, we have three other pine species at Ivy Creek. White pine is next in abundance and is widely scattered over Ivy Creek, primarily in hardwood stands (it is the only pine that is shade tolerant), but also in old field pine stands. Pitch pine is uncommon and only occurs on the peninsula, and it will be discussed in Area 6. Loblolly pine is even less common, but widespread. We have found nine, in Areas 2, 3, 4, and 6, and all apparently originated from natural seeding.

**Forest succession** - Humans have greatly changed ecological processes and forest succession. Perhaps the biggest change currently affecting the forests of Virginia is the huge reduction in forest fire frequency over the past 70 years or so. At Ivy Creek, as in much of the Virginia Piedmont,

agricultural practices had already reduced fire occurrence before the introduction of fire control legislation and programs. The suppression of fires has seriously impacted regeneration of the kinds of mixed hardwood forests, usually oak dominated, which predominate in the Piedmont today. Prior to fire control, understories were more open and sunny, and shade tolerant hardwoods were much less common because they don't survive fire as well as oaks. Small oaks were able to survive and grow slowly in the understory until some opening occurred in the canopy. If a canopy opening was large enough, small understory oaks were usually able to grow fast enough to dominate, or become important, in the following stand. Understories today tend to be dominated by red maple, beech (Figure 9), and other shade tolerant species such as black gum, hickory, dogwood, hornbeam, redbud, and other species. Shade levels are usually too great to permit small oaks to survive, with the exception of Stand 4 in Area 3, and Stand 4 in Area 6, which are described later in the report.

The consequence of this change is that the diverse, mixed-species hardwood stands are being replaced by less diverse forests composed primarily of the few shade tolerant species available, which at Ivy Creek are primarily beech and red maple. The beech ravine (Figure 10) later described in Area 5, Stand 3, may indicate the kind of forest that will become increasingly common at Ivy Creek.



Figure 9. Beech dominated understory.



Figure 10. Beech dominated stand below the Orange Trail.

**Fire history** - We found charred remains of litewood pine, mostly small stumps but some knots, in about 10 different places in Areas 1, 2, and 5. We also found six large beech trees with what appear to be very old fire scars on the uphill side. These are discussed later in the report under Areas 1, 2 and 5. The fact that the charring is on litewood means that the trees had to have been dead when the fires occurred. Fires don't burn through living sapwood all the way to the heartwood. The fact that only pines are charred may be because other species are less resistant to decay (except perhaps red cedar and black locust), and may have rotted away since the fires occurred. This raises a question about fence posts. We saw at least a hundred of them while searching for old fence lines, all red cedar or black locust, scattered widely in all six Areas. None of them are charred. Why not? Is it possible that the fires that charred the pine stumps occurred before barbed wire fences were erected at Ivy Creek? Or were the fences present, and the fact that none of them are charred suggest that fires were small and local? The fires may have been deliberately set to burn brush and clear land, and kept away from fences.

**Pine and yellow poplar height growth** - The relationship between rate of height growth and site quality (site quality depends on moisture supply and fertility) is very different for yellow poplar than for other species. When comparing yellow poplar with Virginia and shortleaf pines, on very productive sites yellow poplar grows much faster in height than the pines, but on medium to poor quality sites the pines grow faster. This means that on very good sites yellow poplar will run away from and shade out pines, but on average to poor sites yellow poplar gets shaded out or ends up in the understory. This is why yellow poplar is more abundant on cooler

and more-moist north-facing slopes than on warmer and dryer south-facing slopes. We can see good examples of where yellow poplar has shaded out pines at Ivy Creek. One is in Stand 8 of Area 1, behind the barn, and another is in Stand 7 of Area 2, adjacent to the Parking Lot Field.

**Invasive plants** are having a big impact on the forests at Ivy Creek. Oriental bittersweet is the biggest problem, followed by autumn olive and then Japanese stilt grass. They seem to be increasing despite heroic efforts by a dedicated group of volunteers. They are worst in the most heavily used areas and areas that were still fields and pastures in 1957. They suppress and crowd out all kinds of native plants, including tree seedlings. After fire control, invasive plants are the second biggest factor altering forest succession.

**Beavers** have had a lesser, but still important impact, girdling and damaging trees as far as several hundred feet from the reservoir. They had been wiped out in Virginia, but were re-introduced about the mid 1900's. They feed on just about all species, but at Ivy Creek have a distinct preference for black or sweet birch. Some people don't like the damage they do, but the more open forest canopy and thicker understory are good habitat for some birds. Also, beaver cuttings are the only place where small oaks are growing vigorously at Ivy Creek. Beaver "clearings" mimic the openings that fires used to create.

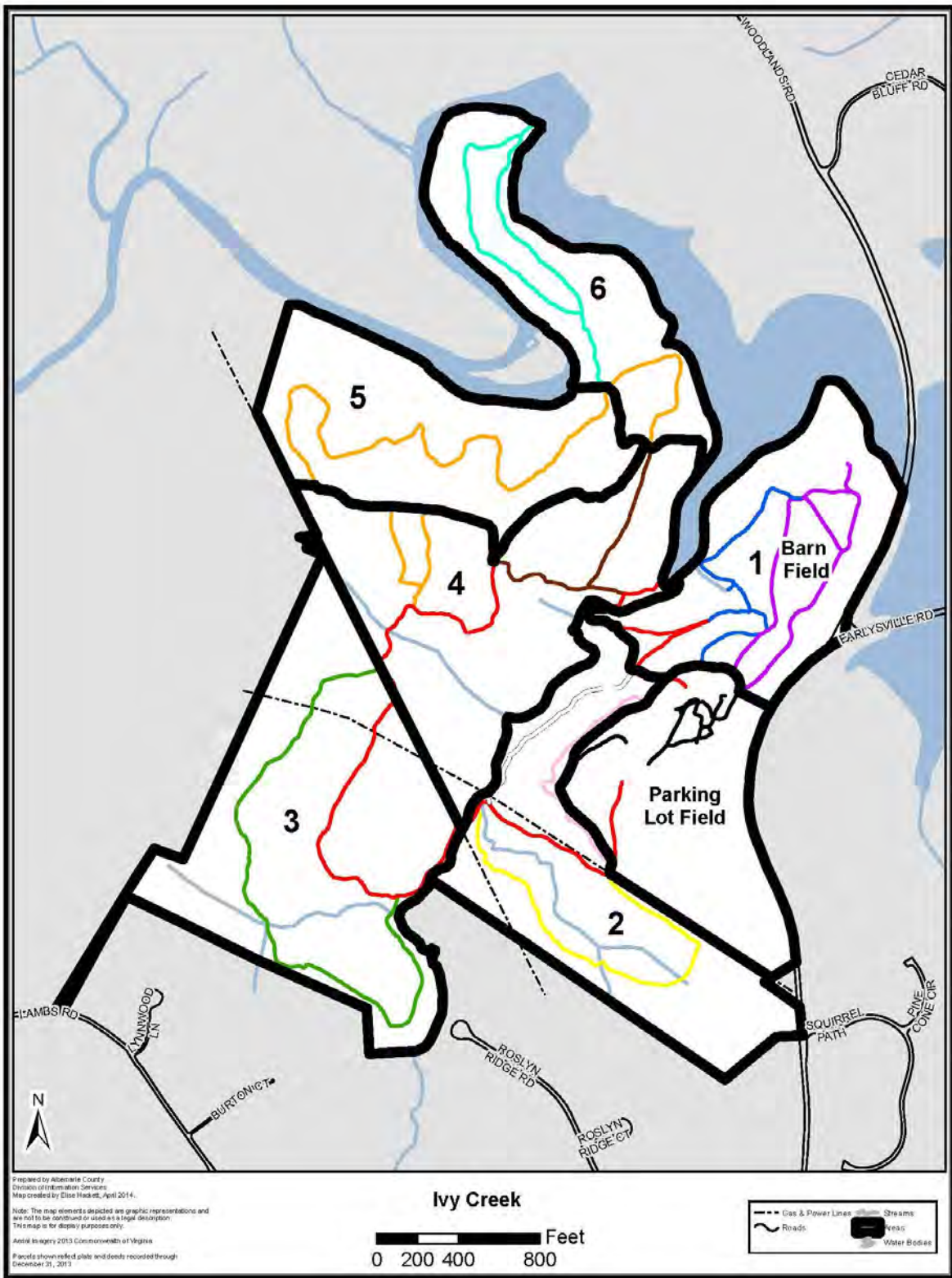
## **Caveat**

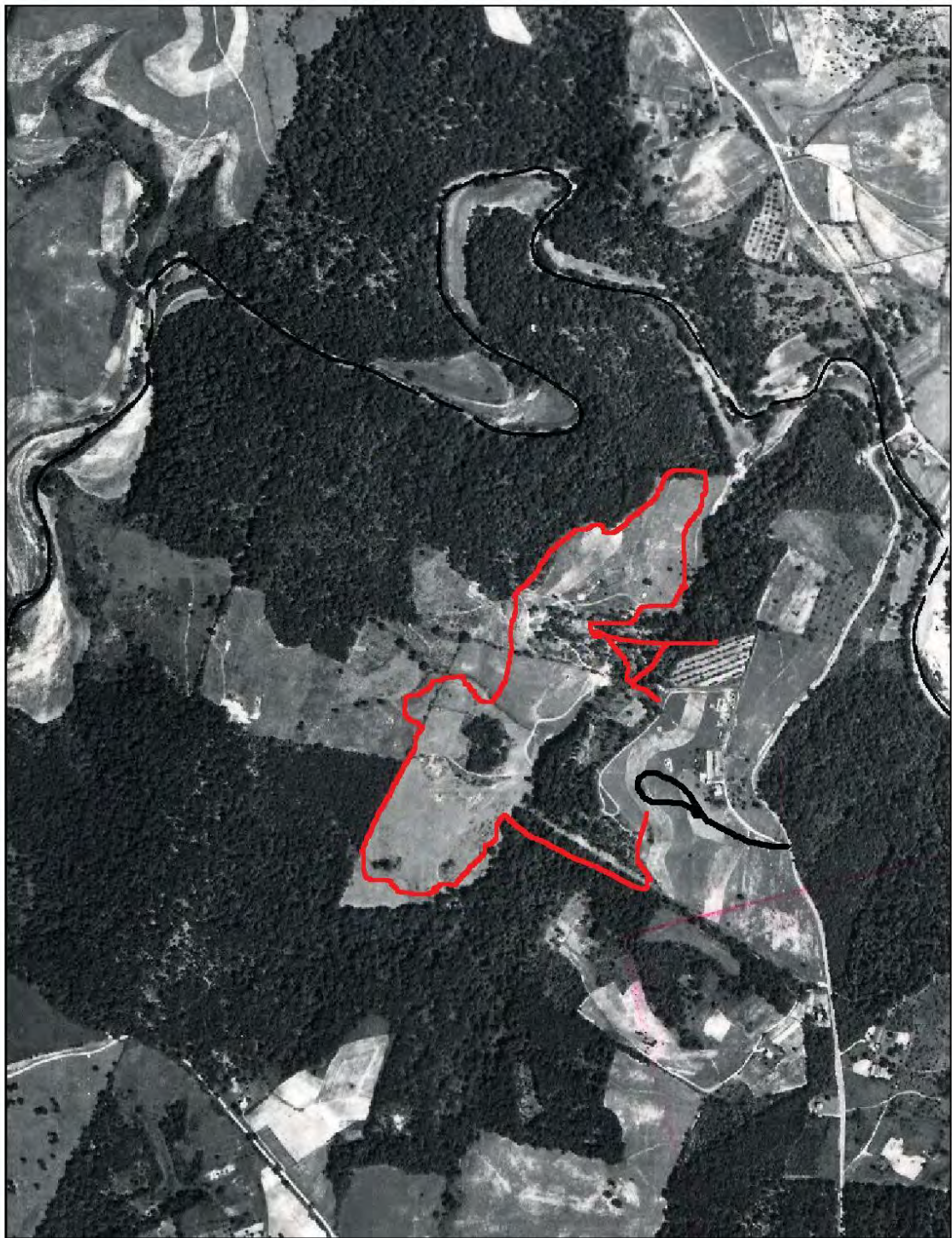
The separation of a large forested area into individual stands is sometimes difficult. It is a matter of judgment, based on observation, and interpretation of evidence gathered. I identify 42 different stands in the report that follows. If I had spent more time, I might have drawn a few boundaries differently, or added or eliminated some stands.

## **Trail and Area Maps and Aerial Photographs**

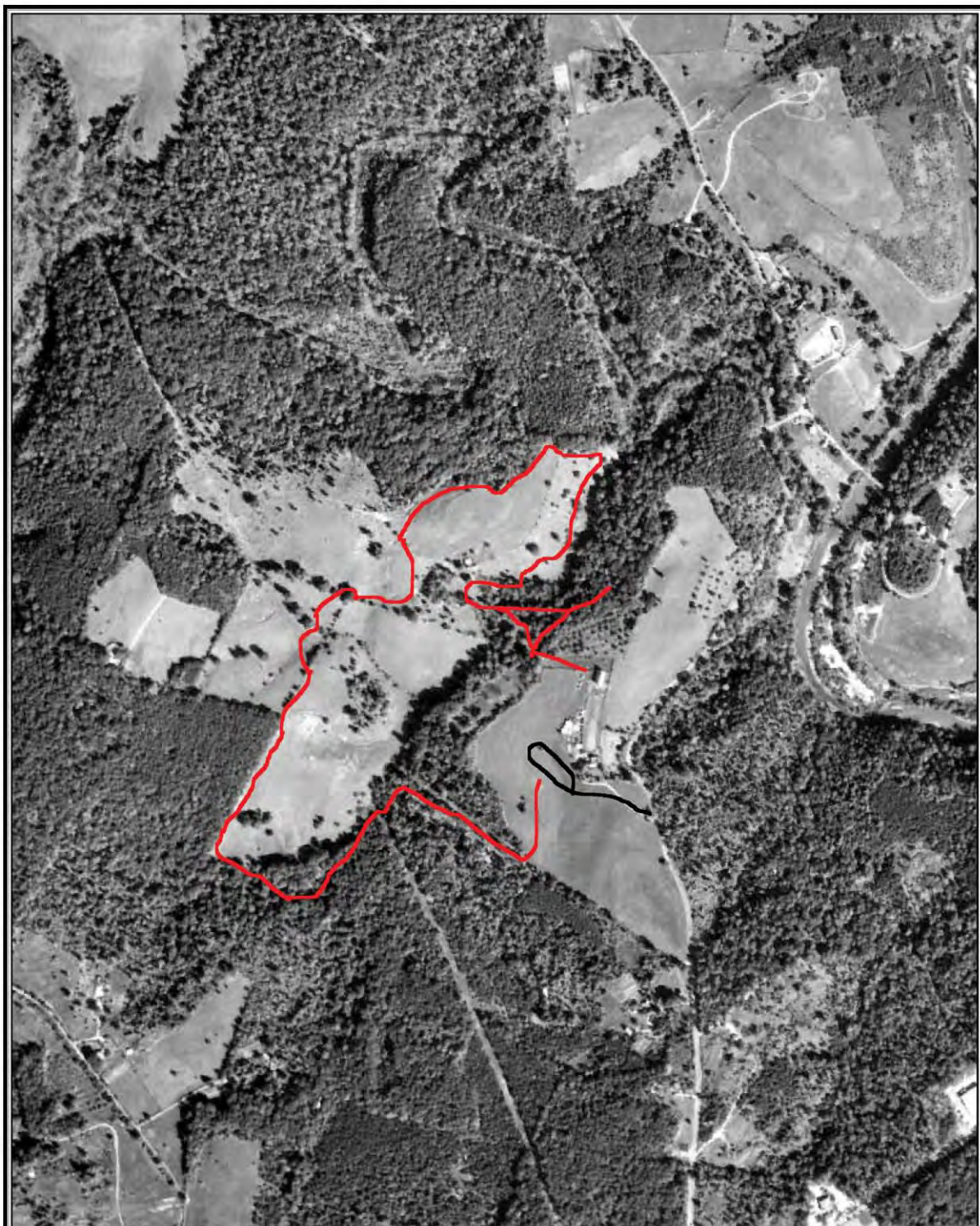
To facilitate presentation of the results of our study the Ivy Creek Natural Area was arbitrarily divided into six sub-areas using trails, Martin's Branch, and the pipe line. On the next page is an Ivy Creek trails map with the 6 areas superimposed. Area 4 is central, and shares boundaries with the other five areas.

Following this map are the 6 aerial photos, which are referred to frequently in the report, taken in 1937, 1957, 1966, 1974, 1980, and 2013. In recent years it has been possible to take spatially accurate aerial photos, and the 2013 photo has all the trails accurately superimposed. The 5 earlier photos are not spatially accurate. The map scale changes progressively as you move out from the center of the photo, which is the point on the ground that was directly under the plane when the photo was snapped. Consequently, there is no way to electronically superimpose the trails and have them accurately located. To help readers get oriented on these photos the approximate location of the Red Trail has been drawn in manually by Nancy Weiss. The Red Trail is the longest trail and all of the other trails branch off it, except for the Purple Trail in Area 1 and the black Handicapped Trail in Areas 1 and 2, which runs along the edge of the fields.

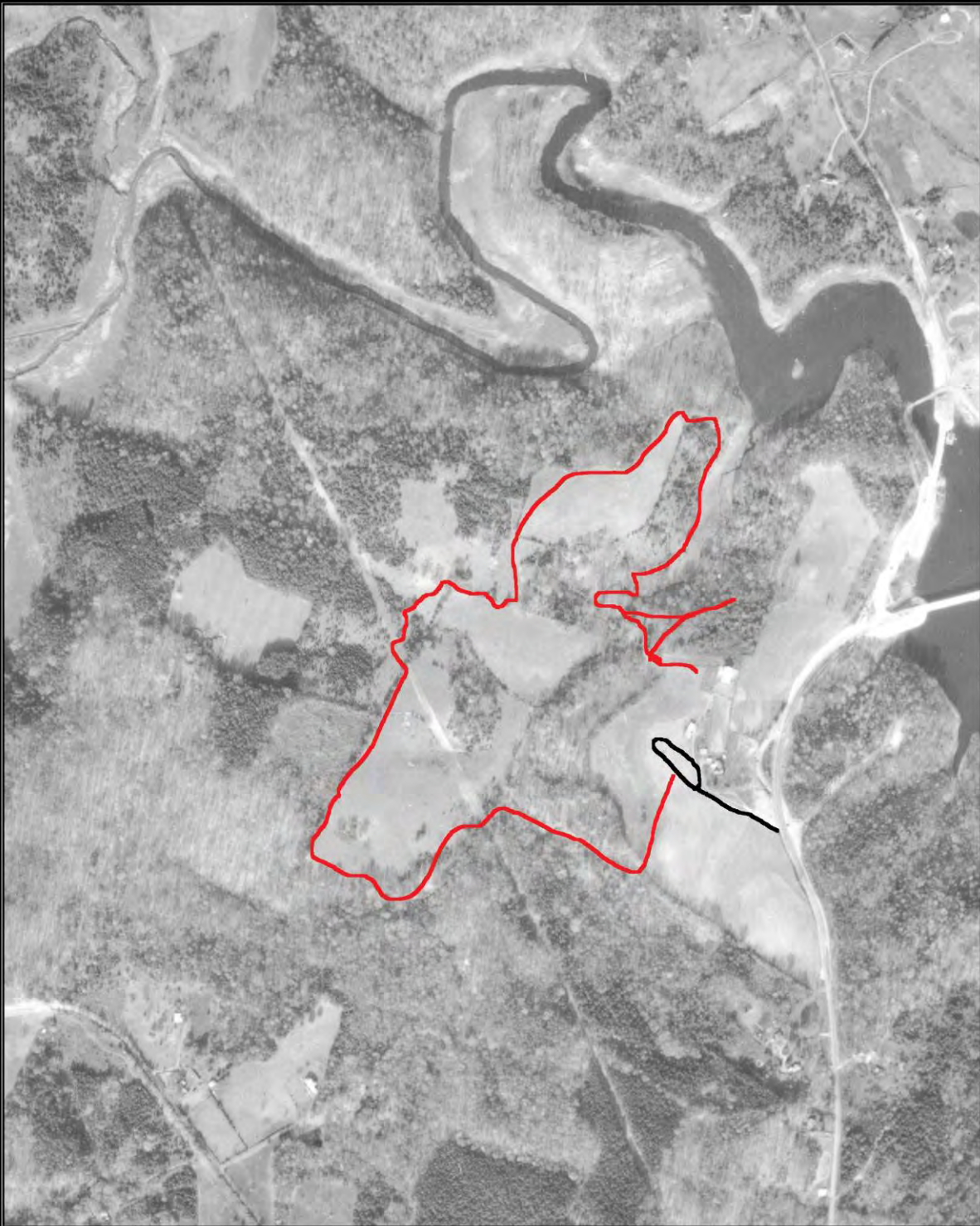




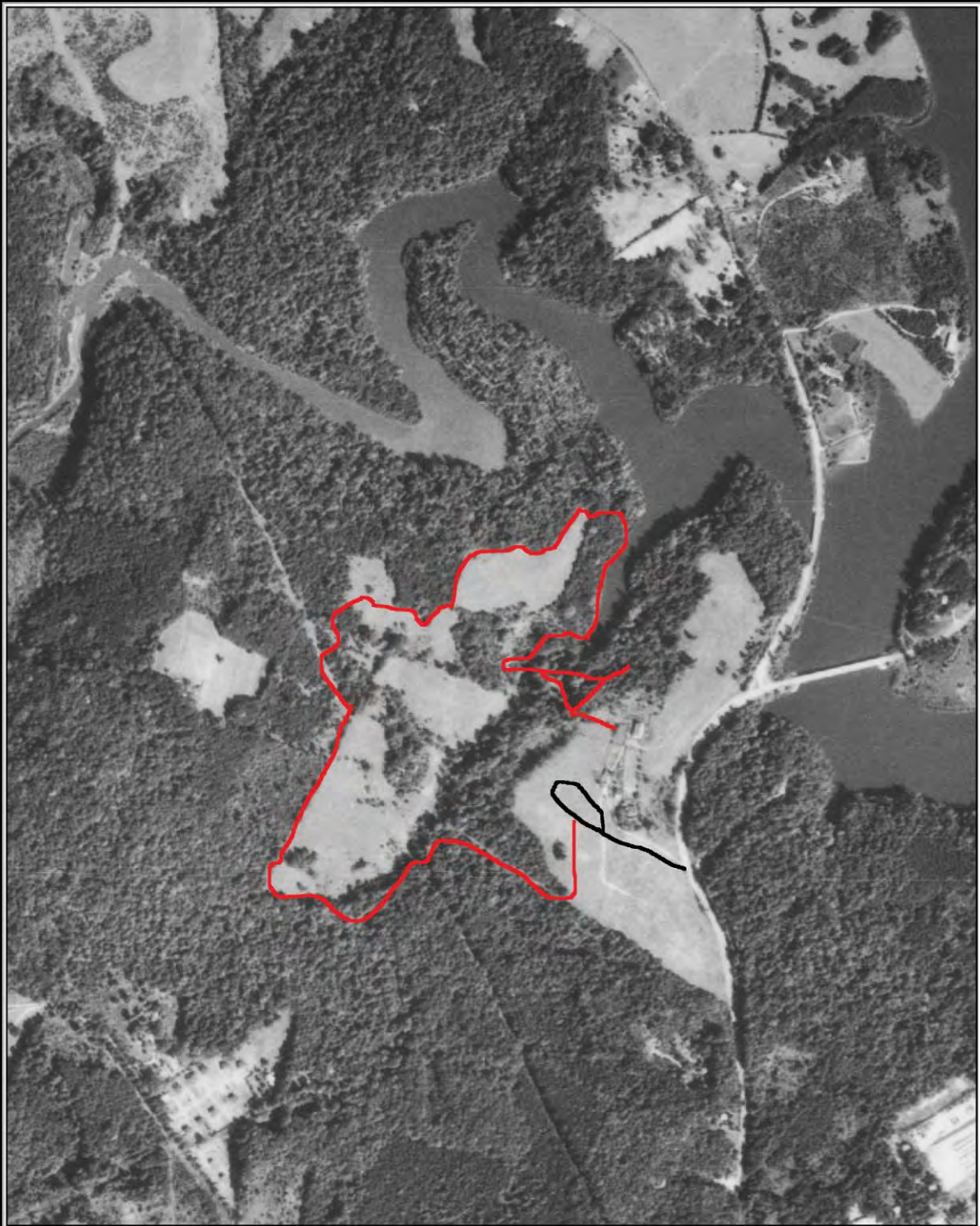
1937 Aerial



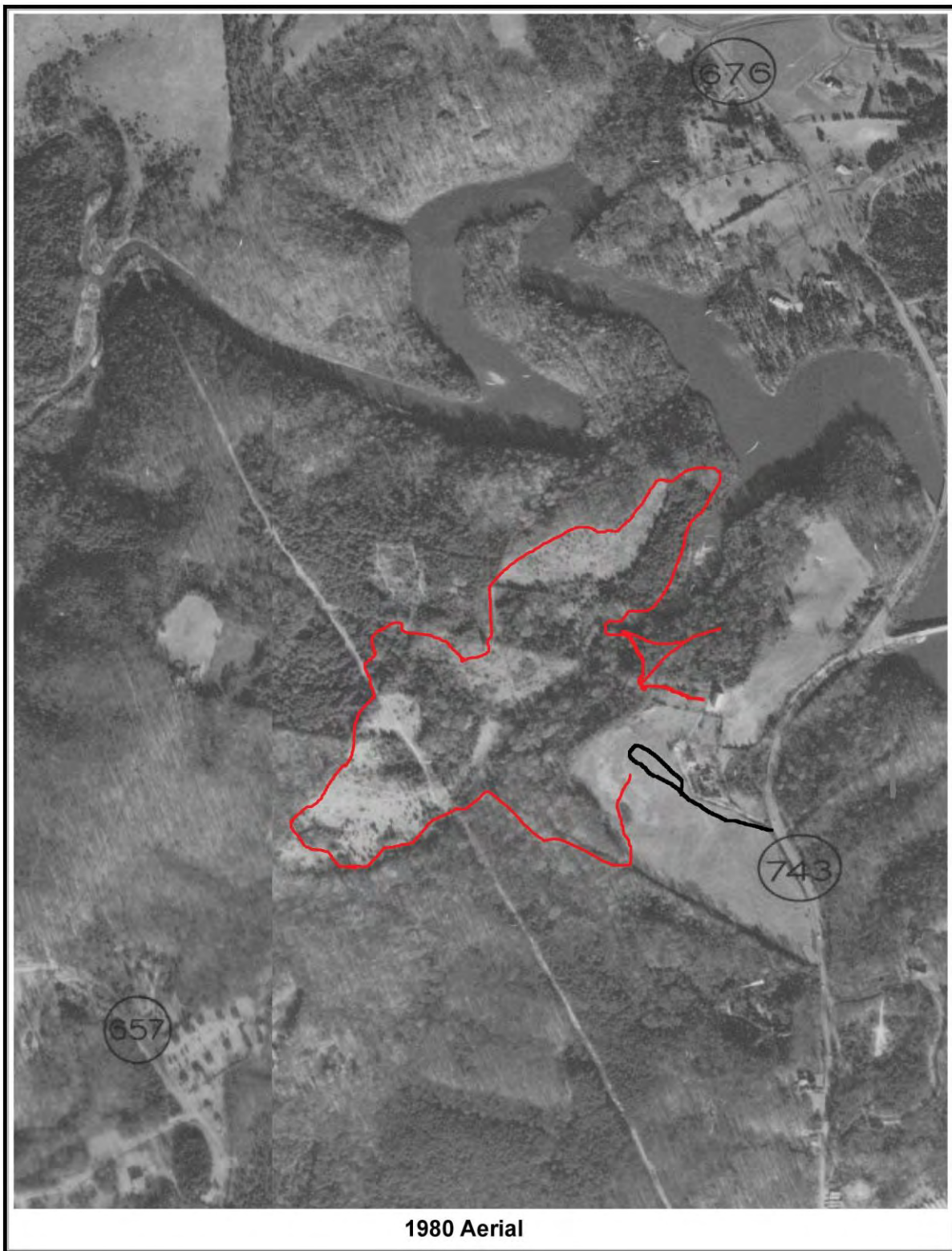
1957 Aerial

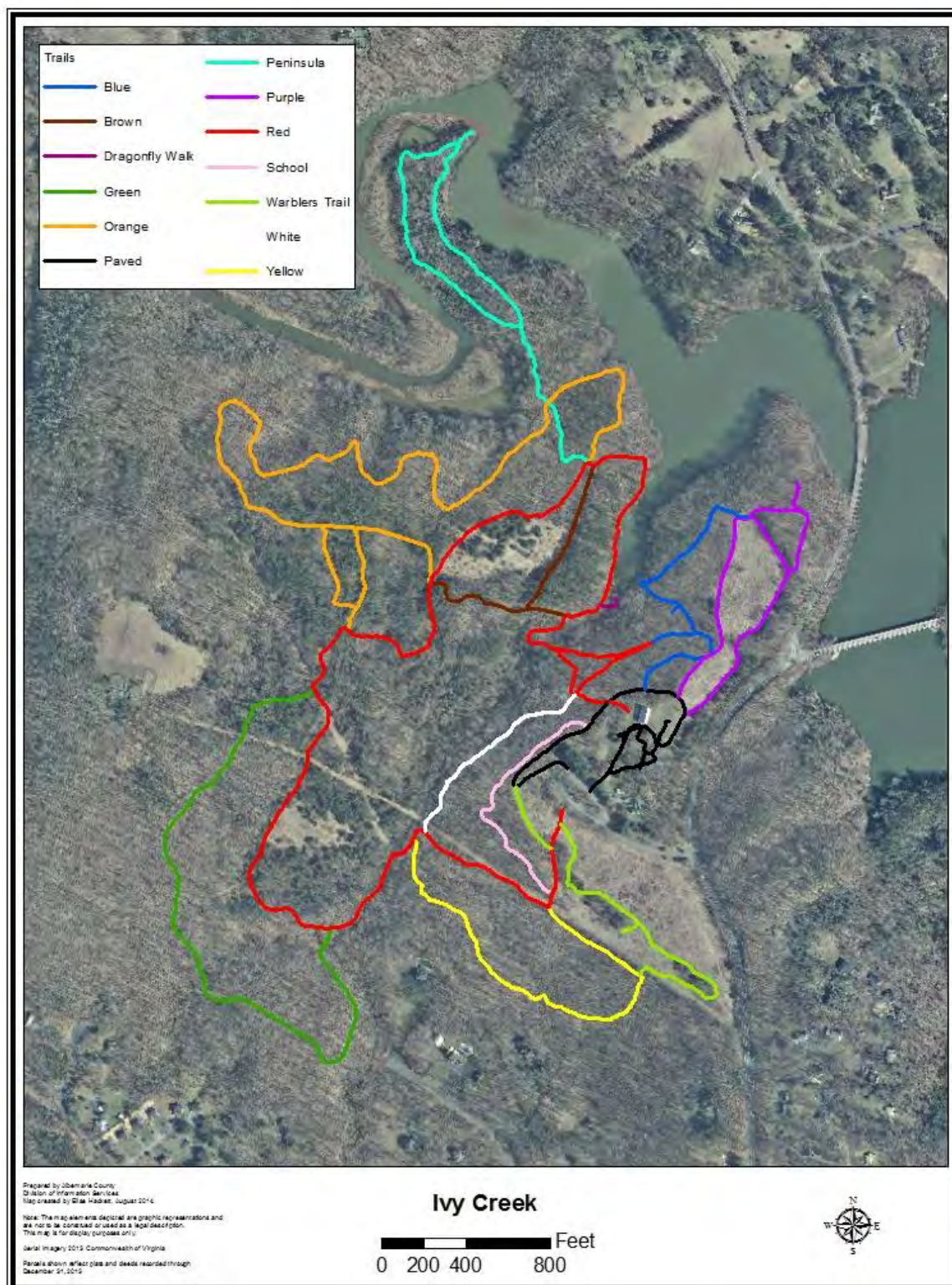


1966 Aerial Photo



1974 Aerial





**Description of Forests by Area** – with an appendix for each area at the end of each area description. Appendices list all numbers cited in the report (and shown on the area maps), with descriptions of each numbered item. GPS coordinates follow the descriptions.

### Area 1

Area 1 includes the “Barn Field” and the Purple and Blue Trails, between Martin’s Branch on the west to Routes 743 and 676 on the east. South of Martin's Branch it extends to the Red Trail cut-off (see map on next page). The Barn Field was originally larger, and contained an orchard which clearly shows in the 1957 photo. It has been mowed, and for about ten years prescribe-burned, ever since Ivy Creek was established.

**Stand 1** - is a narrow strip of forest between the present barn field and Route 743. It appears to be still part of the Barn Field in the 1980 photo. It has gradually been growing up in a mixture of species characteristic of abandoned fields, including Virginia pine, red cedar, black locust, black cherry, yellow poplar, sassafras, and ailanthus. It includes a row of white pine above the power line, apparently planted after the ICNA was created. Figure 11 is an open-grown, now dead, red cedar on the boundary between Stands 1 and 2. A fence line with a linear soil ridge, near this red cedar, has not been mapped.



Figure 11. Dead red cedar on boundary between Stands 1 and 2.



Figure 12. One-sided fence-line white oak.

**Stand 2** – wraps around the field on the east and north. The boundaries were obtained from aerial photos, and this is an excellent example of how the aerial photos have been useful. Stand 2 appears open in 1937, as an open stand with scattered trees in 1957, and gradually becoming



growing here include black cherry, red cedar, Virginia pine, black locust, black walnut, and persimmon, and these species are characteristic of abandoned fields. A fence line along the field contains large, one-sided trees, whose lower branches extend (or used to extend) over the field. These are mostly white oak (Figure 12).

There are some unusual, felsic (light-colored), volcanic rocks within the loop of the Purple Trail. They are obviously very resistant to weathering. Here, they create the greatest concentration of surface rocks (on a nearly level surface) in the ICNA. Many of them appear to be loose, but at least one large piece may be bedrock (#115 and Figure 13). The soil derived from these rocks appears to be dry and infertile. A large colony of black huckleberry occurs among these rocks (Figure 14), and this plant is characteristic of dry, acid, infertile soils. There are at least 10 post oaks growing here, including a 36.1 inch tree with embedded barbed wire (the probable parent of the others), which is on the eastern end of the fence line mentioned above (#221). This is the only concentration of post oaks at Ivy Creek. Post oaks usually grow on stressful sites where soils become very dry in the summer and also are often infertile. Post oaks are the slowest growing in (height) of our common upland oaks, and are most common on poor sites where they are better able to compete with the other oak species. In the next stand, Stand 4, and on the Peninsula, are the only other places at Ivy Creek I remember seeing post oak growing in the woods. One of them is #91, on the peninsula in Area 6, which may be growing on the same felsic rocks. Two other post oaks (#s 108 and #13 in Areas 1 and 4), both grew up in open fields where they did not have to compete with other trees.



Figure 13. Felsic volcanic rock.



Figure 14. Huckleberry growing around felsic rocks.

**Stand 3** – is an older stand on land that drops off steeply to the northeast, north, and northwest. These are usually favorable aspects for soil moisture, but much of the present forest suggests dry conditions. However, there are some small colonies of pawpaw and New York fern in places, and these species usually occur on moist soils. Oaks predominate, and considerable mountain laurel is present in the understory. The soils appear to be infertile as well as dry, and

in one small area an Oak-Heath forest is present, with small black gum trees sharing the understory with mountain laurel (Figure 15). This area of Oak-Heath forest is growing on the same felsic rocks described under Stand 2 above. In terms of species diversity, this may be the poorest patch of forest that occurs at Ivy Creek, and it contains a small colony of black huckleberry (Figure 16). This felsic rock is widespread on the surface of much of Stand 3, and may be responsible (at least in part) for the apparent low fertility of Stand 3.



Figure 15. Mountain laurel and black gum in patch of oak-heath forest.



Figure 16. Black huckleberry colony.



Figure 17. Michaela Accardi GPS'ing a chestnut stump.

We found a number of American chestnut stumps (#'s 155, 158, 160, 161 and Figure 17), so chestnut must once have been fairly common here. Beech is dominant on the steep northwest slope above the reservoir. The boundary line between Stand 3 and Stand 4 is based primarily on the presence of mountain laurel, which becomes much less abundant in Stand 4. The abundance of mountain laurel may be related to past burning. The slopes above the reservoir are the only places at Ivy Creek where dense stands occur (Figure 18). Mountain laurel sprouts back readily after fires, and if the flood plains were once farmed by Native Americans there could have been a long history of fires. Fire was used by Native Americans to clear and maintain fields, and fires started in the fields below would have run uphill. Mountain laurel sometimes grows very large, but the largest stems I found in this stand were about 4 inches at the stump. We found three large, apparently fire-scarred beech trees (#'s 223, 224, and 225 and Figure 19) on the steep slope above the

flooded mouth of Martin's Branch. We also found charcoal on two small litewood pine stumps (#116 and 117) and a small cedar stump. These



Figure 18. Dense understory of mountain laurel.



Figure 19. Fire-scarred beech.

had to have been dead before the fire for the charcoal to be on the heartwood. These charred stumps are close below a fence and none of the fence posts are charred. Also, none of the nearby chestnut stumps (mentioned above) were charred, suggesting that no fires occurred in this area since the chestnut blight arrived in Albemarle County about the time of the First World War.

A 23.0 inch hemlock (#119, Figure 20) stands near the top of the very steep bluff, and another 16.3 inch tree (#159, Figure 21) is near the bottom of the slope, just above the reservoir. The felsic rocks are common on the surface here also. There are several smaller hemlocks (#154) and even some seedlings (#s 156 and 157). The 16.3 inch tree has been half girdled by beavers. Just recently beavers chewed on a black birch (Figure 22) next to the 23 inch tree, and by the end of summer this black birch had been completely girdled. All of these hemlocks might benefit from a wrapping of wire, and they could be treated with a systemic insecticide to protect them from the hemlock adelgid.

Most of the trees in this stand seem to have originated after heavy logging in the 1920's and 1930's. We increment cored six Virginia pines (#s 109, 110, 113, 114, 151, and 226), and



Figure 20. 23 inch hemlock.



Figure 21. 16 inch hemlock.



Figure 22. Birch recently damaged by beavers.

Phil Stokes cut cross sections from 3 scarlet oaks (#s 111, 112, and 153). Figure 23 is scarlet oak #153, blown down probably by the 2012 derecho. Phil was uneasy while cutting this cross section with the other tree hanging over his head. These 9 trees originated between about 1921 and 1941. There are very few oak stumps present, suggesting that not many trees were large enough for harvesting again in the 1960's.



Figure 23. Cross-sectioned scarlet oak.

**Stand 4** - slopes to the west, which should mean a somewhat dryer site, but the trees in it suggest a moister and more fertile site than Stand 3. Yellow poplar is common along with other species characteristic of moister and more fertile soils, and it contains larger and perhaps older trees than Stand 3. Virginia, shortleaf, and white pines are also fairly abundant along with white and red oaks, hickories, and even some black walnut. Oak, pine, and cedar stumps are fairly abundant. I counted 14 white pine trees, 12 below (west of) the Blue Trail and 2 close above the trail. This is

the greatest concentration of white pines at Ivy Creek. I cored one of them (#165 and Figure 24), a 15.3 inch tree that originated about 1929. It stands only about 6 feet from a 28 inch white

pine which is probably about the same age. A white pine stump (Figure 25) is nearby, and this tree must have been cut during a partial harvest in the 1960's. The largest white pine is 30.9 inches (the largest at Ivy Creek), and stands just below the Blue Trail (#166). It seems to have grown up under fairly open conditions based on large lower limbs. We also increment cored a 12.0 inch Virginia pine that originated about 1923 (#162), and a 9.3 inch shortleaf pine that originated about 1887 (#163 and Figure 26).



Figure 24. The small pine in front was cored.



Figure 25. White pine stump.

Stand 4 extends south to the spring (Figure 27). This spring was protected from livestock by fences on both sides and also above and below. Obviously the surrounding slopes were once pastured. The fence on the south side of the spring is lined with rocks, perhaps to keep hogs out of the spring. There seems to have been a double fence enclosing a wagon road leading from the spring uphill towards the residence. Water may have been hauled to the house by wagon, using this road.

**Stand 5** – This is a small stand within Stand 4 that was cut very heavily, virtually clearcut, during the 1960's. The present stand of mixed hardwoods and scattered pines is similar in composition to Stand 4. We cored 3 pine trees (#'s 120, 167, and 168 and Figure 28) that we estimate originated between 1963 and 1966. As far as we can tell, the shortleaf pine germinated in the same year that Tex was born, 1965.



Figure 26. This 9 inch shortleaf pine is about 127 years old.



Figure 27. Spring bounded on two sides by the Blue Trail.

**Stand 6** is another narrow stand, similar to Stand 1, which was also part of the barn field in 1957. Another prominent fence row, with large one-sided trees, marks the former lower edge of the field. The boundary between the older Stand 4 and the younger Stand 6 was also obtained from aerial photos. A very large red cedar (Figure 29), visible in the 1957 aerial photo, marks the boundary at the field edge. The stand is rich and diverse, composed of young hardwoods mostly, with yellow poplar prominent, plus Virginia pine, red cedar, black birch, black cherry, northern red oak, southern red oak, black walnut, and persimmon. Pawpaw (Figure 30) and hornbeam occur in the understory. Scattered rock piles (Figure 31) indicate the area was once cultivated.



Figure 28. Tex Weaver and this shortleaf pine are 49 years old.



Figure 29. Red cedar at edge of field.



Figure 30. Oak stump from the 1960's in a pawpaw patch.



Figure 31. Marilyn Smith by a pile of rocks picked from a field.



Figure 32. This red maple, blown down by the 2012 derecho, was about 134 years old.

**Stand 7** is a rich forest that occupies the steep, moist, north-facing slope below the Blue and Red Trails and extends down to the spring and Martin's Branch. Scattered oak and pine stumps show it was partially harvested during the 1960's and perhaps 1950's. It contains scattered older trees, and many younger trees that originated after the partial harvests. Black birch is the most abundant species. White oak is also fairly common. There are also beech, northern red oak, black oak, black gum, yellow poplar, several black walnuts, some Virginia pines, hickory, a paulownia, and lots of hornbeam in the understory. Some of the trees are very old. A red maple

blew down in the 6/29/12 derecho, and Phil Stokes cut a cross section from it that showed it originated about 1878 (#100, Figure 32). The large “split” beech (#7, 36.1 inches) and red hickory (#97, 40.3 inches, which for years we misidentified as a shagbark hickory), also appear to be very old

A northern red oak blew down across the Red Trail in the fall of 2003 (#209) and I counted rings on the stump (cut to clear the trail). It originated about 1923. Two Virginia pines were cored, and we estimate they originated about 1925 and 1921 (#'s 227, 228). These three trees probably originated after logging in the 1920's. It is likely that this steep slope also had a long history of woodland grazing. On 9/30/14 I counted rings on a Virginia pine that was recently cut because it was a trail hazard. It is between #'s 127 and 128, about 40 feet west of the start of the Blue Trail. It had about 88 rings and had been dead several years. It also originated in the 1920's.

**Stand 8** extends from the barn down to the Blue and Red Trails. Most of this area was once an orchard, which shows distinctly in the 1937 photo but not so distinctly in the 1957 photo. We can find no evidence of this orchard. The barn is supposed to have been built in the 1930's, but it does not yet show in the 1937 photo, although it appears as if it may have been under construction when the photo was taken.

A swath 40 to 60 feet wide, adjacent to the field edge and behind the barn, running



Figure 33. Red cedar shaded out by yellow poplar.

east to west, is almost pure black walnut. The walnut trees probably grew up in a strip of pasture, which shows clearly in the 1957 photo, with the orchard below it. Walnut trees require high fertility, suggesting livestock may once have been concentrated in the area or that manure from the barn was applied. Below these walnut trees, in another east-west swath, is a fast-growing stand of mostly yellow poplar, which is thriving on this north-facing slope. A few black walnuts also occur in this stand. Perhaps these trees invaded the orchard when it was abandoned. Initially there were a lot of Virginia pines, but they were over-topped and shaded out by the faster growing yellow poplars, and the remains of some of them are still present on the ground. There are also dead red cedars that were shaded out (Figure 33). Further downhill, in another east-west swath dominated by yellow poplar, there are stumps, indicating the yellow poplar came in after timber harvesting. There are also a number of small rock

piles and perhaps short stretches of terraces.

Along and above the Blue and Red Trails is a broken string of larger and older trees, which in places seem to be on a fence line with linear soil ridges. However we could not clearly establish a fence line location. There is a small, dead Virginia pine (#128) between two large yellow poplars, on this elusive fence line. I increment-cored this tree on 9/26/03 when it was 11.7 inches in diameter, and it originated about 1929. I cored another Virginia pine in 2014 (#126) that originated about 1938. Both of these trees would have originated after logging in the 1920's and 1930's. A very large red maple, 35.4 inches, tree #127, perhaps the largest red maple at Ivy Creek, stands on the lower side of the Blue Trail.

### **Area 1 Appendix**

7. Beech, 36.1", dominant, split tree above bridge

38.09288234 N 78.49412012 W

97. Red hickory, 40.3", dominant

38.09262561 N 78.49362438 W

98. Mockernut hickory, 24.2", codominant?

38.09270168 N 78.49355633 W

100. Red maple, cross section #7, blew down in the derecho on 6/29/12 (there was a similar storm in Charlottesville in 2010). The cut was made close to the ground. The rings are extremely narrow in places. I counted 134, which I would hope is within 3 years plus or minus. Adding 2 years since the derecho, it originated about 1878.

38.09285355 N 78.49380192 W

108. White oak/post oak hybrid, 37.0", dominant

38.09283396 N 78.49081388 W

109. Virginia pine, 12.4", intermediate, cored tree FF, about 77 years old, originated about 1937

38.09470708 N 78.49005059 W

110. Virginia pine, 11.1", intermediate, cored tree EE, about 73 years old, originated about 1941

38.09474541 N 78.49012562 W

111. Scarlet oak cut down by line maintenance workers, cross section #16, 88 rings + 2 years dead + 1 year to ground = 91 years, originated about 1923

38.0952453 N 78.48994625 W

112. Scarlet oak cut down by line maintenance workers, cross section #17, 81 rings at 19 feet + 10 years to ground + 2 years dead = 93 years, originated about 1921

38.09532897 N 78.48989539 W

113. Virginia pine, 12.4", intermediate, cored tree HH, about 82 years old, originated about 1932

38.09516134 N 78.48996602 W

114. Virginia pine, 12.8", over-topped, cored tree GG, crooked and deformed, very poor core, best not used

38.0945333 N 78.49015269 W

115. Large felsic rock

38.09449115 N 78.49025263 W

116. Charred litewood pine stump

38.0947962 N 78.49045109 W

117. Charred litewood pine stump

38.09477243 N 78.49047985 W

118. Rock pile

38.09469461 N 78.49094704 W

119. Hemlock, 23.0", codominant

38.09490315 N 78.49106268 W

120. Virginia pine, 11.1", intermediate, cored tree PP, about 51 years old, originated about 1963

38.09394052 N 78.49190465 W

121. Rock pile

38.09357704 N 78.49165902 W

126. Virginia pine, 13.4", intermediate, cored tree QQ, about 76 years old, originated about 1938

38.09289909 N 78.492034 W

127. Red maple, 35.4", dominant

38.09297054 N 78.49212465 W

128. Virginia pine, died 2 years ago, cored on 9/26/03, originated about 1929

38.09273506 N 78.49282091 W

148. Spring house

38.0932838 N 78.49199153 W

150. Bench at lake-overlook

38.0950104 N 78.48995831 W

151. Virginia pine, 12.0", poor intermediate, cored tree VV, about 92 years old, originated about 1922

38.09508641 N 78.49004688 W

152. Scarlet oak, 29.0", dominant

38.09511192 N 78.49012105 W

153. Scarlet oak blown-down by the 2012 derecho?, cross section #18, 90 rings + 2 years dead + 1 year to ground = 93 years, originated about 1921

38.09507602 N 78.49051509 W

154. Hemlock, 9.8", over-topped

38.09493113 N 78.49070707 W

155. Chestnut stump

38.09490609 N 78.4907488 W

156. Hemlock seedling, 10" tall

38.09495858 N 78.49128825 W

157. Hemlock seedling, 18" tall

38.09500059 N 78.49123683 W

158. Chestnut stump

38.09498411 N 78.49123986 W

159. Hemlock, 16.3", intermediate, half girdled by beavers

38.09507833 N 78.49127465 W

160. Chestnut stump

38.09483199 N 78.4914141 W

161. Chestnut stump

38.09460514 N 78.49186964 W

162. Virginia pine, 12.0", intermediate, cored tree TT, about 91 years, originated about 1923

38.09449508 N 78.49195269 W

163. Shortleaf pine, 9.3", overtopped (almost dead), cored tree YY, about 127 years old, originated about 1887

38.09456242 N 78.49215318 W

164. White pine, 28.5", dominant, open-grown

38.09425692 N 78.49186695 W

165. White pine, 15.3", codominant, cored tree SS, 28.4 inch white pine 6 feet away, also 27.4 and 24.9 inch trees nearby, rings narrow in center, about 91 years old, originated about 1929

38.09424741 N 78.49191754 W

166. White pine, 31.0", dominant, open-grown

38.0940348 N 78.49173331 W

167. Virginia pine, 12.4", codominant, cored tree RR, 3 inch living sassafras 10 feet away, about 49 years old, originated about 1966

38.09362456 N 78.49219787 W

168. Shortleaf pine, 9.3", poor intermediate/over-topped, cored tree UU, about 49 years old, originated about 1965

38.09370712 N 78.49193673 W

169. Black walnut with unusual bark, 16.0", intermediate/codominant

38.09346498 N 78.49165241 W

183. Mockernut hickory, 20.2", codominant

38.09227156 N 78.49351432 W

209. Northern red oak that blew down across Red Trail in the fall of 2003, probably around 30" DBH, 80 rings, originated about 1923, no suppressed rings in center

38.09270284 N 78.4929649 W

221. Post oak, 31.2", dominant, on fence line on Purple Trail

38.09380563 N 78.48994238 W

222. Hemlock, 7.0", over-topped, on Purple Trail

38.09424714 N 78.48984311 W

223. Fire-scarred beech, 26.8"

38.09484208 N 78.49124799 W

224. Fire-scarred beech, 26.9"

38.09500752 N 78.49152541 W

225. Fire-scarred beech, 31.0"

38.09468013 N 78.49178028 W

226. Virginia pine, 10.0", over-topped, cored tree EEE, originated about 1925

38.09452165 N 78.49189426 W

227. Virginia pine, 12.6", intermediate, cored tree FFF, originated about 1925

38.09289071 N 78.49250222 W

228. Virginia pine, 13.9", intermediate, cored tree GGG, originated about 1921

38.09276514 N 78.4934098 W

## Area 2

Area 2 is south of the Parking Lot Field, and includes the Yellow, School, White, and paved Handicapped Trails, and is bordered by Martin's Branch and the Red Trail cutoff down to the bridge (see map on next page). This was the most difficult area to separate into different stands. It has been heavily used and repeatedly disturbed. The 1937 photo shows a complex intermixture of patches of completely open land, partially open land, young forest, and mature forest. The parking lot field, which Area 2 wraps around, like the barn field, has also been either mowed or prescribe-burned ever since Ivy Creek was established.

**Stand 1** – is a small stand adjacent to the Red Trail cutoff. It was just starting to grow up in forest, and may still have had cattle in it, when Ivy Creek was established. We have increment cores from two Virginia pines (#'s 88 and 99) that originated about 1976 and 1978. It is dominated by Virginia and shortleaf pine, but also contains a lot of red cedar and black birch (it is a north-facing slope). It is bounded below by the Red Trail and on the ridge top above by a fence row with three large red cedars (#'s 4, 5, and 6) and a large, open-grown beech (#8).

**Stand 2** – This is a large stand that appears to have grown up on open land, as there are few to no stumps. This agrees with the 1937 and 1957 photos which seem to show this area open except for scattered trees. We increment cored two Virginia pines that originated about 1958 and 1957 (#'s 9 and 196, and Figure 34). This is a moist and productive, north-west facing slope, and vigorous yellow poplar predominate. Even several sycamores and a few black walnuts occur. Other trees present are red cedars, northern red oak, hickory, black cherry, black locust (all dead already), red maple, and even a hackberry.



Figure 34. Virginia pine #96 on the White Trail.

A large open-grown, field-edge, white oak, with long branches extending out over the field, stands in the intersection of the Red and White Trails (#2 and Figure 35). Embedded barbed wire seems to run almost through the center of the trunk. A nearby, large, open-grown beech is also a fence line tree with barbed wire embedded in it (#3 and Figure 36). A major leader broke out of this beech a couple of years ago, and from a cross section cut from it we estimate the tree is about 116 years old and originated about 1898.

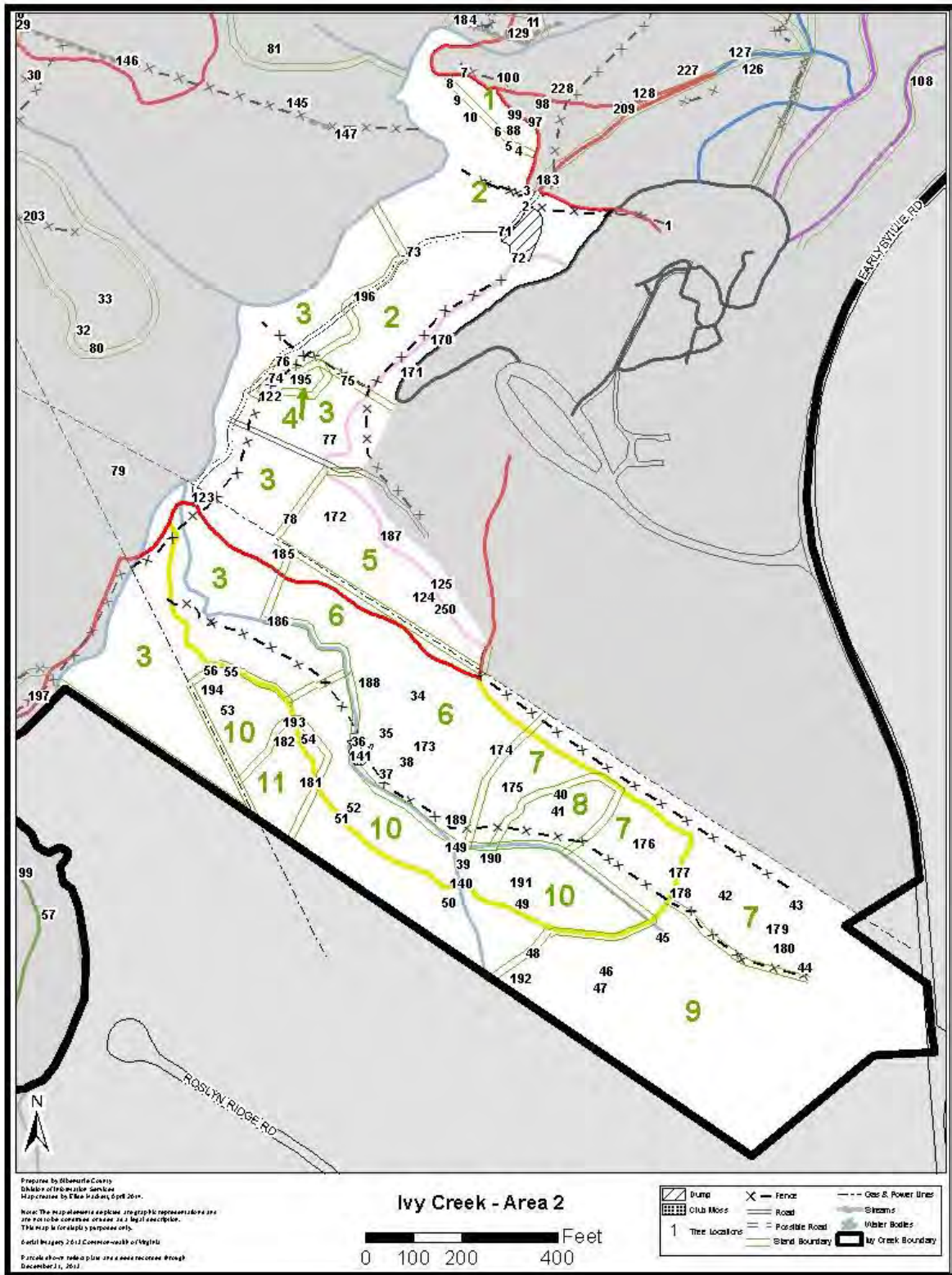
Conley Greer had a contract with the University of Virginia, and later also with the hospital, to collect waste from the kitchen and dining room, which he dumped on the farm. Hogs fed on the food scraps. The dump is between the White and School Trails, and just east of the Red Trail (see map). Black walnut trees came up in and around the dump and have grown very well, obviously benefitting from the nutrients added over the years from the food scraps and manure. There are about 20 black walnuts now. The largest black walnut at Ivy Creek, 27.7 inches, is growing here (#71), and an even larger one died some years ago (Figure 37). There is also a 17.1 inch ash (#72), one of the larger ash at



Figure 35. This white oak was a small tree when barbed wire was nailed to it.



Figure 36. Notice barbed wire and cross section cut.



Ivy Creek. Both black walnut and ash require fertile soil. The next-to largest rock pile at Ivy Creek (Figure 38) starts at the School Trail and extends into the dump for about 30 feet. The largest rock pile at Ivy Creek is not far away, in the Parking Lot Field, above and parallel to the Red Trail.



Figure 37. Large, dead black walnut in old dump.



Figure 38. Large rock pile starting at School Trail.

Below the dump, and extending back to the southwest on both sides of the White Trail, there used to be a colony of large *Ailanthus* trees, most of which have died naturally, apparently killed by native, pathogenic fungi. A clump of four trees is still living, including #73, a 10.2 inch tree. These trees apparently originated before the field was abandoned, as I remember them as already being large trees in the 1980's.

It is not easy to separate this stand from the older Stand 3 along the School Trail. I arbitrarily used an old fence line containing a large black gum (#75 and Figure 39). The paved Handicap Trail runs along a prominent fence row that shows in the 1957 aerial photo but not the 1937 photo. An old hay rake (#170 and Figure 40) sets on the edge of this fence row, apparently right where it was parked many years ago. A 38.0 inch yellow poplar (#171 and Figure 41), which grows out over the Paved Trail, does not appear in the 1937 photo.

**Stand 3** – I spent a lot of time trying to establish the boundaries of this stand. It is a rather open stand dominated by scattered, older and larger trees growing on the steep, north-west facing slope above Martin's Branch. It is also on both sides of the tributary above where it enters Martin's Branch. Large beech predominate, but northern red oak, white oak, yellow poplar, hickories, red maple, and black gum also occur. Some of the trees may be quite old. The stand extends to the south, across the Red Trail, the tributary (Figure 42), and the pipeline, all the way to the southern boundary of Ivy Creek. It has been periodically logged for many years, and scattered oak stumps show parts of it were partially logged in the 1960's (and perhaps in the late 1950's). In places there are numerous small trees in the understory that originated after



Figure 39. Dan Nissen measuring black gum boundary tree.



Figure 40. Hay rake on the Handicap Trail.



Figure 41. Yellow poplar on the School Trail.



Figure 42. Beech dominated forest along tributary.

the most recent logging. There is an 11.1 inch cedar close to the bridge on the School Trail, and many smaller, mostly-dead cedars among the large beech and oaks. There are also black cherry, small yellow poplars, and several barely surviving paulownia trees (#77), all suggesting that the stand was very open after partial logging. Beech trees had little lumber value and were rarely cut during timber harvesting. They benefitted from the extra growing space resulting from cutting neighboring trees, thus their large size today.

We have an age from a beech cross section, #185, on the edge of the power line. One of its leaders broke out, and we estimate the tree originated sometime before 1913, and was released about 1970. The release may have been related to power line maintenance. Small beech trees are abundant in the understory in much of Stand 3, and beech will probably become more abundant in the canopy as time goes by.

A wire fence runs along the School Trail and the south edge of the Parking Lot Field. There is an old, well-entrenched road running along the fence. Figure 43 shows Tex Weaver standing in this old road just below the small foot bridge on the School Trail. A prominent gully parallels the old road here (Figure 44). We traced this old road down to Martin's Branch. It is probably the old road that was washed out near the bridge (in Area 4).



Figure 43. Tex in old road. Note rock pile.



Figure 44. Frank Biasioli standing in gully.

**Stand 4** – This is a small stand within Stand 3. It was quite open in the 1937 photo and still mostly open in the 1957 photo, except for scattered older trees. The stand is dominated by

yellow poplar, with both Virginia and shortleaf pines, black cherry, and red cedar (mostly in the understory, and many now dead). We cored 3 pine trees (#'s 74, 122, and 195), two Virginia pines and a loblolly pine, which we estimate originated between about 1964 and 1967

**Stand 5** - is a heavily-stocked, hardwood-dominated forest that originated following heavy logging (near clearcutting?) around 1940. The southern boundary is the power line right-of-way (R/W), which suggests that the R/W was present when the logging took place (the R/W was present when the 1937 photo was taken). The stand appears even-aged, and is one of the nicest hardwood forests at Ivy Creek. This area was almost certainly cultivated at one time, based on the presence of numerous old-field pine stumps (Figure 45). In addition to pine stumps, there are numerous stump sprouts of various hardwood species (Figures 46 and 47), and trees that had been double trees from which one stem had been cut during past logging (Figure 48). We have 4 ages from this stand. A 16.3 inch Virginia pine near the power line right-of way was recently cut by line maintenance people (#78 and Figures 49 and 50), and it originated about 1937. Two Virginia pines alongside the School Trail (#s 125 and 250) originated about 1943 and 1939. Finally, a cross section was cut from some kind of red oak (#187) that originated about 1941. Two white pine cores (#'s 124 and 172) could not be accurately counted.



Figure 45. Litewood pine stump from old field stand.



Figure 46. Yellow poplar stump sprouts.



Figure 47. Northern red oak stump sprout.



Figure 48. Former double white oak from which one trunk was cut.



Figure 49. Virginia pine sawn down near power line.



Figure 50. Edge of stump shaved with a knife to count rings.

**Stand 6** – occupies a rich and fertile south and southwest slope that was once almost certainly cultivated. Pine stumps indicate an old field pine stand once grew here (Figure 51), and there are several minor gullies and a few rock piles (Figures 52 and 53). Yellow poplar is most abundant, but there are also a lot of beech (some quite large), hickory, white oak, red maple, and black gum. There used to be a Paulownia, now dead, below the Red Trail close to where the Red Trail enters from the parking lot (#34 and Figure 54).



Figure 51. Old field litewood pine stump.



Figure 52. Rock pile and two stump sprouts, note gully.

We have 3 ages from this stand, all cross sections: 1. #186, a black walnut growing on the stream bank, which blew down, originated about 1946 in a canopy gap. 2. #188, a double-trunk beech from which one trunk split off, was strongly released about 1927. 3. #37, a beech that was knocked down by a red oak and fell across the stream, originated about 1926 and was released about 1953.

I used a prominent low ridge, which runs from the Yellow Trail to the stream, to separate Stand 6 from the apparently younger Stand 7. This is an arbitrary separation, as there is not an obvious change in the appearance of the forest. A mysterious soil mound (#174) is on this boundary line, and there is a shallow, un-drained depression to the east of it from which the soil for the mound apparently was taken. A large, apparently declining scarlet oak (#189) is close to this boundary.



Figure 53. Rock pile with yellow poplar stump sprout. Note pine stump in back.



Figure 54. Elise GPS'ing a dead paulownia.

An interesting seep (#s 35 and 36) contains a thriving colony of crested woodfern, the only place it grows at Ivy Creek. Two shallow, human-caused, gullies feed into this seep (Figure 52). In August, a team of Master Naturalists led by Marilyn and David Smith pulled stilt grass here. Just upstream of this fern colony is a colony of tree clubmoss (#141), which probably started as a single spore, sometime after cultivation ceased. Marilyn and David observed that the stilt grass, a later arrival, did not seem to be invading the clubmoss.

**Stand 7** - may once have been the most productive field at Ivy Creek, based on topographic position and how well the present yellow poplar stand has grown. It is dominated by vigorous yellow poplar, which have shaded out many Virginia pines, most of which are now lying on the ground. Litewood pine stumps (Figure 55) and scattered litewood pine knots (Figure 56) are abundant. Scattered white, chestnut, red, and black oaks, hickory, beech, black cherry, and black gum occur, and dead sassafras and black locust are present. Formerly, it probably was a typical old field pine stand with hardwoods well established in the understory and sub-canopy. These understory and sub-canopy hardwoods, along with pine and yellow poplar seedlings, grew up following clear-cutting to form the present stand. The previous stand was present in the 1937 photo but appears to have been mostly harvested in the 1957 photo. We have 3 increment cores from Virginia pines (#'s 175, 177, and 178) that originated about 1966, 1937, and 1945. We also have 3 increment cores from yellow poplar (#'s 176, 179, and 180, and Figure 57) that seem to have originated in the 1960's (yellow poplar cores are hard to count). These six ages, which vary from 1937 to 1966, a range of 29 years, are hard to relate to the 1957 photo, which suggests the stand originated in the 1950's (Stand 7 is hard to figure out). Oriental bittersweet dominates the understory and scattered barberry are also present. Old bottles and daffodil clumps are scattered throughout. Scattered rock piles can be found, and shallow gullies also occur in a few places.



Figure 55. Five litewood pine stumps are in this photo.



Figure 56. Litewood pine knot propped against a dead black locust.



Figure 57. Coring yellow poplar #180, note red handle of increment borer.



Figure 58. Old fence at lower end of Stand 8. Note fence posts.

**Stand 8** - This is a small stand within Stand 7 which appears to be open in the 1937 photo but perhaps growing up in young forest in the 1957 photo. It stands out today because of all the Virginia pines it contains, most of which are dead and lying on the ground. There are no stumps that date from that period, suggesting it may have been in pasture. There are fences above (the field line fence) and below, along the stream (Figure 58), but no fences we could find along the sides. It contains scattered older trees (Figure 59). We have two increment cores from Virginia pines, one of which we could not count accurately (#40) and the other yielding a date of origin of about 1966 (#41).

Along the Yellow Trail is a narrow string of larger and older residual trees containing yellow poplar, hickory, beech, and southern red oak.



Figure 59. A "residual" red maple. Note callous bumps where branch stubs healed over.



Figure 60. The largest excavation. Note water at the bottom of the hole.

**Stand 9** - This area was completely open in the 1937 photo. It contains large, abandoned dumps with a variety of trash including old tires. It also contains three “mysterious” circular excavations, hand dug, with the excavated soil and rocks piled around the edges (#s 45, 46, and 48). The largest of these is surrounded by trash (Figure 60), and is deep enough to hold water. Yellow poplar dominates the canopy, which varies from sparsely to densely-stocked. Numerous clumps of daffodils are showy in the spring (Figure 61). Some osage orange trees are near the main concentration of trash (Figure 63). The southern boundary of Ivy Creek is not marked. A small permanent stream drains the stand, and runs into the Yellow Trail tributary of Martin’s Branch. Two large, much older trees, a red maple and a white oak, may have once been line trees, as a metal fence post is just in front of them (Figure 62). There is a small, charred litewood pine stump (#192).

**Stand 10** – occupies the north facing slope above and to the south of the tributary, and extends all the way down to Stand 3. It is also a fertile area with a rich, mixed stand of yellow poplar, northern red oak, white oak, black oak, southern red oak, hickory, beech, red maple, and black gum. It appears to be largely even-aged, originating after heavy timber harvesting, perhaps in the 1930’s. We have two increment cores from Virginia pines (#’s 49 and 50) that originated



Figure 61. Daffodils growing in sparse yellow poplar stand.



Figure 62. Probable one-time line trees. Stand 7 is beyond.



Figure 63. Osage orange growing in dump site. Note tire.



Figure 64. Increment coring Virginia pine # 49.

about 1933 and 1934 (Figure 64). We also have two increment cores from residual shortleaf pine trees (#'s 53 and 194) whose increment cores show a major release in 1940 and 1938 respectively.

The slopes are steep with pronounced gullies in places above the stream. We also found 2 litewood pine stumps on this very steep slope, which along with the gullies strongly suggest that the slope was once farmed. There are two more of the mysterious round holes (#55 and #56), two large, apparently-fire-scarred beeches (#'s 51 and 52 and Figure 65), and a large 36.3 inch northern red oak (#190). The southern boundary of Ivy Creek is not marked, but a large pile of stumps behind a house is apparently on Ivy Creek.

**Stand 11** – is a small stand within Stand 10 that is similar to Stand 8. This small area shows as open, or mostly open, in the 1937 photo but largely grown up in forest in the 1957 photo. Like Stand 8, it stands out because of all the Virginia pines, again mostly dead and on the ground. Perhaps it also was in pasture, although there are a scattering of stumps in the western part. There are no fences around it. We increment cored 3 Virginia pines (#'s 181, 182, and we can't relocate the third tree to GPS it) in this stand and they originated about 1943, 1944, and 1944. Two small charred, litewood pine stumps are close to the Yellow Trail (#'s 54 and 193 and Figure 66).



Figure 65. Probable fire scars on two beech trees.



Figure 66. Fire-charred litewood pine stump.

## Area 2 Appendix

1. Black walnut, 19.9", dominant

38.09201036 N 78.49264239 W

2. White oak, 35.6", dominant

38.09212085 N 78.49367901 W

3. Beech, 36.4", dominant

38.09217817 N 78.49366558 W

4. Red cedar, 22.6", intermediate, one of several cedars on an old fence line

38.09245852 N 78.49375174 W

5. Red cedar, in same fence line

38.09245994 N 78.49377707 W

6. Red cedar, in same fence line

38.09251956 N 78.49385256 W

8. Beech, 26.2", dominant, in same fence line

38.09281683 N 78.4942269 W

9. Virginia pine, 10.5", intermediate/codominant, cored tree L, about 56 years old, originated about 1958

38.09274812 N 78.49417486 W

10. White pine, 22.9", dominant, close above fence line

38.09262854 N 78.49407522 W

34. Dead paulownia

38.08932379 N 78.49445825 W

35. Head of seep

38.089108 N 78.49467837 W

36. Lower end of seep and lower end of clubmoss colony

38.08906472 N 78.49488029 W

37. Beech blow-down, cross section #14, 15.5", codominant, knocked down by #38, cross section was cut at a height of about 3 feet. I counted 87 rings, and the tree has been down about a year, giving a total age estimate of about 88 years (at 3 feet), and originating about 1926. There was a very strong release about 61 years ago, 1953, when a harvest cut was apparently made.

38.08887442 N 78.49468307 W

38. Red oak that has been dead a long time. It toppled over and knocked down #37.

38.08894673 N 78.49453712 W

39. Rock pile

38.08839047 N 78.49412359 W

40. Virginia pine, 12.3", intermediate, cored tree N, not a good core – I don't have the center or any bark; 40 rings

38.08875924 N 78.49342458 W

41. Virginia pine, 10.6", intermediate, cored tree O, 40 rings +4+4= 48 years, originated about 1966

38.08869007 N 78.49344215 W

42. Small dump

38.08818595 N 78.49222809 W

43. White pine, 24.5, dominant, in field fence line.

38.08812862 N 78.49172096 W

44. Beech, 23.8", dominant, open grown

38.08779804 N 78.4916618 W

45. Round hole

38.08794354 N 78.49268808 W

46. Round hole in huge dump

38.08775193 N 78.49308992 W

47. Osage orange, not measured, photo #2118

38.08765293 N 78.49313778 W

48. Round hole

38.08785623 N 78.49361921 W

49. Virginia pine, 12.3", intermediate, cored tree P, 74 rings + 3 + 4 = 81, originated about 1933

38.08813607 N 78.493697 W

50. Virginia pine, 12.4", over-topped, cored tree U, 70 rings + 6 + 4 = 80; originated about 1934.

38.08814343 N 78.49423149 W

51. Beech, 27.4", dominant, fire-scarred

38.08864996 N 78.49498117 W

52. Beech, 36.9", dominant, fire-scarred

38.08866046 N 78.49493832 W

53. Shortleaf pine, 15.4", codominant, cored tree W, 106 rings + 5 = 111; originated about 1903  
Strongly released about 74 years ago (1940)

38.08924007 N 78.49583293 W

54. Charred litewood pine stump

38.08907554 N 78.49524295 W

55. Round hole

38.0894611 N 78.49581791 W

56. Round hole

38.08946872 N 78.49593066 W

71. Black walnut, 27.8", dominant, in dump on upper side of White Trail

38.0919725 N 78.49382506 W

72. Ash, 17.1", co-dominant, on upper edge of dump above White Trail

38.09182202 N 78.4937282 W

73. Ailanthus, 10.2", intermediate, edge of White Trail, one of a few survivors

38.09185654 N 78.49448222 W

74. Loblolly, 9.2", strong intermediate, cored tree R, 43 rings + 4 = 47 years old, originated  
about 1967

38.09113323 N 78.49547918 W

75. Black gum, 20.6", co-dominant, with a wide crown, fence line tree

38.09112123 N 78.49496156 W

76. Small buckeye, photo #2156, above White Trail

38.09123259 N 78.49542781 W

77. Paulownia, 14.0", over-topped, on School Trail

38.09078444 N 78.49508731 W

78. Virginia pine, 16.3" at 2.5 feet, cut down by the power company, cross section #4, I counted  
70 rings, and adding 4 years to ground plus an estimated 3 years dead gives an estimate of 77  
years, meaning it originated about 1937. I shaved the edge of the felling notch with a pocket  
knife until I was able to count the rings, and came up with the same estimate of age.

38.09033327 N 78.49537876 W

88. Virginia pine, 8.3", intermediate, cored tree C, about 36 years old, originated about 1978  
38.09257573 N 78.49375783 W
99. Virginia pine, 8.3", intermediate, cored tree D, about 38 years old, originated about 1976  
38.09261532 N 78.49375188 W
122. Virginia pine, 14.9", codominant, cored tree II, 51 years old, originated about 1964  
38.09105928 N 78.49552299 W
123. Carya ovalis, 28.0", dominant  
38.09045795 N 78.49600905 W
124. White pine, 12.7", over topped, cored tree H, residual white pine?, decayed, core broke up and some was lost, not useable  
38.08991264 N 78.49438962 W
125. Virginia pine, 13.1", intermediate, cored tree G, about 71 years old, originated about 1943  
38.08993162 N 78.49430491 W
140. Foot bridge over Yellow Trail tributary  
38.08828096 N 78.49413965 W
141. Club moss colony  
38.0889787 N 78.49487067 W
149. Forks of tributary  
38.08843245 N 78.49418141 W
170. Hay rake on Handicap Trail  
38.09135532 N 78.49428271 W
171. Yellow poplar, 38.0", dominant  
38.09116738 N 78.49449558 W
172. White pine, 12.2", overtopped, cored tree Q, the core I recovered is 6.75 inches and I lost at least .25 inches of bark. I should have hit the pith, but I can't distinguish it. Starting from the bark, I counted 95 rings to a clear release point (about 1919), when it must have been a small, suppressed seedling. There was another release point 60 years ago (about 1954).  
38.09034339 N 78.49505143 W

173. Rock pile

38.08900886 N 78.49440441 W

174. Soil mound, about 20 by 15 feet, soil came from adjacent depression

38.08901156 N 78.49385482 W

175. Virginia pine, 10.1", intermediate, cored tree WW, originated about 1966

38.08880308 N 78.49377163 W

176. Yellow poplar, 12.3", weak codominant, cored tree JJ, difficult to count

38.08847756 N 78.49282113 W

177. Virginia pine, 13.7", cored tree OO, died a year or two, died about 77 years ago, originated about 1937

38.08831445 N 78.49256352 W

178. Virginia pine, 9.2", cored tree NN, died a year or two ago, died about 69 years ago, originated about 1945

38.08819769 N 78.4925525 W

179. Yellow poplar, 12.6", intermediate, cored tree KK, poor core broke up when extracted

38.08798837 N 78.49185468 W

180. Yellow poplar, 13.9", good intermediate, cored tree LL

38.08788157 N 78.49180708 W

181. Virginia pine, 12.6", overtopped, cored tree MM, about 70 years old, originated about 1944

38.08882983 N 78.49522701 W

182. Virginia pine, 9.9", intermediate, cored tree XX, about 70 years old, originated about 1944

38.08906137 N 78.49541282 W

185. Beech, 23.2", dominant, leader broke out at a height of 36 feet within the past year (still some leaves on twigs), cross section #11, cross section 11.7". I counted 78 rings on the cross section. Using a white oak site index curve by Willard Carmean, I estimate that a free-to-grow beech might grow to a height of 36 feet in 23 years. Adding this to the 78 rings gives an estimate of about 101 years as the minimum age this tree could be. It is likely (probable) that this tree has not been free-to-grow since germination, but rather has grown in the shade of other trees when young. This tree was released about 44 years ago.

38.09013201 N 78.49542597 W

186. Black walnut, 11.3", intermediate, blew down about 2 years ago (based on condition of twigs and bark), cross section #12, growing on the north bank of the Yellow Trail tributary. The section was cut at a height of 3.5 feet. I counted 64 rings. Adding 2 years for the time it has been dead and another 2 years to grow to 3.5 feet gives an estimate of 68 years, meaning it originated about 1946. This tree grew quite well for the first 10 years. There are 2 very large beech, each about 50 feet away, to the east and south, which must have been quite small when this walnut germinated, apparently in a canopy gap created by logging about 68 years ago.

38.08974921 N 78.49546605 W

187. Red oak of some kind, 15.0", codominant, blew down perhaps 6 years ago (based on condition of sapwood), cross section #9, cross section 14.5" in diameter was cut at a height of 4 feet. I counted about 66 rings. Adding another year for the 4 foot section height gives an estimated origin of about 1941.

38.09023927 N 78.49464727 W

188. Beech, dominant, double-trunk tree; half the tree split off and was cross sectioned, cross section #15, section height was 10 feet, it has been down perhaps 2 years, and decay in the sapwood makes it difficult to get an accurate ring count (beech wood decays extremely rapidly). There is a strong release at about 25 rings, and the total number of rings is about 110. Adding 2 years since it died, means the release occurred about 1927. We did not try to measure DBH because the trunk is too badly split.

38.08939898 N 78.49480561 W

189. Scarlet oak, 38.5", dominant, seems to be dying. There are several large, dead branches and the bark on the lower side may be dead.

38.08861905 N 78.49418153 W

190. Northern red oak, 36.3", dominant

38.08839574 N 78.49392699 W

191. Plot stake. I could not find any information on it.

38.08825984 N 78.49370554 W

192. Small charred litewood pine stump

38.08770785 N 78.49371332 W

193. Small charred litewood pine stump

38.08916878 N 78.49534927 W

194. Shortleaf pine, 14.9", codominant, cored tree BBB, released 77 years ago (1938), over 120 years old

38.08938343 N 78.49594211 W

195. Virginia pine, 10.0", good intermediate, cored tree AAA, about 47 years old, originated about 1967

38.09112654 N 78.49530063 W

196. Virginia pine, 10.2", intermediate, cored tree ZZ, about 57 years old, originated about 1957

38.09160504 N 78.49483849 W

250. Virginia pine, 12.4", intermediate, cored tree HHH, originated about 1939

38.0898432 N 78.49428173 W

### Area 3

Area 3 lies southwest of the gas line right-of-way and includes all of the Green Trail (see map on next page).

**Stand 1** - This large area was still an open field, except for scattered trees, even as late as 1974, as shown in an aerial photo taken in 1974. A very long fence line forms the northwest boundary, and this fence continues on across the pipeline until it intersects another very long fence line at a section of rock wall in Area 4. The Red Trail runs close to this fence along much of its length.

Part of this field was mowed (bush-hogged) about every two years after Ivy Creek was established, up until about 2000, when mowing was discontinued. In 2012, mowing was started again, just on the part that was previously mowed, and the rest of the field has been growing up in forest. The 2013 aerial photo shows what is being mowed now.

Pines were slow to seed in on much of this field, and consequently some of the pines are very limby, some trees with very large branches close to the ground (Figures 67 and 68). It is not until the 1980 photo, a year after Ivy Creek was established, that the field is clearly growing up in trees, but unevenly. Hardwoods outnumber pines in many places, especially yellow poplar (Figure 69), and in other places red cedars predominate (Figure 70). There are a few large open-grown oaks, all or mostly southern red oak. Autumn olive is a serious problem.

The power line right-of-way bends about 20 degrees where it crosses the Red Trail. On the 1937 photo there appears to be a structure of some sort here with a clearly defined road running from the "structure" east to Martin's Branch, passing just south of Stand 1 of Area 4. The autumn olive and other brush is very dense here, and during the summer we could find no sign of a structure. We went back in January when the leaves were off and could still find no

signs, and concluded that maintenance of the right-of-way over the years may have removed any evidence.

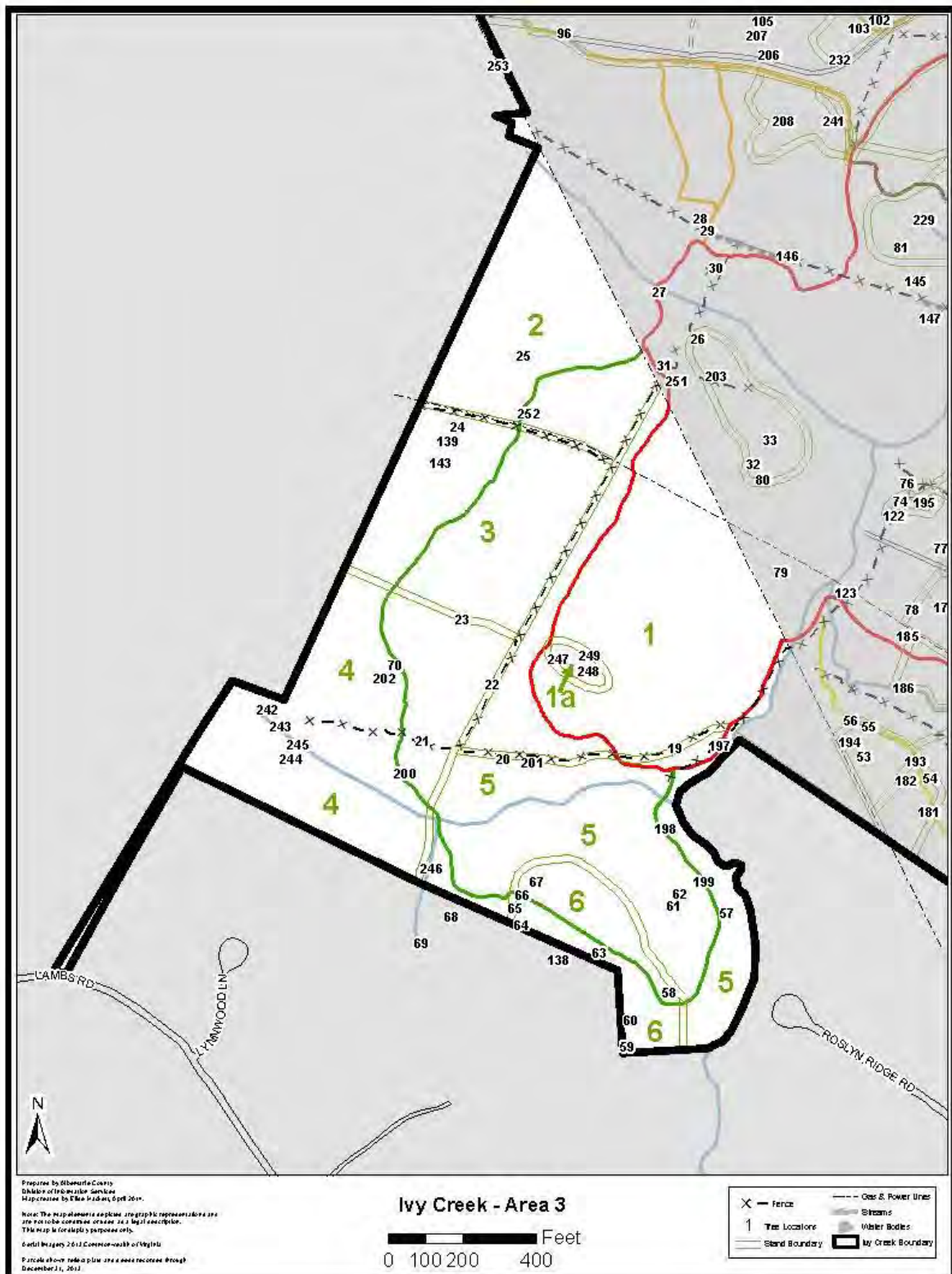




Figure 67. Large lower limbs on a very open-grown Virginia pine.



Figure 68. Another Virginia pine that grew in the open for years.



Figure 69. Yellow poplar and red cedar along the Red Trail. Note autumn olive.



Figure 70. Red cedars along the Red Trail.

**Stand 1a** – is a small stand within Stand 1 that has just 4 older and larger trees: one each of white oak, hickory (*Carya glabra*), red cedar, and yellow poplar. It shows clearly on the 1937 and, especially, 1957 aerial photos.

**Stand 2** - This area, bounded by the pipeline, the power line R/W, and the Red Trail, was also an open field in 1957, but was abandoned soon after 1957 and has grown up in mostly Virginia pine, shortleaf pine, and yellow poplar. In places yellow poplar predominates, partly perhaps, because the aspect is generally northeast. It seeded in much more rapidly than Stand 1. Part of it was still open in the 1966 photo but by the 1974 photo it all shows as a dense pine stand. This is perhaps the most densely stocked pine stand at Ivy Creek, and many of the pines are well pruned, with branch free lower trunks (Figure 71). It is badly gullied and evident that a lot of soil erosion occurred. It contains a large yellow poplar (#25 and Figure 72) that grew completely in the open until the field was abandoned. Oriental bittersweet dominates the understory. There is a large loblolly pine close to, and just north of, the power line, and a short distance east of the Green Trail (#252).



Figure 71. Well-pruned Virginia pine.



Figure 72. Open-grown yellow poplar, note holly in understory.

**Stand 3** – The 1957 aerial photo shows this area as a young, old-field pine stand. In aerial photos of forested landscapes, smooth texture means smaller trees (and probably younger) and coarse texture means larger trees (and probably older). As an example, contrast Stand 3 with the older Stand 4 on the 1957 photo. This stand is growing on land that was once cultivated, as

evidenced by gullies and scattered rock piles (Figure 73). It was essentially clearcut (Figure 74) in the late 1950's. The present, heavily-stocked, even-aged stand (Figure 75) is a mixture of hardwoods: northern red, black, southern red, scarlet, white, and chestnut oaks; yellow poplar, hickories, and black gum; with an occasional pine. Oaks predominate. Occasional residuals,



Figure 73. Rock pile in the edge of Stand 3.



Figure 74. Esso oil can from logging about 1957, set on one of the pine stumps.



Figure 75. Densely-stocked, even-aged forest.

trees not cut in the late 1950's, are scattered through the stand. One of these residual trees, on the stand boundary, blew down (#23, Figures 76 and 77) and was cross sectioned by Phil Stokes. This tree originated about 1872. The cross section shows a major release about 1915, when the tree was about 6 inches in diameter, when growth increased from an average of .8 mm per year to 2.4 mm per year in the 10 annual rings before and after the release event. Another significant release, with growth increasing from 1.0 mm to 1.6 mm during the 10

years before and after release, occurred about 1957, the year the stand was apparently clearcut, based on several increment cores I collected in 1994.



Figure 76. Residual white oak that was cross sectioned.



Figure 77. Same residual tree showing wide crown with large branches.

The soil in this stand is mapped as Hayesville, which is more fertile than the other soils mapped at Ivy Creek, but the vegetation does not suggest more fertile soil.



Figure 78. Open-grown yellow poplar on power line.



Figure 79. Bench. Note self-thinning in Stand 3.

In the northwest corner of this stand, on the power-line right-of-way, there is a large, open grown yellow poplar (#24, Figure 78). A deep, straight gully runs parallel to the R/W and there is a bench (Figure 79) just across this gully, and under the crown of the yellow poplar, that few people know about. On the western boundary of this stand, west of the Green Trail, is a jumbled pile of large sandstone rocks that does not appear to be natural. Rather, it appears to have been dumped there (#143 and Figure 80). Some of the rocks seem to be too large to have



Figure 80. Rock pile just west of the Green Trail.

been picked from the fields above, on Jane Moore's property, but this seems to be the most logical explanation. The other possible explanation is that they were carried there when clearing the site for her house, Shack Mountain, which was built in 1935, and shows on the 1937 aerial photo. I measured 34 feet from the Green Trail to the lower edge of this rock pile. There is a steel fence post and a very recent survey mark pinned to the ground, both just below the edge of the rock pile, suggesting the rock pile is just off of Ivy Creek.

Sandstone occurs as scattered surface rocks over part of Stand 3. It is nowhere near as abundant as in Stand 4, which follows, and does not have the effect on vegetation as it does in Stand 4.

**Stand 4** - This is an older stand that is dominated by oaks, especially chestnut oak. The surface rocks here are sandstone, and it produces dryer and less fertile soils than the granite gneiss that occurs over most of Ivy Creek, thus the prevalence of chestnut oak. Other typical species occur but are less abundant: white, black, southern red, and scarlet oaks; yellow poplar, hickory, shortleaf and Virginia pine, red maple, black gum, and beech. The latter three are mostly smaller trees, often in the sub-canopy. There are huge numbers (tens of thousands) of small, seedling-size oaks in the understory, more than anywhere else at Ivy Creek, and these are also mostly chestnut oak (Figure 81). There is a colony of black huckleberry near the Green trail (GPS #200), diagnostic for acid, infertile soils.

There are scattered, dead red cedars, which strongly suggests that at least part of the area was once cleared. However, there are so many sandstone rocks on the surface in places, particularly in the western part of the stand, that it could not have been cultivated. Walking from the Green Trail east toward Stand 1, sandstone rocks on the surface decrease, and the character of the stand changes to a richer mixture of species, but there is no clearly discernible

boundary. I arbitrarily placed the boundary at the fence line that forms the boundary with Stand 1.



Figure 81. Dense chestnut oak seedlings.



Figure 82. Virginia pine #21. Note increment borer.

We have increment cores from a Virginia pine and two shortleaf pines (#s 21, 70, and 202 and Figure 82) which originated about 1922, 1920, and 1921, indicating widespread partial harvesting around the early 1920's. Numerous stump sprouts from this harvesting are present



Figure 83. Dan Nissen standing by chestnut oak stump sprouts.



Figure 84. Chestnut oak stump sprouts.



Figure 85. Residual chestnut oak. Note large crown.

(Figures 83 and 84) and also scattered residual (uncut) trees (Figure 85). Crowns of residual trees have larger diameter branches than the younger trees growing around them. They also usually have callous bumps below the crown, where epicormic sprouts developed in response to release and later shaded off and healed over.

The Green Trail tributary to Martin's Branch is a permanent stream. It forks just below the western leg of the Green Trail, and there is a small foot bridge over the south fork and three high steps leading up from the north fork. There are springs at the heads of both forks.

The spring on the north fork is on Ivy Creek, and once had an elaborate system for collecting and storing water. The very head of the spring is walled up, and a short distance below it is walled up again (Figure 86). Water was apparently pumped from here up into a large, concrete, storage box (Figures 87). In the ravine below the spring are three



Figure 86. Walled-up spring.



Figure 87. Pump house (above) and storage box (below).

galvanized pressure tanks that were also once used to store water, but were later discarded (Figure 88). Wire fences enclose the spring, indicating the surrounding area was once grazed.

The spring house on the south fork is on an adjacent property, and is extremely well-constructed (#69 and Figure 89). We wonder where the farms were that used these springs. No currently-used trails lead to them. There is a road that leads to the north spring, which was kept open by cutting out fallen trees, perhaps up to the time that the ICNA was created.

**Stand 5** This hardwood stand occupies the mostly-steep land above Martin's Branch and on both sides of the Green Trail tributary. There are many large, widely-spaced beech that were left after past timber harvests, but also lots of oaks (northern red, white, chestnut, and black), and hickories, as well as yellow poplar and red maple. Oak stumps dating from the 1960's and perhaps 1950's are scattered about, and there are occasional litewood pine stumps. There is



Figure 88. Pressure tanks were shoved into the ravine.



Figure 89. Spring house.

some black cohosh, a fertile soil indicator, and some pawpaw. There are rock piles (#s 57, 61, and 62 and Figures 90 and 91), and a few shallow gullies. Much of this area may once have been cleared, and the rock piles suggest that part of it was once cultivated. Rock piles, including rock

walls, evidently create favorable habitats for tree seedlings to come up, as for example in Figures 90 and 91. Moisture is conserved in them because evaporation is reduced, temperatures are moderated, and the rocks probably provide some protection from trampling and browsing. They are also probably attractive places for squirrels and other wildlife to hide (store) nuts and fruits. Rock piles are widespread at Ivy Creek on areas underlain by granite gneiss (which is most of Ivy Creek), but I don't remember seeing any of them in Stand 4 (last described), which is underlain by sandstone. Figure 92 shows blood roots growing in a



Figure 90. A yellow poplar, beech, and hickory growing in a rock pile.



Figure 91. A beech, yellow poplar, and hickory growing in a rock pile.

rock pile, suggesting that the granite gneiss here is on the more fertile side.

There is a beech below the Green Trail, above Martin's Branch, which appears to have an old fire scar (Figure 93).



Figure 92. Bloodroots growing in a rock pile.



Figure 93. Probable fire scar on a large beech.

Stand 5 also includes the narrow strip of forest on the slope above Martin's Branch and the Red Trail, before the start of the Green Trail. There is an old fence along Martin's Branch here, and in the fence line is an old shortleaf pine (#197 and Figure 94) that is now about 173 years old and originated about 1842. This is the oldest tree we know of at Ivy Creek, and has to be about the same age as the much larger yellow poplars to the right of it, in the same fence line. Just



Figure 94. Old shortleaf pine.

above the Red Trail, above this old shortleaf pine, an open grown white oak (#19) is on another fence line that forms the southern boundary of Stand 1. There is no fence wire here, but a linear soil ridge indicates where the fence was. Scattered oak stumps dating from the 1960's or 1950's are present. This fence line extends to the west, crosses the Red Trail (Figures 95 and 96), and then the Green Trail, and continues all the way to the boundary on the west side, to a point above the spring. Barbed wire is present over much of this length. This fence forms an intersecting corner, of about 60 degrees, with the fence that runs north-east along Stand 1 (see map). To help prop the corner post, a



Figure 95. A row of fence line trees.  
Original field to the right.



Figure 96. Fence line tree with embedded  
barbed wire that was nailed to it when it  
was a small tree.

short length of red cedar was wedged  
between the corner post and a red oak just  
inside the corner (Phil Stokes figured this out). Over time the red oak engulfed the cedar  
support (Figure 97).



Figure 97. Engulfed cedar fence post support.

**Stand 6** This is another clearcut,  
done in the 1950's based on  
increment cores from a yellow  
poplar and a Virginia pine (#s 58 and  
65) which originated about 1959  
and 1955. It was once, almost  
certainly, a cultivated field, based on  
the gentle slope, abundant litewood  
pine stumps (Figure 98) and  
scattered rock piles (Figure 99). The  
boundary of this stand is not  
distinct, as the harvesting which  
created it became more of a partial  
harvest as it extended to the east,  
north, and west. An increment core



Figure 98. Litewood pine stumps in a former field.



Figure 99. Rock pile with stump of an oak tree which once grew in it.

from another Virginia pine (#64) only 25 feet away from #65, originated about 1939, indicating an earlier partial harvest. Oaks predominate: black, scarlet, southern red, white, and chestnut oaks; but yellow poplar and hickories are also common. Red maples, beech, and black gums are common but tend to be sub-canopy trees. A few Virginia pines are scattered through it.

To the west of this stand, on the tributary fork with the south spring (#69), a beech tree blew down across the stream (#246). Phil cut a cross section (cross section #19) and we counted about 90 rings at a height of 6 feet. A strong release occurred about 1951, increasing growth about four-fold, and this release may have been related to the harvest that created Stand 6. Another very strong release occurred about 9 years ago due to the death of three larger trees that had been growing close around it.

### Area 3 Appendix

19. White oak, 45.0", dominant field edge tree

38.08930546 N 78.4976119 W

20. Northern red oak, 35.1", dominant field edge tree

38.08922021 N 78.49922905 W

21. Virginia pine, 14.3", intermediate, cored twice, cores K and T, core T is the better core, 81 rings + 7 rings to pith + 4 = 92 years; originated about 1922

38.08935769 N 78.49997832 W

22. Shortleaf pine, 19.4", dominant

38.08977543 N 78.49932119 W

23. White oak, 19.6", cross section # 13, blew down in 2010 based on the age of a sprout which originated when the tree went down, cross section is 19.5" and was cut at a height of 2 feet. The tree was probably a codominant when it went down. This tree was definitely a residual. It is located just within, but close to the south edge of Stand 3. Some of the rings are narrow and obscure, and I counted 137. Adding a year because the section height was 2 feet, and 4 years for how long it has been dead, gives an estimated age of 142 years, and originating about 1872. The section shows a very strong release about 1915, when it was about 6" in diameter, increasing growth perhaps 8-fold. There was another release, with growth more than doubling, about 1957, which is about the time of the clearcut when Stand 3 originated.

38.09026185 N 78.49960271 W

24. Yellow poplar line tree on power line R/W, 38.7", dominant, very open-grown, near bench

38.09164753 N 78.49968171 W

25. Yellow poplar, 35.6", dominant, very open-grown, in intermittent tributary

38.09221485 N 78.49902781 W

57. Rocks piled on outcrop, below Green Trail

38.08807571 N 78.49712751 W

58. Yellow poplar, 14.6", codominant?, cored tree I, advance regeneration?, originated about 1959?

38.08748988 N 78.49766501 W

59. Property corner stake?

38.08708781 N 78.49806382 W

60. Red oak, 38.2", dominant, litewood pine stumps around it

38.08728394 N 78.49802871 W

61. Rock pile

38.08816494 N 78.49758824 W

62. Rock pile

38.08818832 N 78.49758943 W

63. Rock pile

38.08778504 N 78.49831968 W

64. Virginia pine, 12.9", weak codominant, cored tree X, 66 rings + 5 + 4 = 75 years old, originated about 1939

38.08799406 N 78.49905608 W

65. Virginia pine, 9.4", intermediate, cored tree J, originated about 1955

38.08807976 N 78.49907754 W

66. Carya glabra, 22.9", dominant, 3 sprouts, dominant one measured

38.08817789 N 78.49907703 W

67. Rock pile with glass fragment on top

38.0882792 N 78.49894048 W

68. Rock pile

38.08907554 N 78.49524295 W

69. Rock and mortar spring house, not on Ivy Creek

38.0894611 N 78.49581791 W

70. Shortleaf pine, 13.2", codominant, cored tree Y, 86 rings + 4 + 4 = 94; originated about 1920

38.08988155 N 78.50027212 W

139. Bench

38.09161153 N 78.49974756 W

142. Property stake

38.09141762 N 78.49981155 W

197. Shortleaf pine cored in November of 1994, over-topped, originated about 1845

38.08932208 N 78.49719324 W

198. Fire-scarred beech, 24.4", codominant

38.0887087 N 78.49770235 W

199. Possible road bed where it crosses Green Trail

38.08831078 N 78.49734165 W

200. Huckleberry colony on side of Green Trail

38.08911386 N 78.50014567 W

201. Northern red oak, 37.2", dominant, fence line tree

38.08919156 N 78.49894882 W

202. Shortleaf pine, 12.4", codominant, cored tree Z, 82 rings + 7 + 4 = about 93 years old, originated about 1921

38.08985522 N 78.50030776 W

242. Upper (top) spring

38.08959116 N 78.50144267 W

243. Lower spring

38.08942814 N 78.50131273 W

244. Walk-in cinder block upper structure, photos 2525 and 2526

38.08925612 N 78.50118819 W

245. Concrete box, lower structure, photo 2524

38.08929145 N 78.5011503 W

246. Beech, 14.5", cross section #19, blew down across the stream perhaps a year ago, but is still alive, sustained by a large root-ball. Phil cut the section (14.2 inches) at a height of about 6 feet. The first 26 rings were very narrow and then an abrupt release occurred, about 1951, increasing growth about four-fold. There was another very strong release about 9 years ago due to the death of two large trees, each about 20 feet away, one across the stream and the other back up the bank. Interestingly, the most recent ring, while the tree was on the ground, is about as wide as the previous several rings.

38.08841228 N 78.49989752 W

247. Carya glabra, on west end of Stand 1a

38.08996629 N 78.49870443 W

248. White oak, on east end of Stand 1a

38.08987831 N 78.49842267 W

249. Mimosa, 13.1", over-topped

38.0899542 N 78.49843939 W

252. Loblolly pine, 19.5", codominant

38.091787 N 78.498982 W

#### Area 4

Area 4 lies within a large triangle bounded by the gas line on the southwest, Martin's Branch on the southeast, and the Orange and Red Trails on the north. The other five areas all share a boundary with Area 4 (see map on next page). The Orange and Red Trails here follow a high ridge that is a watershed divide, with rainfall draining directly into Ivy Creek to the north, and into Martin's Branch to the south.

**Open fields** – Area 4 was almost completely in open fields or pastures in 1957, and about half of the fields were still partly open in 1974, just five years before Ivy Creek was established. Two fields were mowed by Ivy Creek to keep them open, and part of one is still being mowed. The larger field, the one still being mowed, is south of the Red Trail, and it was mowed about every other year until about 2000, when mowing was stopped. Mowing resumed in 2012 on just part of what had been mowed up until 2000. The 2013 aerial photo shows the part being mowed today, and the many pines and cedars that are being "mowed around". The other field that was mowed is within the Orange Loop Trail, and it was mowed for just a few years, mowing around cedars, but mowing was soon discontinued, and it is now almost completely grown up in young forest. The open fields have grown up in forests dominated by pines in most places, with many red cedars in the sub-canopy (Figures 100 and 101). In places hardwoods occur in the canopy,



Figure 100. A well-stocked pine stand with well pruned trees.



Figure 101. An open grown red cedar.

scattered among the pines, especially yellow poplar, and the occasional oak is frequently a southern red oak (#30 and Figure 102). As is typical, many small hardwoods have become established in the understory.

**Stand 1** was a big surprise to me. I had no idea it existed until I saw the 1937 aerial photo. It is on the ridge above (southeast of) the large tributary to Martin's Branch. It includes a nice outcrop of granite gneiss (Figure 103). The stand was partially harvested between 1937 and 1957, because the stand appears much more open in the 1957 photo. There was apparently another partial harvest about 1970, as revealed by an increment core from a Virginia pine (#203) that originated about 1971. As a result of these harvests, there is now only a scattered



Figure 102. Old-field southern red oak.



Figure 103. Elise on outcrop of granite gneiss.

remnant of the older trees shown in the 1937 aerial photo (#s 26 and 33 and Figure 104), including the present champion tree for Ivy Creek (#32 and Figure 105) a 54 inch southern red oak. Most of the trees are younger trees that originated after the logging operations (Figure 105). Several shallow gullies run off both sides of the ridge, towards both the tributary and pipeline, suggesting this area was once cleared. There is at least one fence line in this stand that has not been mapped.

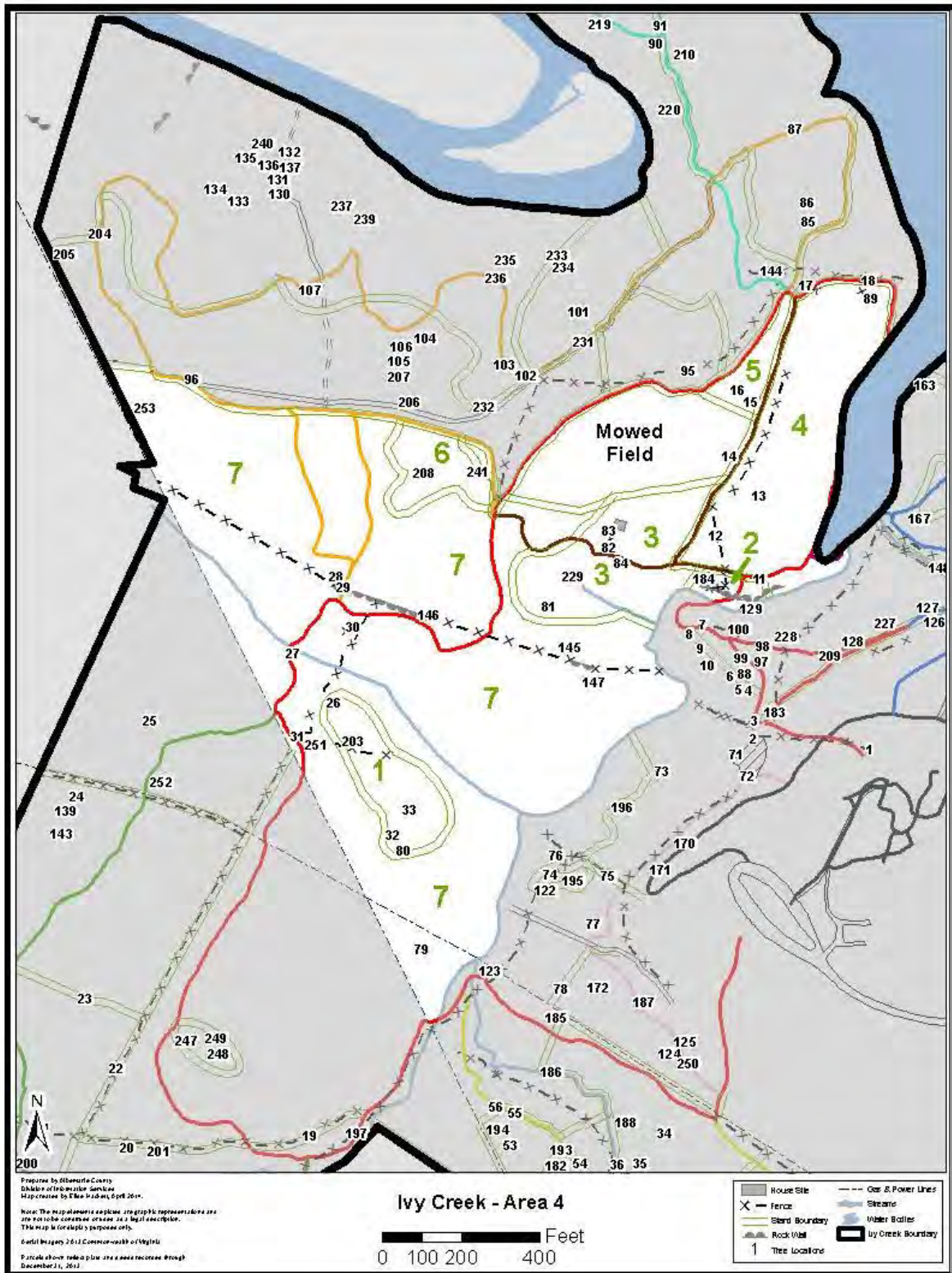




Figure 104. Open grown southern red oaks.



Figure 105. 54.6 inch southern red oak. The largest living tree at Ivy Creek.

**Stand 2** is a small, narrow stand containing scattered old hardwoods, just across the bridge from Martin's Branch and below the Brown Trail. A large bitternut hickory (#11 and Figure 106) is on the eastern end of this stand, and close to this hickory, in Martin's Branch, is a mafic dike,



Figure 106. Bitternut hickory.



Figure 107. Mafic dike in Martin's Branch.

which may have been a feeder dike for the Catoctin Greenstone (Figure 107). The stand is composed of white oak, red oak, yellow poplar, hickory, and walnut. Partial harvesting occurred during the 1960's, as over much of Ivy Creek, and Figure 108 (#129) shows a northern red oak stump with two stump sprouts that resulted from this logging. Phil Stokes cut a cross section from a northern red oak that blew down during the June, 2012 derecho, and for a while blocked the Red Trail near the bridge (#184). This tree originated about 1872.



Figure 108. Sprouts on a red oak stump cut in the 1960's.

the Red Trail near the bridge (#184). This tree originated about 1872.

The remains of an old road, with a rock wall supporting it (Figure 109), runs along Martin's Branch below Stand 2. In the 1980's, Ralph



Figure 109. Rock wall built to support an old road to Hydraulic Mills.

Bartholomew cored a white oak growing in the old roadbed and estimated it originated about 1850, probably not long after a flood washed the road out just upstream.

**Stand 3** includes the site of a former tenant house, which was taken down in 1973 (#'s82 and 83 and Figure 110). This house can be clearly seen in the 1957 photo, still out in the open field at that time. The large white oak in the yard (Figure 111) as well as the big beech on the Brown Trail below (#84 and Figure 112) can also be seen in the 1957 photo. The 1957 photo shows an orchard southwest of the house along the Brown Trail, and I remember seeing an apple tree on the edge of the trail which has since died and decayed. The 1937 photo shows several roads near the house, one of which ran to the east, perhaps to Martin's Branch.

A steep-sided ravine heads up where the Red and Brown Trails intersect. The small stream at the bottom of it seems to flow all the time. I walked up this small stream on 9/9/14, before the leaves started to turn. It was flowing well, and at the head, where it emerged from

the base of a steep bank, there is clear evidence that it was probably used as a water source for the tenant house. It seems to have been walled up, and is enclosed by barbed wire. The trees to



Figure 110. Foundation of tenant house.



Figure 111. Old bucket. Big white oak was a yard tree.

which the wire was attached have died and largely decayed (Figure 113). The spring is less than 200 feet from the tenant house.



Figure 112. Large, initialed beech on Brown Trail below tenant house.



Figure 113. Spring below Brown Trail.

There are many black walnut trees around the house and on the south-east facing slope below the Brown Trail. One day I counted about 6 walnut trees below the trail, plus several dead trees, and at least 7 above and around the house. The only other places at Ivy Creek where there are concentrations of walnut trees are below the barn in Area 1 (already described), and around the old dump above the White Trail in Area 2 (also already described). The forest here resembles the kind of forest that typically grows up around old house sites, where fertility builds up over the years from food scraps, pets, livestock and poultry. In addition to black walnut, there are a lot of red cedars and yellow poplar, and also some black cherry and even a hackberry. On the steep, northeast-facing slope above the spring there are white oaks, hickories, beech, walnuts, a large ash, and yellow poplar. Many of these trees are much older than the trees in Stand 7, which adjoins it.

**Stand 4** - This stand is dominated by Virginia and shortleaf pines, except at the foot of the slope on the south end, where yellow poplar is dominant. The aspect is similar to Stand 3, generally to the southeast, but species composition is quite different, with few black walnuts (I only found one tree). It was open in the 1957 photo except for scattered trees, but by 1966 was growing up in trees and by 1974 was a closed forest. It contains some pines with very large lower branches (Figure 114), showing that it seeded in over a long period of time. There is one outstanding tree in this stand, a large post oak that grew up in the former field before it was abandoned (#13 and Figure 115). When it was a small tree it was wrapped, probably with wire, and the top was cut out just above the wire.



Figure 114. Open-grown old-field pine.



Figure 115. Wire-wrapped post oak. The large leader on left arose after wrapping.

The location of the wire clearly shows in Figure 115. There is a short stretch of low rock wall a short distance above this post oak (Figure 116). Perhaps it supported the road mentioned in Stand 3, which ran east from the tenant house. It would have been less than 50 feet from the big post oak. We wonder why the post oak was wrapped. Also notable in this stand is the largest loblolly pine at Ivy Creek (#12 and Figure 117).



Figure 116. Rock wall that once supported an old road.



Figure 117. The largest loblolly pine at Ivy Creek.

Closely spaced gullies occur on the steep, east-facing slope above Martin's Branch (now the reservoir), showing that this steep slope was once cultivated. The upper end of an old drainage ditch can be seen in the winter just below the Red Trail at the head of the present lake. The purpose of this ditch would have been to drain the upper flood plain of Martin's Branch so it could be cultivated. On the north end of Stand 4, south of the Red Trail, is a classic field-edge tree, a large white oak on an old fence line (Figure 118).

**Stand 5** is a young forest that was initially part of the mowed field. Mowing in this portion of the field was stopped during the late 1980's, and it has grown up in a forest dominated by yellow poplar. These yellow poplars are mostly sprouts from stumps cut off by the mower. A few shortleaf pines, also mostly stump sprouts, are scattered through it (Figure 119). Both shortleaf and pitch pines sprout from "the stump". We increment cored a shortleaf pine and a

yellow poplar in this stand. The yellow poplar core could not be counted accurately, but the shortleaf pine (#16 and Figure 119) originated about 1984.



Figure 118. Classic field-edge white oak on Red Trail.

**Stand 6** is a young hardwood forest that originated after the last bark beetle epidemic, in 1994. The previous forest, before the bark beetle attack, was like most of the other forests in Area 4. It had gradually seeded in to mostly pines after field abandonment. The remains of many of the beetle-killed pine trees are still present on the ground (Figures 120 and 121). The hardwoods already present in the understory



Figure 119. Shortleaf pine #16 in Stand 5.



Figure 120. Pines killed by bark beetles.

and sub-canopy, when the beetles attacked, have grown up to produce the present stand of



Figure 121. Bark beetle "spot".

mixed hardwoods, with no pines. The forest changed abruptly from mostly pine to all hardwoods.

Yellow poplar trees predominate today, but many other species are present, including a surprising number of ash, including the largest at Ivy Creek (#208 and Figure 122). Obviously, the rocks here produce more fertile soils than occur over most of the ICNA. Other species present include white and southern red oak, red maple, beech, black gum, black cherry, black birch, and even a few sycamore, with a lot of red cedar and holly in the understory. The young yellow poplars growing in the gullies seem to be as vigorous as any at Ivy Creek.

This "beetle spot" contains the largest gully complex at Ivy Creek (Figure 122). A number of gullies came together and dropped their sediment in the "basin" above the rock wall, which is discussed under fence lines below. This beetle spot extends slightly to the north across the Orange Trail and occupies a small part of Area 5. Figure 123 shows the pine stand west of the beetle spot and east of the Orange Loop Trail.



Figure 122. Large ash on interfluvium above gully.



Figure 123. Pine stand west of beetle spot and east of Orange Loop Trail.

**Stand 7** includes all the rest of Area 4. When the 1980 aerial photo was taken, a year after the ICNA was created, portions of this stand were still not fully forested. Pines predominate, with lots of cedar in the understory and sub-canopy, and varying numbers of yellow poplar and other hardwoods. In places hardwoods predominate. The occasional oaks in these old field pine stands are often southern red oaks (Figure 124).

I have been looking for big tooth aspen at Ivy Creek for years. There used to be one at the top of the peninsula, in Area 6, that originated in a beaver clearing sometime before Ivy Creek was created. In the early 1990's it was cut down by beavers when they re-cleared the same area, and now it has completely decayed and there is no sign of it. This fall I noticed one growing on the southwest side of the pipeline, which is the Ivy Creek boundary (#253 and

Figure 125). Ivy Creek doesn't own it, but it is an easy tree for people to visit. In the 1957 aerial photo, the area where this tree stands was part of the same large field comprising Stand 7.



Figure 124. Open-grown southern red oak in abandoned field.



Figure 125. Big tooth aspen on west edge of gas line.

There is a very long, east-west fence line that runs from just above Martin's Branch all the way to the gas line. It contains two stretches of rock wall, one of which is familiar to all who hike at Ivy Creek. The familiar rock wall is just above the Red Trail and starts at the Orange Trail (#29 and Figure 126). It crosses a shallow valley, and a thick deposit of soil which eroded off the fields above has filled the wall to the top on the uphill side (Figure 127). The wall is noticeably higher in this valley, and I wonder if it wasn't gradually raised in order to trap more soil and thereby create a larger field. The large gully complex, described above in Stand 6, fed directly into this "sediment trap". There is another, much smaller gully feeding in from the east (Figure 128). Figure 129 shows the fence line where it crosses the Red Trail.

The other section of rock wall, which few people have seen, is on the east end of the fence line, just above Martin's Branch. Between the two sections of rock wall the fence line is marked by barbed wire and hog wire nailed to trees or fence posts.

These short sections of rock wall are a mystery to me. Could they have been Civil War barricades? If so, why are they part of a very long and straight fence line? Were they intended

as a place to pile rocks gathered from the fields on either side? Scattered piles, as occur over the rest of Ivy Creek, required much less work. The longer section, starting at the Orange Trail, might have been built as a sediment trap, but why did it extend so far uphill on either side, far beyond where it would trap sediment?



Figure 126. White oak that grew up next to the wall.



Figure 127. Sediment has filled upper side of wall (on right). Note the dead red maple that grew on the wall.



Figure 128. Small gully entering sediment basin from the east.

**Recent human history** – When I was looking for the eastern end of the long fence line described above, I was walking up Martin's Branch. Up on the ridge, I saw a large oak that looked like a fence line tree. When I got up to it I discovered the other section of rock wall (Figure 130), and was startled to realize I was quite close to a tent (Figure 131), and quietly retreated. The tent was pitched in a dense stand of autumn olive, and on April 14 it was already leafing out, effectively hiding the tent. It was only about 400 feet from the popular rock outcrop above the bridge, where so many children play. The residents apparently waited until everyone left in the afternoon before lighting campfires (Figure 132). They had apparently spent the winter here. They had no car, but walked in to the parking lot, and then on a well-worn, direct path, across the Paved, School, and White Trails, down the steep bank and across Martin's Branch, and

then up to the tent. Dan Nissen and Phil Stokes knew they were coming and going, and once, late in the afternoon, I saw the woman carrying groceries in the parking lot, but where they were going had been a mystery.



Figure 129. Fence line where it crosses the Red Trail.



Figure 131. The tent, just south of the end of the rock wall.



Figure 130. Short section of rock wall on east end of fence line.



Figure 132. The campfire site. The tent was pitched just behind it.

## Area 4 Appendix

11. Bitternut hickory, 30.0", dominant, in floodplain

- 38.09317036 N 78.49364037 W
12. Loblolly pine, 22.6", dominant
- 38.09351259 N 78.4940018 W
13. Post oak, 37.9", dominant
- 38.09378716 N 78.49362318 W
14. Southern red oak, 4.4", dominant
- 38.09406476 N 78.49388229 W
15. Yellow poplar, 8.3", codominant, cored tree S, can't count rings
- 38.09447814 N 78.49372305 W
16. Shortleaf pine, 9.6", intermediate/codominant, cored tree M, originated about 1984
- 38.09449884 N 78.49378615 W
26. Southern red oak, 37.5", dominant
- 38.09233924 N 78.49739034 W
27. Beech, 31.8" (measured larger stem on downstream side), dominant
- 38.09268273 N 78.49775446 W
28. Hickory (*Carya glabra*), 18.3", codominant, on western end of rock wall where Orange Trail starts
- 38.09319052 N 78.49734707 W
29. White oak, 31.9", dominant, extremely open-grown
- 38.09318038 N 78.49733306 W
30. Southern red oak, 37.1", dominant fence line tree
- 38.09286623 N 78.49722449 W
31. Red cedar, 21.9", dominant, fence line tree
- 38.09210429 N 78.49771457 W
32. Southern red oak, 54.6", dominant, open grown
- 38.09141136 N 78.49687303 W
33. Beech, 26.7", dominant

- 38.0915897 N 78.49671862 W
79. Loblolly, 12.4", dominant
- 38.09060974 N 78.49661594 W
80. Red cedar, 18.3", open grown but now intermediate
- 38.09133227 N 78.49677966 W
81. Beech, 30.2", dominant?
- 38.09301409 N 78.49548879 W
82. White oak, 37.8", dominant, open-grown
- 38.09346235 N 78.49495222 W
83. Holly, 18.8" measured below fork, intermediate, yard tree in house site
- 38.0935083 N 78.49494813 W
84. Beech, 35.4", dominant, open-grown
- 38.09331877 N 78.49484364 W
89. Red maple, 29.5", dominant
- 38.09517059 N 78.49262512 W
129. Red oak stump sprout from 1960's harvest
- 38.09313431 N 78.49370677 W
145. End of rock wall
146. End of rock wall
147. End of rock wall
184. Northern red oak, about 30", dominant, cross section #10, blew down across Martin's Branch in June 2012 derecho, section was cut at a height of 4 feet. I counted about 140 rings at a height of perhaps 3 feet. It started as a fast growing sprout. Adding 2 years since the derecho, it originated about 1872. The sapwood showed considerable decay in just 2 years.
- 38.09320637 N 78.49411341 W
203. Virginia pine, 10.7", intermediate, cored tree DDD, originated about 1971
- 38.09206438 N 78.49722953 W
208. Ash, 27.8", dominant, on interfluvium between large gullies

38.09395114 N 78.4965961 W

229. Spring below Brown trail and tenant house

38.09322003 N 78.49527193 W

241. Red maple, 25.7", dominant, open-grown

38.09395213 N 78.49611667 W

251. Loblolly pine, 8.5", intermediate/over-topped

38.092061 N 78.497594 W

253. Big tooth aspen, 13.5", dominant, on western edge of gas line

38.094364 N 78.499268 W

### Area 5

Area 5 includes the Orange Trail (excluding the Orange Trail Loop) and extends down to the reservoir, bounded on the east by the Red and Peninsula Trails (see map on next page).

**Stand 1** This area was once cultivated and grew up in an old-field pine stand. The evidence for this includes rock piles (#95 and Figure 133), gullies (Figure 134), and lite-wood pine stumps with large branch stubs close to the ground (Figure 135). Conley Greer constructed rock dams at several places in the gully shown in Figure 134, in an attempt to check its growth, and this gully is the boundary between Stands 1 and 2. There are several other fairly large gullies in Stand 1.

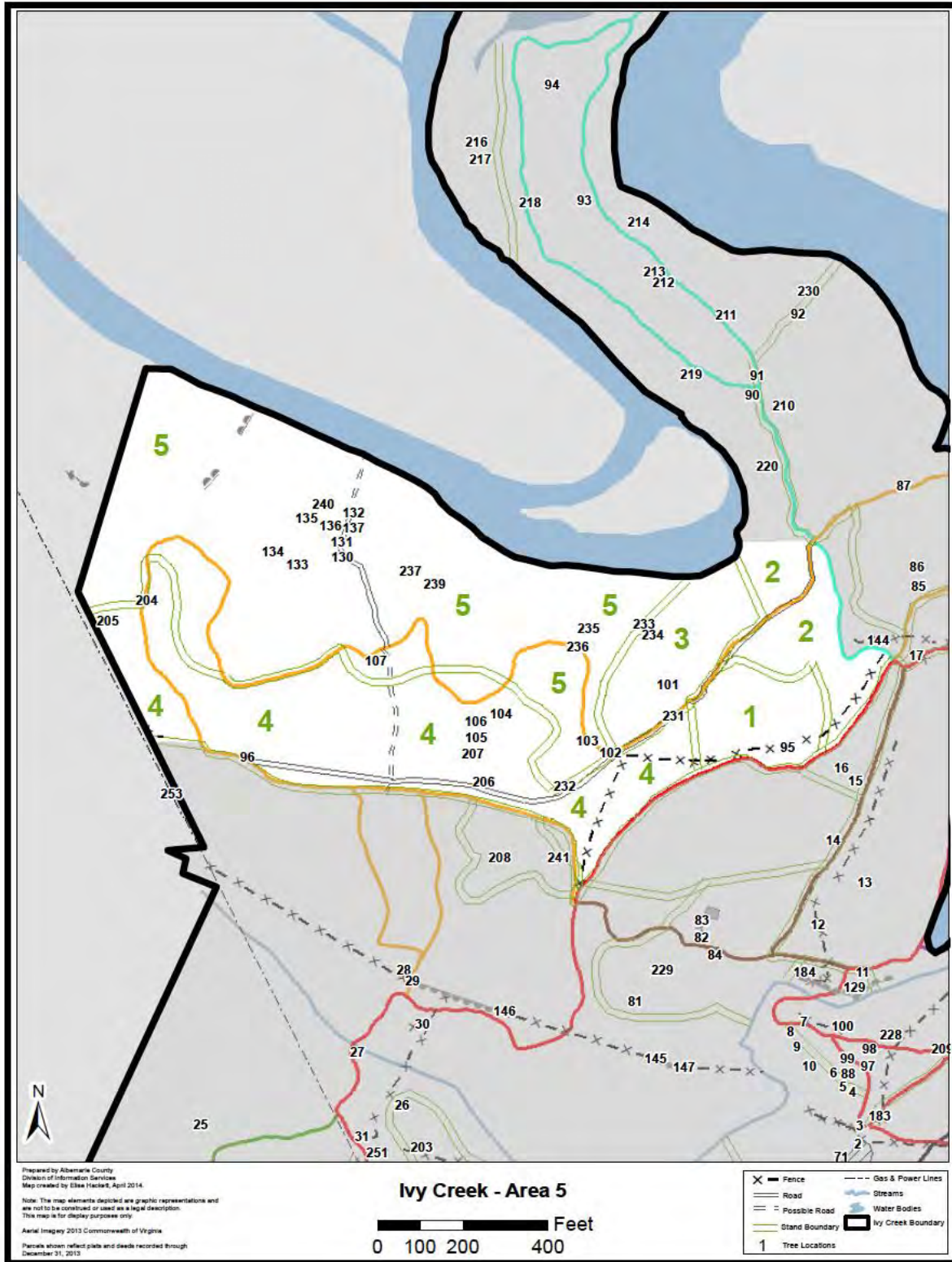


Figure 133. Rock pile in Stand 1.



Figure 134. Gully with rock dams installed to check erosion.

The old-field pine stand was clearcut in the late 1930's, based on four early increment cores from Virginia and shortleaf pines that I collected between 1994 and 2008. The present canopy



contains a rich mixture of hardwoods, including many black birch, northern red oak, black oak, southern red oak, chestnut oak, yellow poplar, hickories, black cherry, red maple, plus a fair number of Virginia pines and some shortleaf pines. Many of the birches have been partially girdled by beavers. The sub-canopy and understory is dominated by small beech and red maple.

**Stand 2** This is an older hardwood stand that wraps around Stand 1 on the east and north. Considerable beaver damage has occurred, especially to the numerous black birch. This north facing slope supports a species-rich hardwood forest, including northern red oak, white oak, hickory, yellow poplar, red maple, beech, chestnut oak, and even a black walnut. Maidenhair fern grows along the road bank and black cohosh is present, species that indicate fertile soils.



Figure 135. Old-field litewood pine stump.

**Stand 3** This is a steep-sided ravine dominated by beech, more beech than in any other stand at Ivy Creek (Figures 136, and 137). A few other species occur in the canopy, including red maple, black gum, yellow poplar, hickory, and black birch. It was partially logged heavily, in the 1960's, removing mostly oaks (Figure 137), which evidently were the predominant canopy trees before logging. Many of



Figure 136. The beech ravine of Stand 3.



Figure 137. The beech ravine. Note oak stump from 1960's harvest.

the present beech trees were probably growing in the sub-canopy before this harvest, and have responded rapidly to being released. The harvest cutting created large enough canopy gaps in several places to permit yellow poplar seedlings to germinate and grow into the canopy. I cored

one of them (#101) to verify the time of logging, about 1962. The ravine includes a steep-sided gully starting at the foot bridge (Figure 138) and several other gullies, suggesting it was once cleared or mostly cleared.

The northwest boundary is a ridge crest, which is also the boundary for Stand 5. The eastern boundary, below the Orange Trail, is also a ridge that encloses the beech ravine. Along these boundaries there is little difference between the forests on either side.

The Orange Trail follows an old road that forms the upper boundary of this stand on the southeast side. This old road seems to appear on an old county map prepared by Hotchkiss in 1867. The foot bridge in Figure 138 is on this road. This road continues on uphill, between Stands 4 and 5, and then through Stand 4, gradually approaching and bordering and finally joining the Orange Trail (see map). We found rebars driven into the bottom of the road bed at several locations going up the road, at one place two rebars side-by-side (Figure 139), evidence of gully stabilization efforts sometime after Ivy Creek was created. Downhill, this road probably ran into Martin's Branch at the "inlet" described in Area 6.



Figure 138. Looking up the gully to the foot bridge on the Orange Trail.



Figure 139. Rebars, flagged in blue, in the old road, entrenched about 10 feet here.

**Stand 4** This area shows as open land in the 1957 aerial photo. It has grown up largely in pines, but with a greater mixture of hardwoods, especially yellow poplar, than most of the other old-field pine stands at Ivy Creek. In places yellow poplar dominates, and other hardwoods are abundant in places. The northerly aspect of this stand is probably at least partly responsible for the greater number of yellow poplar and other hardwoods. A dead, open-grown paulownia (#106 and Figure 140) also indicates the area was once open. There are many pines with large lower branches (Figure 141), showing that pines seeded in gradually. Some of the

stand was still partly open in 1980. In places there are quite a few scattered, much older hardwoods and a few pines (#107 and Figure 142) that had been growing in the field when it was abandoned, and these scattered trees are more abundant in the western third of the stand. Rock piles are abundant in some parts of this stand (Figures 143 and 144), and gullies are frequent (Figures 145 and 146), which tell us that this area was once cultivated.



Figure 140. Dave Smith standing by a dead paulownia.



Figure 141. Old-field Virginia pine with large branches close to the ground.

We found four small, charred, litewood pine stumps (#s 104, 105, 207 and Figure 147) and charred litewood knots (#206, Figure 148) from another tree. These trees must have been dead (cut) before the fire, because the charcoal is on the litewood.

We have a couple ages from the western edge of Stand 4: a cross section from a Virginia pine that fell across the Orange Trail (#204 and Figure 149) that originated about 1959, and an increment core from another Virginia pine (#205) that originated about 1953.

A small part of the bark beetle spot described in Area 4, Stand 6, extends across the Orange Trail into this stand, and the description of Stand 6 in Area 4 applies well to this extension, except that this part of the "beetle spot" drains to the north and is not part of the gully complex.



Figure 142. 28 inch white pine.



Figure 145. Gully.



Figure 143. Rock pile. Note large red oak that is much older than the surrounding stand.



Figure 144. Rock pile. Note oak stump from 1960's harvesting.



Figure 146. Another gully.



Figure 147. Charred pine stump.



Figure 148. Three charred pine knots.



Figure 149. Counting rings on Virginia pine #204.

**Stand 5** This mixed hardwood stand occupies the steep slopes and ravines above the reservoir. Early in the history of Ivy Creek, much of this steep area was cleared and farmed or grazed, as evidenced by the presence of dead cedars, some notably open grown (Figures 150 and 151), litewood pine stumps (Figure 152), and occasional gullies and rock piles (Figures 153 and 154). Logging was widespread in the 1960's and perhaps late 1950's, as evidenced by oak stumps (Figure 155). Many stump sprouts originated from this harvesting, as well as earlier logging episodes (Figures 156 and 157). We also found a chestnut stump (#233 and Figure 158). I cored a shortleaf pine just above Stand 3 (#102) that originated about 1936, and an older Virginia pine just across the trail (#103) that was strongly released about 1936.

The forest has a good mix of species indicative of a somewhat moist and fertile site. There are yellow poplar, hickories, northern red oak, white oak, chestnut oak, red maple, black

gum, black birch, ash, and black walnut. Herbaceous species in the understory also indicate calcium rich soils. The following species have been found which tend to grow on, or be favored by, calcium rich soils: Black cohosh (*Cimicifuga*), maidenhair fern, silvery spleenwort,



Figure 150. A dead, open-grown red cedar, evidence this land was once open.



Figure 153. Rock pile.



151. Extremely open-grown red cedar. Note the large branches that grew close to the ground.



Figure 152. Litewood pine stump that originated in a field or pasture.



Figure 154. Note yellow poplar sprouts growing on another rock pile.



Figure 155. Four oak stumps cut in the 1960's.



Figure 156. Yellow poplar stump sprout from the 1960's.



Figure 157. Yellow poplar stump sprouts growing on a short rock wall.

horse balm (*Collinsonia*), bloodroot, puttyroot, hog peanut (*Amphicarpa*), sweet scented bedstraw (*Galium tinctorum*), enchanter's nightshade, and showy orchis. Many of these plants are in the ravines, but some occur on the ridges between the ravines.

Mountain laurel occurs on the steep slopes (bluffs) above the reservoir, often in thickets, but on the more gentle upper slopes it thins out and disappears. It doesn't occur in the

hollows (ravines) that drain into the reservoir. Fires may once have been frequent here, and would have burned more intensely on the steep slopes above the river, as discussed earlier in Area 1 and again in Area 6 that follows. However, the presence (and absence) of mountain laurel at Ivy Creek is somewhat of a mystery to me. Abundance on the steepest slopes and thinning out and disappearing on the gentler upper slopes could also be due to more intensive clearing and agricultural use on the gentler upper slopes. Mountain laurel may be slow to invade (or reinvade) abandoned farm land. One day I walked the slopes along Martin's Branch and its tributaries upstream of the reservoir, where the flood plains were not wide enough to farm, looking specifically for mountain laurel. In Area 1, I saw a few small bushes in Stand 7 below the Blue Trail and a few more bushes below the Red Trail, just above the bridge (below the big split beech). I didn't see any in Areas 2, 3, or 4. The slopes above Martin's Branch are generally less steep than the slopes above Ivy Creek, and I also think they were more intensively used. But still, the great difference in abundance, comparing Ivy Creek with Martin's Branch is puzzling. Mountain laurel tends to grow on acidic soils, but on average, comparing the slopes above Ivy Creek and Martin's Branch, I doubt that there is much difference in soil acidity.



Figure 158. Chestnut stump.

Black birch, which are abundant at Ivy Creek, mostly on northerly aspects, is a species whose seeds frequently germinate and grow on old stumps and logs. Figure 159 shows a chestnut oak stump with a sprout, dating from the 1960's partial logging. Figure 160 was taken of the same stump close up, and on it about a dozen small black birch seedlings are growing. Someday one of these birch seedlings may look like the birch trees in Figures 161 and 162, which also germinated on stumps many years ago.

There is an old road that ran down one of the ravines (see map) into the flood plain of Ivy Creek. It tied in to the road described above in Stands 3 and 4. Solid parallel lines on the map show where the old road bed is visible, and dashed lines indicate where we estimated the road bed had been. Near the present reservoir a couple of springs emerge, and rocks were once removed from one of the springs and piled around the uphill sides of it (#132 and Figure 163),



Figure 159. Chestnut oak stump of the 1960's with a stump sprout.



Figure 160. Same stump showing small birch seedlings.



Figure 161. Black birch that germinated on a stump.



Figure 162. Another birch that germinated on a stump.

suggesting it was a source of water. The road went right by this spring, and water may have been hauled uphill by wagon, perhaps to the tenant house above the Brown Trail.

Around the springs is an area with a concentration of ash trees. We measured 6 of them (#'s 130, 131, 135, 136, 137, and 240). This is one of just two places at Ivy Creek with an abundance of ash trees (the other is in Stand 6 of Area 4), as ash trees require higher soil



Figure 163. Former spring on old road, note cinnamon fern.



Figure 164. Vic Parmalee on short rock terrace.

fertility than occurs over most of Ivy Creek. On the steep, east-facing slope above the springs, are what appear to be several short rock terraces (#s 133 and 134 and Figure 164), which may once have been used to grow fruit trees. A nearby, large, extremely-open-grown cedar, now dead (Figure 165) shows this steep hillside was once open field or pasture. Other large, dead cedars are present in this ravine. Perhaps early farmers recognized the potential fertility here (Figure 166), and cleared what might ordinarily appear to be a difficult slope to farm.



Figure 165. Red cedar on short rock terrace.



Figure 166. Showy orchid, an indicator of fertile soil.



Figure 167. The upper rock wall on ridge crest.

There are four ravines that run into the reservoir, starting with the beech ravine in Stand 3. The third ravine to the west splits into two "feeder" ravines, and the rock terraces mentioned in the last paragraph are on the west fork. On the ridge above (and west of) the fourth ravine are two short sections of rock wall (Figure 167) on a very steep ridge above the reservoir (see map). They line up but we could not find any fence line connecting them. The rocks in these walls are sandstone, the same sandstone described in Stand 4 of Area 3, along the Green Trail. A

curiosity, which is hard to explain, is a small colony of walking fern growing right on some of the rocks in the wall. This plant usually grows on limestone and other lime-rich rocks. The western boundary of Ivy Creek is west of these rock walls. Chestnut oak and mountain laurel are abundant on the ridge to the west of these walls, and some of the chestnut oaks are big, gnarly, and appear to be quite old. This type of forest, and the sandstone, continue to the west onto the Shack Mountain property.

## Area 5 Appendix

95. Rock pile, photo #2168

38.09466744 N 78.49424916 W

96. Rock pile, photo #2169, beside upper leg of Orange Trail

38.09460481 N 78.49865089 W

101. Yellow poplar, 10.9", intermediate, cored tree BB, originated about 1962

38.09507556 N 78.49522444 W

102. Shortleaf pine, 9.9", intermediate, cored tree CC, 72 rings + 2 + 4 = 78 years, originated about 1936

38.0946641 N 78.49572021 W

103. Virginia pine, 12.0", intermediate, cored tree DD, originated about 1915, but was strongly released about 78 years ago (1936) when CC originated

38.0946736 N 78.49585607 W

104. Charcoal litewood pine stump

- 38.09485384 N 78.49661332 W
105. Another charcoal pine stump
- 38.09472999 N 78.49678771 W
106. Dead paulownia
- 38.09483216 N 78.49676458 W
107. White pine, 28.2", dominant
- 38.09523165 N 78.49760415 W
130. Ash, 13.7", codominant?
- 38.09590027 N 78.49787744 W
131. Ash, 14.4", codominant?
- 38.09597082 N 78.49785589 W
132. Spring on side of old road
- 38.09616146 N 78.49781363 W
133. Large rock pile
- 38.09588357 N 78.49827012 W
134. Diffuse rock pile
- 38.09590375 N 78.49841872 W
135. Ash, 16.7", codominant?
- 38.09615691 N 78.49814414 W
- 136 Ash, 17.2", codominant?
- 38.09610136 N 78.49794517 W
137. Ash, 16.5" codominant?
- 38.09608845 N 78.49781241 W
204. Virginia pine, cross section #5, a Virginia pine that had recently fallen across the Orange Trail, Phil cut it off at stump height to clear the trail. After some shaving with a pocket knife I counted 55 rings, meaning it originated about 1959.
- 38.09562169 N 78.49947187 W
205. Virginia pine, codominant, cored tree CCC, originated about 1953

- 38.09548507 N 78.49978665 W
206. Charred pine knots (photo 2352)
- 38.09444177 N 78.4967278 W
207. Charred pine stump (photo 2353)
- 38.09462333 N 78.49681625 W
231. Foot-bridge on Orange Trail
- 38.09486882 N 78.49517904 W
232. Rebars in old road bed
- 38.0944123 N 78.49606659 W
233. Chestnut stump, a black birch that germinated on a stump is in the background
- 38.09543623 N 78.49539597 W
234. Close-up of the black birch that germinated on a stump
- 38.09542508 N 78.49537525 W
235. Another black birch that germinated on a stump
- 38.09540671 N 78.49587208 W
236. Double bench
- 38.09534748 N 78.49596036 W
237. Chestnut oak stump with sprout and a dozen small birch seedlings
- 38.09578098 N 78.49729459 W
238. Number not used
239. Bench
- 38.09575589 N 78.49715037 W
240. Ash, 22.1", codominant
- 38.09621913 N 78.49805723 W

## **Area 6**

Area 6 includes the peninsula, the eastern loop of the Orange Trail (east of the Peninsula Trail), and is bounded on the south by the Red Trail (see map on next page).

**Stand 1** – This stand grew up after a large clearcut done in the 1960's. In the 1957 photo, and less clearly in the 1937 photo, the previous stand, that was clearcut, appears smoother textured than Stand 4 to the northwest. We have increment cores from three Virginia pines and two shortleaf pines (Figure 168). The increment core of one of the shortleaf pines, a residual, could not be counted accurately, but the other four originated about 1962, 1963, 1965, and 1967. These five trees were all cored before they were GPS'd, and when we went back to map their locations, we could not find one of them. The GPS numbers of the four we relocated are 85, 86, 87, and 92.



Figure 168. Shortleaf pine #92. Note increment borer.

The southern third of the stand, south of the saddle at the start of the peninsula, is predominately Virginia and shortleaf pine with an intermixture of hardwoods, including a lot of yellow poplar and some oaks in places. The larger approximately two-thirds of the stand, north of the saddle and on the peninsula, is still dominated by Virginia and shortleaf pines, but there is a lot more oak, especially black and southern red, along with a lot of yellow poplar. In both parts of the stand are much-older, scattered residuals of mostly shortleaf pine and yellow poplar. Hickories are scarce and there are no ash or black walnut. In general, fertility seems to be somewhat low. There are some black cherry and I saw three dead black locust on the peninsula. Autumn olive is abundant on the peninsula portion, especially on the lower slope near the reservoir, where it is impossible to walk through in places.

There are three fairly large gullies and a shallow one in the northern portion of the stand, on the peninsula. All of Stand 1 was probably once cultivated. The northern edge of the stand, on the peninsula, occurs where the slope becomes much steeper, and probably was not suitable for cultivation. The eastern and southern boundary, south of the peninsula, follows the Orange Trail mostly, which is curious because the Orange Trail did not exist then. Perhaps when they installed the Orange Trail they skirted the clearcut, staying in the edge of the uncut woods.

**Stand 2** – This stand wraps around Stand 1 on the south and east. It is a species-rich stand of mixed hardwoods containing northern red oak, white oak, yellow poplar, hickory, red maple, beech, and scattered shortleaf pine, with some hornbeam and hop hornbeam in the understory. Autumn olive forms dense stands in places. There is a barbed wire fence line with a



prominent linear soil ridge along the south edge of this stand, adjacent to the Red Trail (Figure 169), which contains the Bartholomew oak (#18 and Figure 170). We obtained a crude estimate of the age of Bart's tree by counting the rings from a cross section of a large lower branch which broke off perhaps 12 years ago. Our procedure is described in the Appendix, and the estimated age is about 152 years, meaning the tree originated about 1862.



Figure 169. Barbed wire embedded in fence line mockernut hickory.



Figure 170. Bart's tree growing on a fence line with a linear soil ridge.

In another fence line, which runs into the above fence line at a slight angle, a very large southern red oak died about 7 years ago (#17 and Figure 171). This tree had been the largest tree at Ivy Creek, at a diameter of about 60 inches (no one had ever measured it; it is about 56 inches now, after most of the bark and some sapwood is gone). We obtained an estimate of how old it was by cutting a cross section from a leader which broke out (Figure 171). The cross section had about 109 rings, and adding 11 years for the estimated time to grow to the section height of 18 feet gives an age estimate of about 120 years at death. If it died about 7 years ago, it originated about 1887.

In the southwestern corner of Stand 2, where the Peninsula Trail leaves the Orange Trail, several large rocks on the surface are the same felsic rocks as described in Area 1, Stand 2.

**Stand 3** – This narrow stand lies between Stand 1 and the Peninsula Trail. It is an older stand of hardwoods with a few shortleaf pines. Black birch trees predominate, but these have been mostly damaged by beavers (Figure 172) and many have died. Black birch seedlings are growing vigorously in a canopy gap created by the beavers (Figure 173). Other species present are

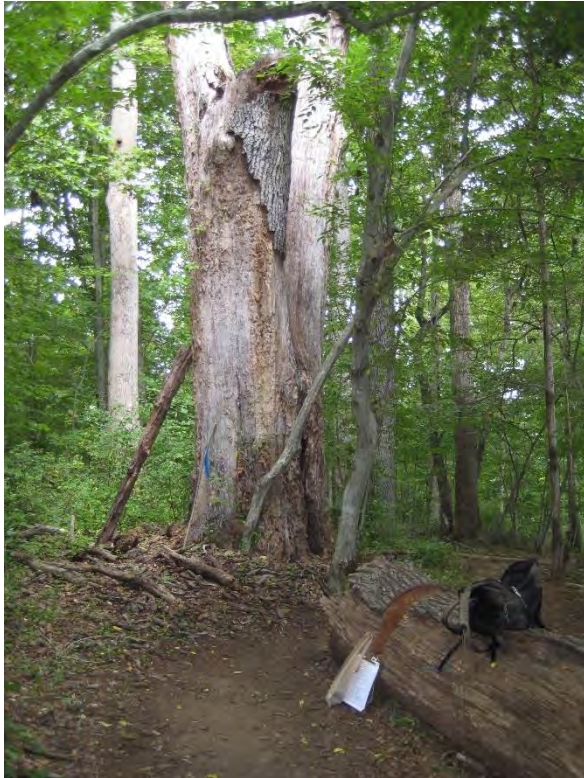


Figure 171. This southern red oak was the largest tree at Ivy Creek. Note cross section.

yellow poplar, hickory, scarlet, black, and white oak, and red maple. Hornbeam is prominent in the understory.

**Stand 4** - The rest of the peninsula supports a variable stand of mostly older hardwoods with white, scarlet, and chestnut oaks predominating. There are also considerable numbers of pine trees of five different species, in descending order of abundance: Virginia pine, shortleaf pine, pitch pine, white pine, and loblolly pine. Four of the nine loblolly pines we have found at Ivy Creek are on the peninsula. The stand is quite open on the west side of the peninsula and also on top, within the loop of the Peninsula Trail. The widely spaced trees have numerous epicormic sprouts along the lower part of the trunk, more such trees than anywhere else at Ivy Creek (Figures 174 and 175). For the most part, these sprouts seem to have originated after heavy partial harvesting. They seem to be too old to have resulted from



Figure 172. Black birch on the Peninsula Trail, heavily damaged by beavers.

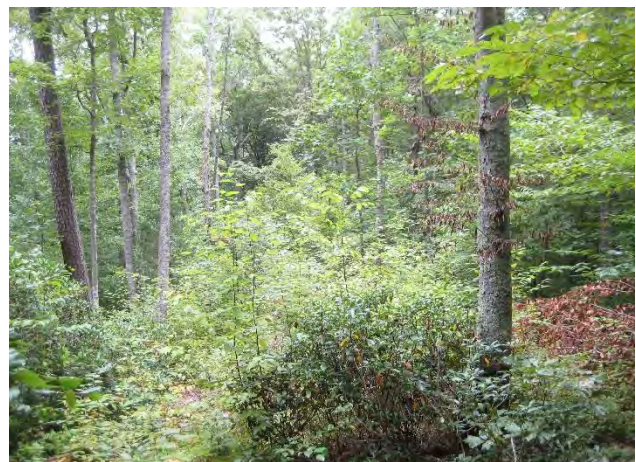


Figure 173. Black birch seedlings in a canopy gap.

beavers “thinning” the stand. However, beaver damage in recent years has undoubtedly caused additional epicormic sprouts. Beaver damage is especially severe on the peninsula, but beaver cutting has resulted in patches of dense, vigorous oak regeneration, the best anywhere at Ivy Creek (Figures 176 and 177). Beavers can also be credited for the two 5 inch loblolly pines, one on either side of the eastern leg of the Peninsula Trail (#'s 93 and 214 and Figure 178). They are both growing in dense stands of mountain laurel, much too thick for loblolly seedlings to “invade”. Beavers “cleared” the areas in which these pines originated, acting as proxies for fire, similar to what they have done for small oaks. The other two loblolly pines on the peninsula are #'s 94 and 210.



Figure 174. Epicormic sprouts on a white oak. Note dense mountain laurel.



Figure 175. Epicormic sprouts on a hickory. Note dense mountain laurel.

The narrow ridge crest and the steep southwest facing slope of the peninsula is perhaps the driest site at Ivy Creek. An oak-heath forest grows on it (another area of oak-heath forest has already been described in Stand 3 of Area 1). Oak-heath forests are fire-prone, and historically burned frequently, and often intensely. Quite a few pitch pine are present here on the peninsula, but occur nowhere else at Ivy Creek. Pitch pines are abundant on fire-prone sites in the mountains, but are uncommon in the Piedmont. It seems likely that pitch pine will have difficulty regenerating here in the future, so on July 20, Dan Nissen and I attempted to count all of them, so as to have a baseline for future reference. Mid-summer, when the leaves are out, is

a difficult time to do this, but we counted 22 trees, including #'s 213 and 220, and we probably missed some. Two of these pitch pines are east of the ridge crest, in Stand 1. There are several



Figure 176. Dense, vigorous young oaks in a beaver cutting.



Figure 177. More young oaks in a beaver clearing.



Figure 178. Small loblolly that originated in a beaver clearing.



Figure 179. Post oak with cankers caused by chestnut blight.

seedlings growing on one of the driest and most exposed places on the peninsula - in front of the beautifully crafted bench that overlooks Ivy Creek (#219). This summer beavers cut off all of them, but they are sprouting back. Dense patches of mountain laurel occur (Figures 174, 175, and 178) as well as blueberries (we looked for but did not find black huckleberry). Scarlet oak is common, a species often abundant in oak-heath forests, and #211 is a 32.5 inch scarlet oak, one of the largest at Ivy Creek. A post oak also occurs near the top (#91 and Figure 179), and as mentioned earlier, in Area 1, post oaks are diagnostic of dry, stressful sites. This post oak is infected with chestnut blight, a common affliction of post oaks. The dead areas surrounded by rims of callous growth are called cankers, which do not kill the trees (as far as I know). I saw a couple more small post oaks further out on the peninsula. A number of herbs and shrubs occur which are characteristic of dry, acidic, infertile sites, including trailing arbutus, goat's rue, hairy angelica, sweet scented golden rod (*Solidago odora*), bracken fern, and low-bush blueberry. There are no signs of former fires today, but prior to European's arriving, fires likely were quite frequent. If Native Americans once cultivated the flood plains along Ivy Creek, the fires they set to clear and maintain fields would have spread up onto the peninsula.

In the middle of the Peninsula Trail, at the point where the trail splits to form a loop, is a large rock. It is the same felsic rock described earlier in Stand 2 and initially in Stand 2 of Area 1. Other smaller felsic rocks occur nearby. These rocks may be fairly widespread here, and the post oak mentioned above (#91) may be growing on soil derived from them.

The north to east facing side of the peninsula, where Stand 1 occurs, is less dry, and few pitch pines occur east of the ridge crest. Toward the north end of the peninsula the slopes become gentle to almost flat, and apparently were once cultivated. A comparison of the 1937 and 2013 aerial photos suggests that the tip of the peninsula was open land in 1937. Mountain laurel drops out and is replaced with hornbeam and autumn olive in the understory. A curiosity is a small southern magnolia (*Magnolia grandiflora*), #212 and Figure 180. A 10.8 inch hornbeam at the end of the peninsula (#215) may be the largest at Ivy Creek.

**Stand 5** – After the reservoir filled, sediment from upstream erosion has created a wide strip of alluvial soil along the west side of the peninsula. It was not yet present when the 1980 photo was taken, but since then has emerged and now supports a rapidly growing young forest. The first tree species to invade was black willow, a short-lived, very aggressive colonizer of sand bars and mud flats. Sycamore soon followed, and there are



Figure 180. Small magnolia in mountain laurel thicket.

now vigorous, fast growing trees up to 16 inches in diameter (#'s 216 and 217). Some of the first willows are still alive and quite large, but sycamore will replace them. Some small box elders are present in places, but no other tree species. This is an ideal site for sycamore and some of these trees could be gigantic someday. Beavers could be a problem, and it might be desirable to put wire around some of these trees.

There was forest here before, of course, before the reservoir. The 1937 photo shows it was cleared and in open land then, but by the 1957 photo it was growing up in trees, which were cleared when the reservoir was created.

**Former location of Ivy Creek?** – There is a clearly defined former stream channel along the north side of the Orange Trail, east of the Peninsula Trail, and a very pronounced inlet where it enters the reservoir (Figure 181). This former stream channel lines up with the original stream channel of Ivy Creek on the west side, as can be seen in several of the aerial photos. We used a soil auger to determine soil depth at four closely spaced locations along the Peninsula Trail, in the low point where the Orange Trail crosses it, and hit hard rock within 8 inches of the surface at all four locations. Normally one would expect to find deep soil in the low point of a saddle like this. Was this channel cut during an unusually severe flood event (or events), when Ivy Creek over-flowed the saddle? This seems to be the most likely explanation, but is it possible that this might once have been the original channel of Ivy Creek, until it cut down to bedrock, and then found an easier way around the peninsula?



Figure 181. Old stream channel and inlet along the Orange Trail.

## Area 6 Appendix

17. Southern red oak, about 60" when it finally died about 5 years ago, cross section #3, the largest tree known to have grown at the ICNA. It had 3 leaders. The first leader to die, about a year or two before Dede retired (10 years ago?), was the largest and was on the downhill side. The other 2 leaders (the rest of the tree) died about 5 years ago. About 2 years ago one of these broke off at a height of 18 feet. Phil cut a cross section from it that I sanded and counted 109 rings. Growth was very slow for about the last 15 years or so as it was declining.

On 4/21/14 I measured the height of an adjacent yellow poplar (the top of the southern red oak has broken out) and got 99 feet. From Carmean's site index curves for black oak, and assuming a site index of 75, a forest grown tree would reach a height of 18 feet in about 9

years, so allowing for open growth, it might have taken 11 years. Adding 11 to 109 rings gives an age at death of 120, so if it died 5 years ago the tree probably originated about 1889.

38.0952601 N 78.49320057 W

18. White oak, 46.8", dominant, the Bartholomew oak, cross section #8, Phil cut a section from a lower branch that broke off over 10 years ago. The section is about 12 inches in diameter, but the sapwood and bark are gone. I counted 100 rings. On 4/21/14, after the leaves were partly out, I measure the height as best I could (at a distance of 90 feet), and came up with 90 feet.

To get a rough estimate of the age of the tree we must add 4 rough estimates to the 100 rings: (1) number of years in the missing sapwood (2) number of years to grow from the ground to where the branch originated (3) number of years to grow from the center of the trunk out to where the branch cross section was cut, and (4) number of years since the branch broke off. For number 1 I used 15 years, an average number of sapwood rings at stump height for oaks. Numbers 2 and 3 were estimated using a set of site index curves. For number 4 I used an estimate of 12 years.

The branch originated at 23 feet and we measured 14 feet from the cross section point to the center of the trunk. Using a site 70 index curve for white oak (Willard Carmean's curves), I came up with estimates of 13 years to grow to 23 feet and 12 years for the branch to grow 14 feet. Combining all these estimates: 100 rings + 15 years for lost sapwood + 13 years to grow to a height of 23 feet + 12 years for the branch to grow 14 feet + 12 years since the branch broke off = 152 years as a rough estimate of the age of the tree.

38.09529687 N 78.49265035 W

85. Virginia pine, 8.6", intermediate?, cored tree A, originated about 1965

38.09574391 N 78.49318492 W

86. Shortleaf pine, 18.0", codominant, residual tree, cored tree B, lost end of core so could not estimate age

38.09580795 N 78.49319863 W

87. Virginia pine, 10.4", co-dominant, cored tree F, originated about 1962

38.09636123 N 78.493304 W

90. Shortleaf pine, 13.0", strong intermediate

38.0969517 N 78.49453897 W

91. Post oak, 9.5", strong intermediate, with cankers caused by chestnut blight

38.09707979 N 78.49449441 W

92. Shortleaf pine, 12.8", codominant, cored tree AA, 45 rings + 2 + 4 = 51 years, originated about 1963

38.0974788 N 78.49416679 W

93. Loblolly pine, 5.0", intermediate, in beaver clearing (there was a large colony of migrating bees in an oak tree 20 to 30 feet uphill when we measured this tree)

38.09821808 N 78.49590504 W

94. Loblolly pine, 17.2", strong intermediate

38.09897248 N 78.49616608 W

144. Rock pile, low and spread out

38.09536057 N 78.49351631 W

38.09206667 N 78.49285268 W

210. Loblolly pine, 13.8", codominant

38.09688283 N 78.49428202 W

211. Scarlet oak, 32.5", dominant

38.09747118 N 78.49474989 W

212. Southern magnolia (*Magnolia grandiflora*) seedling, about 1"

38.09771971 N 78.49528806 W

213. Pitch pine, 14'2", codominant

38.09772399 N 78.4953089 W

214. Loblolly pine, 5.2", intermediate, in "beaver clearing"

38.09807749 N 78.49546382 W

215. Hornbeam, 10.8", leans out over lake

38.09954316 N 78.49532258 W

216. Sycamore, 16.2", dominant

38.09860094 N 78.4967852 W

217. Sycamore, 15.8", dominant

38.09848743 N 78.49675306 W

218. Scarlet oak, 30.4", dominant

38.09820449 N 78.49634678 W

219. Cedar bench over-looking lake, several pitch pine seedlings in front of bench

38.09709174 N 78.49503495 W

220. Pitch pine, 13.0", codominant

38.09649234 N 78.49441674 W

230. Shortleaf pine, 23.0", dominant

38.09763226 N 78.49408087 W

### **Mountain Laurel at Ivy Creek, Revisited**

The occurrence and distribution of mountain laurel at Ivy Creek is puzzling. It forms a dense understory on most of the slopes above Ivy Creek, but is scarce to non-existent on the rest of Ivy Creek. I have written about this earlier in the report, under the descriptions of Areas 1, 5, and 6 (see pages 24, 25, 94, 95, 105, 106, and 107). Here I will attempt to tie it all together and propose a hypothesis that might explain the distribution at Ivy Creek along the reservoir.

Below are listed some facts about mountain laurel:

1. It occurs on dry, acidic, low fertility soils; most often on south-facing slopes, but sometimes (as at Ivy Creek) on north-facing slopes.
2. It is well adapted to fire, and sprouts readily from large burls that form at the base of the plant. The burls can become very large from repeated burns over a long period of time (I read of one burl that weighed several hundred pounds). The sprouts grow slowly, compared to most hardwood tree sprouts, on the order of 5 or 6 inches per year. Laurel also regenerates from "layered" branches and from deep rhizomes.
3. The leaves are resistant to decay, resulting in many nutrients being tied up in a thick "mor" humus, resulting in reduced soil fertility.
4. The leaves are highly flammable, and the accumulation of these highly flammable leaves increases the chances that fires will be intense, which probably favors laurel over the long run.
5. The leaves are poisonous to cattle and other livestock, and I have never observed deer eating them. In the typical grazed woodland, most shrubs are palatable and are gradually eliminated, creating an open understory. Grazing probably would not eliminate a dense understory of

mountain laurel. Logging occurred in these mountain laurel thickets, but this would have caused them to grow even denser after recovery from logging.

6. It is dependent, like all ericaceous plants, on a specialized "suite" of ascomycete mycorrhizae that require acidic soils and form mor humus.

7. The seeds are wind dispersed, but only to a distance of about 50 feet. They remain viable for several years.

8. It seems to have difficulty invading laurel-free sites. I have never seen mountain laurel seedlings on abandoned fields. To my knowledge, almost all young mountain laurel plants I have seen were sprouts from existing plants, and new seedlings seem to be uncommon.

I speculate that the slopes above Ivy Creek have had a long history of frequent fires, often severe, before Europeans arrived. Once Europeans cleared the forests for cultivation and grazing, fuels would have been greatly reduced, with a corresponding reduction in forest fires. I have already suggested that the flood plain of Ivy Creek might have been farmed by Native Americans, which would have required frequent, deliberate burning, with fires spreading up the slopes. The presence of pitch pine on the Peninsula supports this idea. Scattered pitch pines also occurs just west of Ivy Creek, on the adjacent Shack Mountain property, again on the steep slope above the reservoir, where a dense understory of mountain laurel occurs under a forest dominated by old chestnut oak.

Consequently, I suggest that the places where mountain laurel occurs today at Ivy Creek, on the slopes above the reservoir, were never cleared. In Area 5, where soils seem to be quite fertile, clearing extended further down the slopes (between ravines) than on the peninsula or in Area 1, where mountain laurel extends further uphill. Stand 1 of Area 6 seems to support this suggestion. It was formerly a field that was abandoned at least 100 years ago (see description of this stand on pages 100 and 101). I walked over Stand 1 carefully, looking for mountain laurel. The only places it occurs today are around the edge along the Peninsula Trail. I used the trail as the boundary of Stand 1 for convenience, but the clearcut, and the original field, actually extended a short distance to the west of the trail in places, along the top of the ridge on the peninsula (perhaps up to 20 or 30 feet at most). Mountain laurel is abundant only on the peninsula - west of the trail and also beyond the north-west boundary. There is no laurel on the steep, east-facing slope of Stand 2, which is south of the saddle (the low point in the trail where the peninsula starts). An anomaly is a small colony of laurel, in the western edge of Stand 1, on the Peninsula trail, perhaps 40 feet south of the saddle (low point in the Peninsula Trail).

Why has there been so little migration of laurel into Stand 1, which was a field until it was abandoned at least 100 years ago? Mountain laurel has invaded only about 30 feet at the most. Has this invasion been vegetative (by layering or from rhizomes) or by seedlings?

The literature tells us that mountain laurel grows on acidic, infertile soils. In Areas 1 and 6, the steep areas above the reservoir do indeed seem to have such soils, based on the vegetation growing there. I didn't see any "calcium favored" plants in either Areas 1 or 6, but did see a number of plants characteristic of acid, infertile soils. In Stand 3 of Area 1, I saw heartleaf, low-bush blueberry, wild azalea (pinxter flower), and chinquapin. In Stand 4 of Area 6, which because of beavers is more open and sunnier and thus more favorable for herbaceous species, I saw these same species plus goat's rue, bracken fern, hairy angelica, sweet-scented goldenrod, and pitch pine. Scarlet oak is abundant in both areas, and this oak typically is most abundant on acidic, low fertility soils.

In Area 5, on the steep slopes above the reservoir where laurel occurs, the soils seem to be more fertile and have higher amounts of calcium, based on the presence of plants that usually grow in soils with at least moderate amounts of calcium: black cohosh (*Cimicifuga*), maidenhair fern, silvery spleenwort, horse balm (*Collinsonia*), bloodroot, puttyroot, hog peanut (*Amphicarpa*), sweet scented bedstraw (*Galium tinctorum*), enchanter's nightshade, and showy orchis. Many of these plants are in the ravines, but some occur on the ridges between the ravines, where the laurel grows. None of the plants listed for Areas 1 and 6, that are characteristic of acidic, infertile soils, occur here in Area 5. The presence of mountain laurel in Area 5 is indeed puzzling.

Finally, this hypothesis may or may not apply to the steep slopes along Martin's Branch and its tributaries, where laurel is scarce to non-existent. The few straggly mountain laurel shrubs that occur along Martin's Branch may indeed be remnants of mountain laurel understories that were eliminated by clearing for farming and grazing, but we just don't know. We have no way of knowing what the distribution of mountain laurel was at Ivy Creek before European farmers arrived.