

The College Forest Preserve

Silas Cheever Mason

Introductory Remarks

Introductory Remarks

Trustees and Prudential committee of Berea College.

Gentleman:

In submitting this report on the organization of the Berea College Forest Preserve, its divisions into ranges and blocks, its systems of roadways and the general management recommended for the future administration of the work, it seems proper at this place to include a brief sketch of the history of this undertaking.

Perhaps there is not in the United States a more unique and characteristic piece of Forestry work being carried on. The adaptation of this work to the general needs of the Appalachian region as an object lesson and basis for instruction has been commended to come of the best students and experts in Forestry matters in the United States.

I received warm letters of commendation from Dr. B.E. Fernow, formerly chief of the Bureau of Forestry of the Department of Agriculture and later Dean of the College of Forestry of Cornell University, from Prof. Filibert Roth, Dean of the School of Forestry of the University of Michigan, Dr. Chas. A. Schenck, Supt. of the School of Forestry upon the Vanderbilt Estate at Biltmore, N.C., from Prof. Henry S. Graves, Dean of the School of Forestry of Yale University, and from many others.

At the time I entered upon my work in Berea College, September 1897, the only outlying possessions in the shape of Forest lands owned by the College were a small tract, later sold to Jasper Gabbard which had been purchased as a stone quarry, and an acre on the Scaffold Cane Hill purchased of Steven Witt, for a sand quarry.

I think my first idea of the desirability of acquiring a large boundary of forest lands for the College was received when I attended the annual mountain day excursion which took place that year at the Indian Fort, the property later purchased by the College from Wm. Robe. The magnificent panorama seen from that mountain top brought to my mind the desire of building up and having as College property a large boundary of these timber lands both as a means of insuring future supplies of timber and fuel for the institution and for purposes of instruction. I had previously taught during the closing years of my work with the Kansas Agriculture College a class of young men in a post graduate course in Forestry (perhaps the most advanced piece of forestry teaching done in any American School up to that time). I had made a survey of the forest resources of the State of Kansas, submitted as a thesis in my work for the Master's Degree of the Kansas Agricultural College and published in the Eight Biannual Report of Kansas State Board of Agriculture. I also had charge co-operative forest work conducted between the Bureau of Forestry or the Department of

Introductory Remarks

Agriculture and the Agricultural College and had been a member for a number of years, of that most useful pioneer organization in forestry development in the United States. The American Forestry Association. I had also been in correspondence with Prof. Chas. S. Sargent of the Arnold Arboretum of Cambridge, Mass. recording the range and distribution of some of our most important American Forest Trees. My work along forest lines and general interest in the subject had brought from Dr. Fernow when chief of the Bureau of Forestry, an offer of the position of Assistant Chief under him in the year 1895, which was only declined on the earnest solicitation of the President and Trustees of the Kansas Agricultural College of which Faculty I was then a member, followed by a promotion to full professorship of Horticulture and Forestry in that Institution.

I have recited these facts in order to give you an idea of how I was prepared so promptly to recommend the introduction of the study of Forestry in the Berea school and college courses and the acquiring of the land that have since become so large and important a forest boundary.

The first purchase of land now included in the Forest Preserve was, however made by me personally, buying from Edward McHone an irregular boundary including a part of the top of the East Pinnacle mountain and of the ridge of land reaching from that point to the pike road? at the top of the Narrow Gap Hill, in order to afford an outlet. A tract of land including the most important portion of the Indian Fort and the head of what is known on our map as Moonshine Hollow, was purchased a few months later from Wm. Robe, who bought it to ride the premises of a notorious distiller of Moonshine whiskey. The first purchases made by the college were tracts immediately adjoining my holdings and, on either side, forming the slope toward the Berea and Big Hill Pike road. A little later a large boundary was purchased of Dan Skinner lying on the northward of Mr. Robe's holdings. Still a later portion of the estate of Sam Davis, from two of his heirs. Four small purchases which I had made I subsequently sold to the College and on Mr. Robe's removal to another mountain a mile North his small holdings were acquired and a solid and continuous boundary secured of several hundred acres. The most of these purchases were made in the years 1898-9 and the early part of 1900. During this time, I had offered me several boundaries of land on the other side of the Pike Road including the lands belonging to the heirs of Richard Baxter an aged colored man and former slave who acquired soon after the War a large boundary lying from the top of the Big Hill Westward on both sides of the County line. Lands that were the joint property of Edward McHone and E.T. Fish lying in the Cow Bell Hollow had also been offered me and these propositions had been laid before President Frost as well as that for the sale of the Rich Lands

Introductory Remarks

owned by Cash Flit and the 80-acre holding of Anthony Burnell. The time did not seem to be ripe for so large a purchase. In the summer of 1899 I spent a portion of the vacation in collecting forestry specimens and making studies of the timber growth in the region South and East of Bear Knob, boarding in the meantime with John Kindred, then the owner of the fine spring which now supplies Reservoir No. 5. During the first Autumn of my stay in Berea I had made Mr. Kindred's acquaintance, riding up the Bear Knob road one Sunday afternoon and passing down through his place by his fine spring and on to the Narrow Gap Pike through the Pigg Hollow, now known as Ballard Branch. It was then that I gained the idea that this spring and other springs lay at a considerable elevation above Berea College and might be piped in there by a gravity system of water works. During this summer stay at Mr. Kindred's I became acquainted with that entire section of the country, learned the location of the important springs on the head of Ballard Branch, on the land of Mr. Kindred, on the land of the Hoskins being? and on the land of Samuel Pigg. I also learned of a system of springs in the head of the Cow Bell Hollow on the Eastern portion of the Hoskins estate.

From the fact that Mr. Kindred's first wife had been a Hoskins, so giving him family connections, I learned that this entire Hoskins property could probably be bought at a very low figure as there was considerable strife among the heirs and the division of the property into plots such as is usually made, could not be agreed upon. The possibility of acquiring this large boundary and so controlling this magnificent flow of water was laid before President Frost and some members of the Board of Trustees. Exceeding caution had to be used lest a speculative idea should be excited among the people holding these lands and the opportunity to purchase at a reasonable figure be lost. Sometime later in order to ascertain more fully the feasibility of this scheme, President Frost directed Mr. Ernest Todd, then Instructor in Chemistry and Physics to make an exploration of these springs and determine their volume and altitude above Berea. In consultation and co-operation with me, Mr. Todd made these surveys making use of the contour maps of the United States Geological Survey and verifying his work with the aneroid barometer. His report was very full and satisfactory and a most admirable piece of work. With the ostensible purpose of collecting botanical specimens, and provided with my large copper collecting can graduated for measuring water flow, Mr. Todd visited all the important springs in the southern portion of Madison County adjacent and a few in the end of Rock Castle County. I never could learn that his purpose was suspected by anyone, save Mr. Kindred with whom I boarded and who kept the matter entirely secret. This admirable map and report bears the date in Mr. Todd's hand of July 1901, two years after my having spent the summer with Mr. Kindred and acquiring the general idea of the feasibility of this system of supply.

Introductory Remarks

I had already ascertained the approximate level of these springs by the use of a small hand level in stratigraphic surveys made with my geology class and determined the common horizon of the outflow of all these springs, the top of the Waverley Shales to be over 200 feet above the College Campus in Berea, and had so reported.

When the Trustees finally took action authorizing the purchase of the land necessary for controlling these springs and their outlet to the public highway it was considered wise to have Prof. Henry M. Penniman make these purchases in his own name, he giving the impression that he was acquiring a stock range in the Cow Bell Valley.

Of the lands which he purchased and afterwards conveyed to the College in a blanket deed, only three small tracts were lands which had not already been offered to me and proposed by me to the College for purchase. These three were the Bill McHone lands lying between the Sallie Harrison's place and the saw mill seat, a small strip of land bought from the Bogie heirs lying along the mountain side above Sallie Harrison's holdings and small boundary, I think 15 acres, purchased from Sam Pigg and lying in Cow Bell waters. The Hoskins heirs' tract I had already become familiar with and had begun negotiations with them for its purchase. Mr. Caner Flannery, husband of one of the heirs, took the lead in representing them in the negotiations and came to my house offering to sell me the land while Mr. Penniman was making his purchases in Cow Bell, I referred him to Mr. Penniman telling him that he was acquiring a boundary of land in Cow Bell lying adjacent to these lands and probably he could sell to him. Great credit is due Mr. Penniman for his energy in securing the survey of these different boundaries, tracing out the titles, buying the interests of the Baxter heirs and making the final deal with the Hoskins heirs. The deal with Mr. Sam Pigg which secured his very important holdings of 200 acres in the valley known in the old deeds as Quizenbury Branch, which furnishes the water for Reservoir No. 4 and controlling the entire flow of that valley, was made wholly through me. Of the ten reservoirs now furnishing the College supply, Nos. 1, 2, and 3, and 6, 7, 8, 9, and 10 are located on this Hoskins heirs tract, the purchase of which I had negotiated through Mr. Flannery. Reservoir No. 4 is on the Sam Pigg Purchase and No. 5 on the John Kindred land. A valuable group of springs coming into the main Cow Bell by the branch which discharges near the saw mill site from the East are on the Miller tract which was formerly a part of the Baxter heirs land. A "tee" had been left in the main pipe line near the saw mill seat with a view to taking in this water at some future time.

I have thus at length described the acquiring of the lands controlling this water supply, because I consider no greater thing has been achieved for the welfare of Berea College and the

Introductory Remarks

College community since my coming here and I believe that the fact here stated justifies me in claiming that the credit for the inception of this entire enterprise and the working out of many of the details belongs to me. I record this not in a manner boasting but that the facts in the case may be here placed upon record. Of the lands subsequently purchased, in the case of the Clift heirs and the Bear Knob tract while these purchases had been recommended by me sometime previously, the immediate negotiations were completed by President Frost in person. I think no tract of land of all the boundary held by the College at the present time had been bought without my personal examination and approval, with the exception of the three small tracts already referred to, secured by Mr. Penniman in Cow Bell Valley. In the purchase of the John Robinson timber tract with College funds and not as a portion of the Forest Preserve boundary, it is a matter of great satisfaction to me that I was able to secure for them this valuable bargain. The white oak timber standing upon this boundary today would probably sell for \$3,000 more than they paid for the entire tract. I hope this land after the ripe timber is removed may be transferred by the Prudential Committee to the Forest Preserve

Contents

Introductory Remarks	i
Geology & Topography	2
Organization & Tenantry.....	6
Subdivision of the Forest Preserve into Ranges and Blocks	16
Indian Fort Range.....	18
Cowbell Range.....	24
Bear Knob Range.....	32
Management Recommended for Different Portions of the Forest Preserve Land: Indicated by Ranges and Blocks	39
Indian Fort Range.....	40
Improvement Cuttings	56
Brush Burning & Forest Cleaning.....	62
Special Management of Certain Species of Timber in the Forest Lands.....	66
Jersey Pine, <i>Pinus virginiana</i>	67
Yellow Pine	69
Tulip Poplar, <i>Liriodendron tulipifera</i>	71
White Oak	73
The Chestnut	75
Black Walnut, <i>Juglans nigra</i>	77
Sugar Maple.....	81

White Ash.....	83
The Beech	84
The Small Hickory, <i>Hickoria odorata</i>	85
Yellow Locust.....	87
Road Systems of the Forest Preserve.....	88
Indian Fort Range.....	93
Bear Knob Range.....	101
Further Purchase of Forest Lands Recommended.....	105
Concluding Remarks	110

Geology & Topography

Geology & Topography

The lands included in the College Forest Preserve lie first and lowest in the Devonian formation represented by the black carbonaceous shales, classed in the Richmond Quadrangle of the United States Geological Survey as Chattanooga, comprising the lowest lands in the stream valleys, represented by only a few acres in the Silver Creek water shed, a few acres in Cow Bell and other branches leading into Red Lick, and including the tract purchased from John Robinson, a considerable area of this black shale land on the east side of the mountain.

Lying immediately above this we have the formation of gray or olive-green sandy shales, and clays belonging to the Waverly group of Subcarboniferous. These make up the greater portion of the hillside lands and have their best representation in the Narrow Gap and the hillsides adjacent to it. In the upper portion of these shales nearly to the top they become harder into stony layers two or three feet thick constituting a very good building stone known as freestone.

This stone has its outcrop in a characteristic and representative manner, just at the spring on the Bear Knob and running under the log house around the side of the cove to the north; at another point just above the old John Williams cabin in Moonshine Hollow, and again in the neighborhood of the old John Pigg cabin at the spring in the lands recently purchased from Mrs. Robe. This constitutes a very good quality of building stone, but in most places the quarries run into the hillside so deeply that they can only be worked around the margin of the hills. A few feet above these stone outcrops comes a layer of yellow or brown impure clay limestone, followed by white or gray oolitic limestone, in its upper measures more or less flinty and cherty. The upper portion of this limestone is often exposed in bold almost vertical cliffs, sometimes fifty feet or more in height. In other places it affords a regular slope more or less broken with detached fragments protruding from the clay soil.

With the exception of the formation on the top of the Bear Knob and Big Hill, this limestone is overlaid with a series of sandstones, sometimes hard and rising in bold, vertical cliffs with great masses of detached rock separated from the cliffs by narrow crevices, sometimes broad footpaths or even sloping passageways wide enough to drive a team and wagon through. In other places these sand rocks are of a more friable nature so that the hill tops round off gradually instead of rising so abruptly beyond the limestone.

The tops of our hills are usually in the form of rather narrow, plateau lands, sometimes broadening out into considerable fields of mellow, sandy soil. In the Bear Knob and on the Big Hill, where the original formation has not been disturbed, the oolitic limestone is succeeded by a crinoidal limestone, then by sandstone and a clay shale which forms thin and rather poor seams of coal. The clays and sandstones lying still above this form rounded tops of rather poor soil at these two points.

Geology & Topography

The sandstones and sandy soils of the upper portion of the plateau, where kept covered by timber, and the soil clothed with leaves and humus, form a fine catchment area for the rainfall, large quantities of water being held in the porous sand rock, having the effect of a great reservoir, the water of which slowly percolates through the joints of the limestone down to the clays of the Waverly formation. This, being nearly impervious to water, brings these underground rivulets to the surface in a series of springs.

The springs occupy nearly the same physiographic and geographic level throughout our entire area, but are best represented in the heads of Ballard Branch and Cow Bell Hollow, where they constitute the supply for our water-works system. Other good springs are found both on the north and south sides of Bear Knob, on the north slope of the Rich lands, in the slopes of the land purchased from Hannah Bratcher, and in the head of the little cove beyond the old John Pigg house of the Robe purchase.

Other corresponding springs of important and value occur in the coves belonging to the Isaac Davis property just below the Indian Fort land and on the lands now owned by Mr. Hawkins lying to the southwest of our present holdings, both of these tracts being desirable properties for us to acquire in the future "Holiday Purchase."

The sandstone of the upper portion of the formation are for the most part too friable to be of value as building stone but in a large number of places afford such a sharp grained sand when pounded up as to be very important in the manufacture of mortar and cements. Some of the coarser sandstones run into pebble conglomerates of such a friable nature that they are easily broken up with a sledge into very valuable gravel for roofing materials or concrete walls and floors.

While the limestones have not been utilized for this purpose since the College owned the land it is well known that in former times they were burned into a very fine quality of lime, and it is entirely possible that a lot of our inferior timber, tree tops and so forth, may be used for fuel to burn these limestones into an agricultural lime which could be delivered to the farm lands at a cheaper rate than is now asked for lime shipped in here.

It will be seen from this account that the forest lands are of a very great economic importance to the institution aside from their value as producers of timber. Sand and building stone could undoubtedly be quarried upon forest preserve lands in quantities sufficient for the needs of the institution for an indefinite period.

Considering now these forest lands from the standpoint of timber production: They are of a very broken nature. The variety afforded from the diverse geographic formation represented and the

variety of gradience and aspect, comprising all slopes from level to the perpendicular and all the exposures to which the compass can point, help to make these land the natural home of a very great variety of tree species. About seventy-five species of trees are represented upon our College lands. The coniferous trees are represented by two pines, the hemlock and the cedar, the rest of the species being broad leafed, hard wooded sorts. Among these are comprised some of the most valuable hard woods found in the central and southwest states, there being five species of hickory, twelve of oak, two of walnut, three of maple, and three of ash, besides a very large number of young growth of the invaluable tulip tree or poplar and of the yellow locust. Young growth of chestnut is found upon the sandy uplands of a size and quality to furnish telephone poles beyond any possible demands of the local Berea market.

This great variety of timber naturally distributes itself more or less definitely along certain zones of soil occasioned by the geological formations.

The soil areas for forestry purposes may be divided – first, into the rather narrow creek bottom lands where the soil is for the most part rather cold tight clay; second, the hill side lands produced by the Waverly shales which are usually clays more or less mingled with broken shale and stone, though sometimes containing considerable quantities of sand and gravel from the erosion of the upper measures; third, the upper hill side lands consisting of a zone which has its beginning at a natural bench which runs around much of the land near the level of the outcropping stone quarries of the Waverly formation, but which with the soil lying above it is influenced in its character by the limestone higher up and runs into a nearly pure limestone soil in a few places; and fourth, the highest hill slopes and the plateau lands lying above the limestone and being soils of a light sandy loam in character, quickly impoverished by cultivation and the wasting of the accumulated humus, when they become poor gullied sands and gravels.

The clay lands of the valley have largely been cleared up except along the immediate stream banks, but in a few places where the timber remains it is quite sure to consist of the black or scrub pine, scarlet and silver maples, black gum and sweet gum, sycamore and a few elms and cucumber trees and a considerable variety of oaks and hickories, some very good white oaks being found in these soils.

The better lands of the Waverly slopes have in the past produced a great deal of white oak timber as well as good growth of the black or biennial fruited species of oaks, some very good hickory and locust and in the rich coves of northern exposure fine walnut and poplar. The most of

the beeches which are found in our College lands occur in this formation. A considerable number of chestnut oaks are found on the upper more sandy portions of these lands.

As soon as the soils influenced by the outcropping limestone are reached there is a noticeable increase in the number of hickories, walnuts and poplars, as well as sugar maple and ash and a species of oak, the chinquapin, "*Quercus acuminata*", which furnished often more valuable white oak timber than the true white oak, being more fine grained, compact and tough. While on the dry southern limestone slopes trees of this species are of too short bodied, branching and inferior quality, in the rich lands of some of the sheltered coves a few of these trees have been found of magnificent size, and have furnished the finest quality of oak we have ever harvested.

Some very fine white oaks have also been produced upon this quality of soil.

It is an interesting feature of our forest growth that the chestnut almost never occurs upon the limestone soils. As soon as the limestone is passed, the upper sandy slopes and level lands of the top are characterized by a growth in which the chestnut and chestnut oak largely predominate, though there was formerly a considerable amount of a very valuable yellow pine upon these lands also.

The chestnut oak has nearly all been cut away, the greater portion of it owing to the tan bark which it produced. It has seeded abundantly and considerable areas of these uplands are coming up to a young chestnut oak growth, for the most part only in the thicket and shrub stage as yet, but in many places fairly up into the pole stage of growth and all promising to be very valuable timber in the future both for tan bark and for fuel. In other sections of these highlands the chestnut oak has predominated and where the old growth was cut away years ago sprouts and seedlings have come in which are now from thirty to fifty years of age and have very fine size and quality for telephone poles and fence posts. Considerable numbers of the primeval trees of the chestnut remain, for the most part too rugged, wind-shaken and wormy to have any value for saw timber, but which already have been marketed for export to points where the factories of tanning extract are located. As the freight rates were soon adjusted so as to cut off this trade no profitable manner of utilizing these old trees has presented itself.

Organization & Tenantry

Organization & Tenantry

At present we have on the Forest Preserve as tenants on small farms twelve families and three fairly comfortable properties not occupied. Each of these families receives rent of a house, garden and orchard, and pasturage for a few head of stock free, renting from us either for a money rent or for a share of the crop a number of acres of tillable land. These lands vary considerably in quality and the number of acres tended by each tenant varies from seven or eight to twenty-five. The renting for a share of the crop has on the whole proved unsatisfactory and we have been working toward a system of rental on a money basis, not exacting the rent in money necessarily, but frequently allowing the tenant to do work upon roads, reservoirs, or general improvements, with the understanding that portion of his wages when drawn shall be deposited for rent.

Some of these fields are considerable worn with cultivation and ought to be set in grass or clover or cropped in cow peas or the restoring of the humus in the soil.

On the whole the farmlands and tenant houses should not in themselves be regarded as sources of revenue but as a means of keeping upon the property a number of reliable men who will act as custodians of College property and forest guards and especially constitute a firefighting brigade. It is also desirable to have a tenantry who can be called upon for labor of various kinds that may be needed in the forest or in quarrying stone or sand for building purposes.

A number of the families in these lands have been with us since the first purchase of the property they now hold and have proved themselves very trustworthy and reliable tenants. Others have occupied their lands for less time and have not had so good an opportunity of proving their character. For the places most recently purchased arrangements have not been made for next year's occupation, as I have not wished to bind the College authorities or whoever should be in charge of this work. A number of applications have been received, and in all cases I have advised them to file with Mr. Osborne, as Secretary of the Prudential Committee, a written application for the property desired together with such recommendations they could secure as to character and efficiency.

Beginning with those men who have been with us longest – John Harvey Kindred occupies the house at the forks of Ballard Branch near the entrance gate to the water shed enclosure in that valley. He has rented from us about twelve acres of land in the valley above him, some of it on the lands purchased from his father, John Kindred, and the balance the portion of the Sam Pigg lands lying south of the left-hand fork of Ballard Branch. Mr. Kindred owns one good horse and has tended his crops well and been prompt in the payment of his rent. As caretaker of the reservoirs, he has shown ability and good judgement and he is on the whole the most expert woodsman we have

on the Forest Preserve. He has also shown surprisingly good ability in the blasting out of rock and repair of the roads which have been placed in his charge during the past summer.

With one riding over the outside boundary road from near the John Kindred house to the Burnt Bridge, giving his instructions as to the work to be done shortly before I left for the summer vacation, he carried out the work of blasting out the rock along the worst places, especially at the point known as the Burnt Bridge, in a most efficient and capable manner, having the assistance for a considerable part of the time of Robert Viers and Coleman Kindred. Another inspection of the road after my return and with a few brief suggestions as to a little further work than he had felt authorized to do, put this stretch of road in excellent condition for ordinary common traffic, in fact making of it a safe and comfortable carriage road for the entire distance.

Mr. Kindred's health has been rather poor during the summer and he fancies the low position of his house in the deep narrow cut valley has something to do with this. He has made application for one the places on the uplands, his choice being the place lately purchased of his uncle, William Kindred. It seems unfortunate that he should feel this necessity after the response we have made on the house he now has with the special view of making him comfortable there as the most capable and important tenant we have. If his health really demands a higher location I think we ought to favor him as I consider he can be given more responsibility than any other man in our employ. I have relieved him of a part of the reservoir work, having him train Mr. Tom Pigg in his place and under his direction, still holding Mr. Kindred for the final inspection and receiving of it, and for the planning as to when such cleaning and emptying of the reservoirs is a necessity.

I think possibly Mr. Kindred might be made general road inspector for the entire forest, responsible directly to the superintendent in charge.

The next tenant to be considered is Mr. George Pigg. He lives in the house formerly occupied by his father, Mr. Swam Pigg, from whom we have purchased two hundred acres of land in Ballard Branch, on account of the water they afforded and the fact that they controlled the outlet in the springs above. Mr. Pigg has rented from us a great part of the tillable lands on the Sam Pigg purchase and about ten acres of the upper Rich land field, paying a total annual rent of \$50.00.

He has a fairly good team of horses and a wagon, tends his crops well and has been a very capable teamster in hauling sand, stone, lumber and logs. He is a quiet well-behaved citizen, not as enthusiastic in keeping his children in school as I could wish, but on the whole an exemplary tenant and a man I should wish to retain.

Organization & Tenantry

Mr. Tom Pigg, the brother of George, formerly occupied the small house on the same farm a little further down the valley, but for the past two years has been in the saw mill house, cultivating the lands known as the Clift new ground, and this year a small field above the saw mill in the old McHone clearing. He owns a horse and mule, works his land well with the aid of two boys who are old enough to give him considerable assistance and has performed a good deal of labor for the Forest Department. He has also shown very good judgement in road repairing and I would recommend his being made regular road keeper for Cow Bell and the Rich lands.

As caretaker of the lumber and other property in Cow Bell I have found him absolutely faithful to the College interests. He has been wanting to undertake the work of reservoir cleaning and to relieve Mr. Kindred he should be encouraged in this as often as it is necessary.

Like his brother he is a tenant whom we should wish to retain and should give him considerable encouragement. Whenever the saw mill shall be in use again and lumbering operations in progress he is a valuable man either at logging, about the mill or in stacking lumber. His quiet gentlemanly bearing is especially pleasant and noteworthy in one who has had so little opportunity for education or culture.

His wife is a daughter of Mr. Davidson, of Blue Lick, a very excellent woman, so that on the whole they are one of the most desirable families among our tenantry.

Mr. Robert Viers has occupied for four years the property purchased of old Mrs. Hoskins, it being a part of the Hoskins Heirs purchase of over four hundred acres. His wife is a daughter of John Kindred, from whom we purchased the Number 5 reservoir tract and springs, and is a most capable and excellent woman. They have a family of five very bright and interesting children who ought to have better opportunities for schooling than they are having at that distance from any school house.

Mr. Viers is a man of excellent character and disposition but not of the best judgement and capacity for management, and has on the whole been unfortunate, being sick considerably himself and having lost his horse by accident a year ago. While faithful to College interests, financially he has been rather unprofitable as a tenant, only small returns being received from the land he rented from us. The quality of his work has improved considerable in the last year or two and he makes a fairly good hand when employed under a competent foreman who directs the work and keeps him up to his best exertions. In morals and manners we could scarcely have a better family upon College property, and on account of our strong friendship for Mr. Kindred, the wife's father, I feel like

retaining them and giving them an opportunity somewhere near a school house and church privileges.

I have offered them tentatively the property purchased from Samuel Burnell, or that is within a half mile of the Hart school house, where the school is usually well taught. I am afraid that the feeling of being at home in the present location which was owned by the aunt of Mrs. Viers is going to weight more strongly with them than the opportunity for educating the children.

If the Prudential Committee approves of the change I shall urge them strongly to go down there as three of the children are now of school age and ought by all means to be receiving every opportunity. If the place they now occupy were vacated it would be an excellent one for Mr. Kindred to move into as he would then be even more centrally located than he is now with reference to all of the reservoirs.

Coleman Kindred is now living for the second year in the property vacated by John Kindred. He is a quiet respectable man and has an excellent wife and family, owns a good horse but does not show any great activity or enterprise. He has rented only a small crop and on the whole his occupation of the place has not been a very profitable one to us except for the fact that he is a man of good character and gives us an excellent family as tenants, a point which is not easily achieved. I should recommend his being retained upon the place by paying a rental of \$20.00, the most of which he might be allowed to put it in labor. He makes a good hand in the woods and on the roads when his labor is properly directed.

On the property purchased of Mr. Matt Pigg Mr. J.H. Wilson has completed his second season, he paying \$50.00 for rent of that place and half of the upper field of the Rich lands. He farms well, has a good team and is anxious to secure all of the employment he can, logging, hauling of lumber, sand and stone, and has an excellent family including several very bright children who are nearly grown, whom he is keeping in school to the best of his ability. He is not quite as enthusiastic in College interests in the matter of outside responsibilities in the case of roads and fires as I should desire, but is on the whole an excellent tenant and families possessed by the character of his are desirable to retain.

Marion McQueen has completed his second season in the house formerly occupied by the Clifts on the Rich lands. Last year he had no horse but this year has obtained one. We received last year about \$7.00 as our share of the crop he raised. This year I gave him a little more land and place the rental at \$15.00, which is all he could possibly pay on the strength of his crop, but when it is remembered that he received the rent of a house and garden and his fuel, this is rather a small rental

on the whole. I cannot count him a very capable farmer but he is a very fair woodsman , especially good as a board maker, and only fairly good as a general laborer. He is a peaceable men of no bad or troublesome habits that I know of, and while I would not recommend his discharge I do not consider his as among the most valuable of our tenants. Unless a better man applies for the place I think he should be retained rather than have the property left vacant. Vacant houses always invite trespassing and plundering.

In the property purchased of William Robe, which should be known as the Indian Fort Place, we have Mr. Frank Bratcher as a tenant. Last year he gave us a share of the crop. This year he is to pay us a rental of \$25.00 for the use of the land on the top of the plateau to the eastward, known as the Skinner field, which name I hope may be dropped by calling it the Indian Fort field.

When the Co-operative Nursery was established on the tract with the United States Bureau of Forestry, I hoped that Mr. Bratcher and his son might prove competent hands in doing this nursery work. The son refused to remain at home and work and the father proved so unreliable and incompetent in the nursery work that I should not care to employ him longer.

The land he has rented from us he has tended in a good and careful manner. He and his family are of good character and desirable people as tenants. This co-operative work is to be developed, and there ought to be on this place a family from whom, one or two workers could be drawn who would show the skill and judgement necessary for the care and management of this nursery property. Unless such can be found Mr. Bratcher is perhaps as good a tenant as we could have on the place, as he does no harm to anyone, and it is difficult to get a desirable family to go up on this remote point. Some to whom I have offered the property previous to his going declined because they were afraid their small children might fall over the cliffs and others because of the remote position.

In the old Si Baker property Mr. Bryant became a tenant last spring. He came highly recommended by Miss Fox and others over on the east side of the mountain. As the property was considerably run down I allowed him to pay his entire rent in fixing up the place this year. Also, in the cultivation for us of about five acres of cow peas which were planted to test their capacity of improvement of the soil, a very much worn old gravelly field.

Mr. Bryant is the one tenant on that side of the mountain and has the oversight of the Baker and John Robinson forest tracts. The farm lands of this property are so poor and thin that I do not think very much in the way of rental could ever be expected form it, certainly not more than \$15.00 a year. It is important, however, to have a thoroughly trustworthy and capable man on that side of

the mountain, and I think Mr. Bryant is a good a man as we could hope to secure there. In a fire outbreak which threatened our property last year and again in the recent disastrous fire on the John Robinson land, Mr. Bryant has shown great energy and devotion to our interests.

On the B. Harris property, on the pike road, we have as a tenant this year Mr. A.G. Johnson, son of W.A. Johnson, deputy sheriff and former magistrate, and he is a young married man. His wife is a daughter of Mr. Caleb Johnson, who lives just opposite. They are excellent and respectable young people. Young Johnson is an excellent pipe line repairer, having done a good deal of work along the line of the water system, and was afterward employed by Mr. Worthen.

He was to pay \$2.00 a month rent for his house, garden and stable, half of which he was to be allowed to pay in labor in repairing the house and stable and the other half to be paid in general labor on fences, pipe line and so forth, as we might need him.

He rented the field in Moonshine Hollow formerly occupied John Williams, part of which he put in tomatoes and part in corn, for which he was to pay \$25.00 rent. I think he is an excellent man to keep on the place, and recommend that the lease be renewed on favorable terms. I do not think that the land would be worth \$25.00 for the next year as it had been raising crops for three years when he took it and is a rather old field. I let him have the land for \$15.00 for the coming year if he would agree to furnish as much as a ton of fertilizer.

Mr. Eversole is occupying the house on the Sam Pigg land just above the Matt Pigg pasture. There is no tillable land to this excepting a garden patch and he may be considered as a transient tenant. He pays \$1.50 a month for the use of the house, is a quiet well-behaved man, a good citizen in every way as far as I know. He has made application for some of the vacant properties and would not be an undesirable man to have.

Isaac Harrison secured the small house formerly occupied by Campbell Pigg, this being rented to him by Mr. Osborne during my absence in the West and subject to my approval on return. There are no lands with this house except a small garden and it is in need of a new roof and some repairs on the chimney. So far, neither Harrison nor his family have made any trouble and I should approve letting him stay as long as his conduct is good and the rent promptly paid. I think he is one who would have to be looked after closely to make sure that his firewood includes nothing but worthless down timber.

Elmer Stuart is at present keeping house near the Bear Knob Spring, which place he took for our accommodation in order to have a guard for the property and the fruit during the summer time. His wife is a daughter of William Kindred, whose place we bought on the top of the hill, and is an

excellent young matron. They are anxious to secure the William Kindred place next year and if Stuart can give satisfactory guarantee of rent and his ability to secure a horse and form the land properly I should be willing to let him have it.

His reputation is not of the best in the neighborhood where he lived in Jackson County. This is a fact which I had not learned at the time we located him on the Bear Knob land. I am rather committed to letting them have the William Kindred place next year if they can comply with the conditions. I have estimated \$20.00 as a fair rental of that place. The house is a very comfortable one but there is a small area of really productive land.

Decidedly the most undesirable tenant on the College lands is a tenant to charity, Mrs. Robe, who is located in the little house just west of Miss Fox. The rail fences around her place are rapidly disappearing and whether this is entirely chargeable to her or in part to two other families nearby is a hard matter to determine. She pays no rent and the whole matter is one of benevolence and to be dealt with from that standpoint. It is decidedly doubtful whether she is a paying proposition on that basis.

The property lately purchased of Mrs. Robe has a large but only fairly comfortable log house, the old Johnny Pigg house, near the spring, and a very good four room frame house on the top of the hill, built by William Robe two years before his death. Of the two tenants now occupying these properties both rent from Mrs. Robe. Daniel Paine is in the lower log house and while a pretty good worker in some ways I do not consider him a sufficiently reliable character that I could recommend his retention.

Old Mr. Dammel and his wife are occupying the house on the top of the hill, renting a few acres of land. He is an amiable and harmless old man, but whether of sufficient force and ability to make him worthwhile to keep on the land I have not as yet made up my mind. I judge that he is honest and trustworthy.

There is a small vacant house in the low lands purchased of Dan Skinner just back of the Isaac Davis property which has around it two or three acres of cleared land and formerly had a pretty good garden fenced in. So far we have had two or three transient tenants there who were rather a disadvantage to the place than otherwise as it was doubtful whether a man of sufficient force and character to be desirable to have on the land could be induced to occupy the place.

What is known as the Jimmy Roe place on the extreme south line of the reserve has two fair sized log houses, one close to the county line, and the other down in the deep hollow near the spring. Both of these are badly out of repair, but there is on this place considerable fruit and on the

south side of the deep cove about fifteen acres are very fertile land. These places are so remote and inaccessible that I have found it difficult to keep them occupied by respectable families. In the past years the houses have been empty and the lands lying idle. If a reliable man could be induced to live there it would be worthwhile to put one of the houses in repair and keep him there, letting him have the land at a very low rental in order to have a forest guard and fire warden on this side of the property.

There is a small house on the land lately purchased of Andrew McGuire which has been occupied by a decidedly undesirable family. If a better man could be secured there it would be a considerable advantage to the property.

The Spicey Baxter homestead lands contain one or two small houses. We have bought out all the heirs to this property, but the old lady still retains her life interest and it is managed for her in a very reckless manner by her son-in-law, Steve Farris. The tenants on the property have all been of the worst class. If her life interest could be purchased it would be a very important thing to do, but if this is not possible I think the College should rent the land and place its own tenant on the property. So many of the neighbors are of such an undesirable character that the land is liable to be very heavily drawn upon if it is not properly guarded.

On the north side of Bear Knob the little tract purchased from Mr. William Brewer is still occupied by him and he is anxious to remain there another year. There are two small cabins near, of which I think one is occupied by his married son, or son-in-law. I judge Mr. Brewer to be a harmless individual and a hard worker. I do not object to keeping him there and he might be given considerable work in cleaning up Bear Knob lands.

The Bear Knob land contains a number of fields or small plots lying on the north slope of the mountain between the entrance gate and the top which have the right nature for excellent fruit lands. The cove below the mountain road and just inside the gate contains a number of old but very good apple trees growing in a soil which rests on the upper Waverly shales. A long bench field extends from the fence around below the house and clear to the head of the cove. This would make another excellent piece for planting in apples. Above the spring the limestone sets in and a portion of the land both above and below the road leading to the top would be excellent land to plant in grapes with possibly some apples and pears on a portion of it. Above the limestone is quite a belt reaching up to the level of the coal mine of more sandy ground. Beyond the coal mine is a field of similar nature. All of this zone was in peach trees in Mr. Fairchild's time and a few of the old trees still remain.

Organization & Tenantry

I think that these should be grubbed out and the whole land replanted with peach trees of the standard market varieties. It seems to me that there is enough in this land to justify a serious outlay for cleaning up and making of a fruit plantation. None of the horticultural lands close to the College are as well adapted to fruit growing and while this has the disadvantage of being so remote the soil is excellent. It is exempt from untimely frosts, both early and late, and if it were placed in charge of a competent man I believe could be made fairly profitable, at the same time furnishing large amounts of fruit for the boarding hall, affording work for a colony of student workers and pickers during vacation time, and perhaps ultimately developing into a canning and preserving industry.

Very similar lands are found on the John Kindred purchase farther around the mountain on the southeast spur of the Bear Knob. As a level and easy bench road extends clear around to there, crossing the little tract of land now held by Mrs. Nancy Loman these lands might be well managed in connection with the Bear Knob proposition.

To the north of the Bear Knob house on the slope of land leading toward the Indian Grave corner is a considerable stretch of very rocky limestone land but which has pockets of soil in among the rocks of sufficient depth and richness to support a considerable grape plantation if the development of the enterprise should make this a necessity.

I think Mr. George Shockley would make an excellent and valuable tenant for this property. If the fruit growing enterprise is to be developed at all he should be placed there on a comfortable salary and not as a renter and a main part should be added to the house, making it a desirable habitation for Mr. Shockley and his excellent wife. I need not say anything as to his exemplary character and habits and I believe his ability is being persistently underrated by the present farm foreman and am sure he will not remain in his present position much longer. I do not know of anyone whom I could more highly recommend for this position if it is the decision of the Prudential Committee to undertake the proposition.

Subdivision of the Forest Preserve into Ranges and Blocks

Subdivision of the Forest Preserve

I recommend the division of the forest lands into three ranges for purposes of administration. First, the Indian Fort Range, to comprise all lands north of the Berea and Big Hill Pike Road. Second, the Cow Bell Range, to comprise all lands lying to the eastward toward the Big Hill, including the Baxter and MacGuire purchases. More particularly to separate this range from the third, it should begin at the gate at the entrance of the Cow Bell road near the Jesse McHone house, following the McHone line, and Burnell's line to the Low Gap, thence with the old line between the Clift lands and the Bogie land up to the Point and along the brow of the cliff, from this point with the divide of the land or the water shed ridge between the Cow Bell waters and the waters of the Maiden Branch on the Rich lands, to the intersection of the Rich lands road at the point marked in the map "top of the ridge", thence with said ridge through the gate in the water shed fence to the Big Sink, and with the old trace beyond there to the house now occupied by Robert Viers of the Hoskins purchase. The third, or Bear Knob Range, should include all lands at present owned to the Westward of the line just described.

For purposes of administration and management each of these ranges should be divided into blocks which will vary somewhat according to the nature of the timber and the natural boundaries which will make convenient boundaries of separation. These lines will follow in a general manner the geological lines already described. This will be especially true as to their vertical separation; that is, they will be in a series of zones: first, the bottom lands, then the Waverly shales, the limestone and sandstone slopes to the top of the cliffs, and lastly the plateau or capping lands.

Indian Fort Range

In the Indian Fort Range the following divisions into blocks or compartments should be made:

Block No. 1

Beginning at the point of land joining Robert Harris and William Johnson's land, comprising the more or less level rolling lands lying above the pike road leading toward the bench on the B. Harris lands to the foot of the first steep hills and spurs in the Waverly shales, thence with these spurs a level line to the intersection of the sand road near a plank culvert, thence with that to a point on the old worn road nearest Kelley's conner, thence with Kelley's line to the beginning.

Block No. 2

Will comprise similar lands beginning at the road described as the Southeast boundary of Block 1, extending to the Southeast behind the lands of the Kitty Harris dower and land of William Burnell to the top of the Narrow Gap hill, up the first rise and to the backside of the bench, thence with the foot of the steepest spurs a nearly level line to the intersection of the North line of Block 1.

Block No. 3

Beginning at the top of the Narrow Gap hill where the road branches for the Indian Fort, thence with the pike road to the lands of Jess McHone, behind them to the lands occupied by Miss Fox at the Narrow Gap, also to the lands of Mrs. Fox, thence up the point to the bench, with the bench to the end of the road at the foot of the bridle path leading to the Wild Cat Mountain, with that road Westward to the intersection of the Indian Fort road, with the Indian Fort road down the hill to the place at the beginning.

Block No. 4

Comprising all lands lying above Block 3 beyond the Wild Cat Mountain bridle path, over the top of the Wild Cat Mountain to the lands of Hazelwood, with the Hazelwood line to the limestone point intersecting the Baker lands, thence to the middle of the Low Gap between the Wild Cat Mountain and the Indian Fort, thence with the bridle path down this Low Gap ridge to the intersection of the road and the line of Block 3.

Block No. 5

Beginning at the top of the ridge where the line of Block 4 crosses, following the divide along this ridge to the steep sandstone cliffs of the Indian Fort, thence with the cliffs around to the West to the intersection of the Indian Fort road, down the hill with the road to the intersection of the branch road which forms the upper line of Block 3.

Block No. 6

Beginning at the Northeast corner of Block 2 on the Indian Fort road, thence with that road upward to the forks of the road on the bench, thence with the left hand bench road around past the old John Williams cabin in the end of the cove of new growth timber below the field, thence with the line of the cultivated fields across the hollow to the gate in the wire fence, thence around the bench to the projecting spur one hundred yards South of the sand loading point where the old road descends the hill, with the old road until it meets the corners of Blocks 1 and 2.

Block No. 7

Beginning at the corners of Blocks 1, 2, and 6 on the old road on the B. Harris tract, up the hill with that road to the bench, with the bench past the sand loading chute, around to the Northwest face of the West Pinnacle, descending the line with the old rail fence to Curtis Kelley's with his line to the intersection of Block 1, with Block 1 to the beginning point.

Block No. 8

Including for purposes of management the lands of Dr. William E. Barton. Beginning at the point where the line of Block 6 descends the hill, with the line of Block 6 to the gate, thence directly up the hill to the top of the sandstone cliffs of the Robe land, with those cliffs to the high point nearest Berea, to the corner of the old Sam Davis survey, and now a corner to the lands of Isaac Davis, thence around the cliff with Isaac Davis's lines and the upper line of the shares purchased from Hannah Bratcher and John Davis to the point intersecting the line made for Block 6 on the Southwest face of the West Pinnacle.

Block No. 9

Beginning at the branching of the bench road from the Indian Fort Road, thence with the Indian Fort road to the brow of the cliff, with the brow of the cliff around above the John Williams field and the head of the hollow purchased from Mr. Robe to the point of the cliffs, a corner of Block 8, thence with the line of blocks 8 and 6 to the beginning corner. This block contains about twelve acres of tillable land rented with the B. Harris house.

Block No. 10

Beginning at the intersection of the line of Block 7 with Curtis Kelley's line, thence up the hill with said line to the cliffs, around the North side of the Cliffs, with the upper line of the John Davis and Hannah Bratcher shares to the lands of Isaac Davis, with the Davis line down the hill to the nearly level lands at the foot of the steep spurs, around the hills to the Northwest below the old Sam Davis orchard, and the old timber on the John Davis tract to the point of beginning.

Block No. 11

Beginning at the same point in Kelley's line with Blocks 7 and 9, following the foot of the cliffs eastward to the Isaac Davis line, with his line to the main branch, down the branch to the sycamore corner, which is a corner to the lands of Bengé, around the lands of Bengé to his Northwest corner, from there across a strip purchased of Kelly for a roadway, to the lands of Kelley, thence to the new line between Kelley and the lands lately purchased from him to the beginning corner.

Block No. 12

This includes the land sold to the College by S.C. Mason, back of Mrs. Moore's share of the Johnson lens, and with it the roadway purchased from Kelley to the intersection of Block 11.

Block No. 13

Beginning at the gate where the Indian Fort road passes through the old Indian Fort, thence with the brow of the cliff to the southward and eastward including all the lands with-in the Indian Fort and on the plateau which were deeded to Berea College by S.C. Mason and all the land purchased of William Robe by Berea College, excepting the head of the cove which is included in Block 7.

Block No. 14

Will include all lands purchased of Dan Skinner lying on the plateau above the brow of the cliff of rocks, including the cultivated field containing the spring, the Forest Nursery enclosure and the fringes and spurs of timber surrounding this.

Block No. 15

Beginning with the Southeast corner of the Isaac Davis Eastern tract, thence up the hill with the line of the Robe land to the brow of the cliff, with the brow of the cliff through the Skinner purchase to the Middle of the low gap, known as the Horse Cove Gap, at point 21 in the line of the Dan Skinner survey, thence a straight line to the north corner stone of the Isaac Davis eastern tract, thence with the Davis line to the point of beginning.

Block No. 16

Beginning at the corner stone, the old corner between the lands purchased of Dan Skinner, the lands of Isaac Davis and the Maupin land, and the lands purchased of Mrs. Robe, thence a Southeasterly course with the line up the branch to the steep spurs of the hills, with these spurs around the cove to the intersection of the old road leading to the Horse Cove Gap, still with these

spurs above this old road to the old field in the land lately purchased of Mrs. Robe, with the line of this old field to the beginning point.

Block No. 17

Beginning at the Southeast corner of Block 16 in the Davis line, with his line up the hill to his North corner, and corner to Block 16, to point 21 in the old Skinner line, with that line to the intersection of the long line of the Johnny Pigg land running from Buzzard's Basin, Southwestward, with that line to the Northeast corner of the land purchased from Mrs. Robe, with the Mrs. Robe land to her fenced enclosure containing the buildings and cultivated fields till it strikes the brow of the hill directly above the spring, down the hill passing the spring and below the buildings and garden patch to the road, with this wagon road to the entrance gate of the Mrs. Robe property, with that line to the corner stone which is a corner of Block 16.

Block No. 18

Beginning at the entrance gate of the Mrs. Robe land, with the wagon road keeping the Easterly fork of it to the cultivated fields below the old house, thence with the borders of the timbered lands around the cultivated fields to the most northerly corner of the Mrs. Robe tract in the direction of Blue Lick, thence with the line of her property to the corner on One Pine mountain, thence down the hill to place of beginning at the gate.

Block No. 19

This includes the remainder of the Mrs. Robe purchase. This block will contain the two houses and the cultivated fields, excepting the lower field included in Block 17. It will be bounded by the lines of Blocks 17 and 18, heretofore described, and the remaining outside lines of the purchase toward the North and Northeast.

Block No. 20

Will include the lands purchased of Dan Skinner, bounded on the lower side by the land of John Settle and Garland Law and on the upper side by the brow of the cliff which constitutes the Northeast line of Block 14.

Block No. 21

Beginning at the corner stone marked "B.C.", which is the southeast corner of Garland Laws and a corner of the John Robinson lands, thence down the hill a straight line to the wagon road leading from the Laws land to the pike, with this wagon road to its intersection of the East line of the purchase from John Robinson, thence with this line North and Northeast to corner of said tract thence with the line between John Robinson purchase and the lands of Mrs. Lewis, and to corner

Subdivision of the Forest Preserve

“2” of the Robinson lands in Robert Turpin’s garden, thence crossing the creek at corner “1”, and the with the line of Garland Laws to the beginning corner.

Block No. 22

Beginning at the block oak corner and corner to the John Robinson lands and Jeff Robinson land and the Sam Baker purchase, being corner “7” in the Robinson plot, thence a straight line through the Robinson lands due North to the intersection of the road which forms the line of Block 21, thence with the line of Block 21 to its beginning corner, thence with Garland Laws to his walnut corner, thence with the Robinson survey around to the West, South and Southeast to the beginning corner.

Block No. 23

Beginning at the Northeast corner of Block 24 in the valley, with the lines of the Robinson purchase to the wagon road, corner of Block 21, with that road to the corner of Block 22, with the line of Block 22 Southward to the intersection of 24.

Block No. 24

Beginning at the black oak corner heretofore described as a corner of Block 22, thence Eastward with the line of Jeff Robinson and the John Robinson purchase to the stake corner in the lands of Grant Abrams, with the Abrams line Northward to the crossing of the second branch, from there a line due West to the intersection of the line of Block 22.

Block No. 25

Beginning at the black oak corner previously described as a corner to Block 22 and 23, thence South to the line of Hazelwood, with the Hazelwood line to the intersection of the cultivated fields of the old Si Baker place, with the margin of these fields Northward and Eastward, passing the gate of the entrance road to the Baker place, still with the margin of the cultivated fields to the branch, up the branch, passing the heavy young pine timber on the East, thence a straight line to the point of the high limestone cliffs.

Block No. 26

A line from the west corner of Block 25 around the old fields to the right of the main branch, crossing the road leading from the barn Westward, still with the cultivated fields as far as they extend into the cove and around them on the Eastward to the line of Block 25.

Block No. 27

All the timbered lands in the cove to the Northward of Blocks 25 and 26 and up to the brow of the cliff, around to the point of the high cliff of rocks to the Southeast of the Forest Nursery, down the cliff a straight line to the intersection of Block 26.

Block No. 28

From the corner of the edge of the Baker field, a corner to Blocks 25 and 26 and a corner to Hazelwood, with the Hazelwood line up to the hill to the stone corner on the ridge, then a line to the once cultivated field, with the upper line of the cultivated fields in this West cove of the Baker lands, surrounding them and returning to the beginning corner.

Block No. 29

Beginning at the stone on the ridge of the Hazelwood line, up the hill to the brow of the cliff of rocks, with a cliff of rocks Northwesterly above the maple cove, around to the fence and the line of Block 5, up the dividing ridge to the point of the Indian Fort, with the brow of the cliffs around the hill below the lands of Blocks 13 and 15, to the limestone point, meeting Block 27, from that point down the hill to the line of Blocks 26 and 28.

Cowbell Range

Block No. 1

Beginning at the entrance gate on the South side of Berea and Big Hill pike in the Narrow Gap just beyond the line of Jesse McHone, thence with the pike Southeastward to the lands of Edward McHone, with McHone's line South to his corner close to the main Cow Bell Road, thence with that road to the lands of Sally Harrison, with Sally Harrison's line Northwestward to a stake corner on the hillside, thence Southwestward still with her line to the line of her field enclosed with fence near the pipe line road, to the pipe line, with it Northwestward to the corner stone in the Low Gap, being a corner to the College lands and lands of Anthony Burnell, with the line of Burnell Northeastward to the top of the mountain and corner of Burnell and Jesse McHone, with the line of McHone down the hill to the pike and beginning corner.

Block No. 2

Beginning at the corner of Block 1 in the Low Gap, thence with the pipe line road to the culvert in the Dark Hollow above the lands of Sally Harrison, from thence with the branch, the course of the drainage, up the hill to the intersection of the Bear Knob Range, with the line of the Bear Knob Range to the beginning point.

Block No. 3

Beginning at the culvert in the Dark Hollow, the corner to Block 2, thence with the pipe line road to the last turn of the road as it descends the hill to the mill yard, thence around the foot of the bluff to the Northwest to the old path ascending the dividing ridge across the Bill McHone lands, continuing with this path to the brow of the limestone cliff, with the brow of the cliff to the intersection of Block 2, descending the line of Block 2 to the beginning point.

Block No. 4

Beginning at the brow of the limestone cliff, and point of intersection of Block 3 with Block 2, thence with the line of Block 3 to the intersection of Block 5, thence with the line of Block 5 and the South line of the cultivated fields now grown in sassafras to the intersection of the road dividing the Cow Bell from the Bear Knob Range, with said road and the dividing of the ridge to the corner of Block 2, with the line of Block 3 to the beginning corner.

Note that this block contains the lands which have been in cultivation by George Pigg and the old field lands grown up in sassafras.

Block No. 5

Beginning at the Southernmost point of Block 3 in the pipe line road, down the hill to the mill yard road, with that road to the culvert crossing the main branch from Shingle Mill Hollow, with the waters of that hollow Northwesterly, with the right hand fork of that hollow to the bridle path on the bench near a small spring, passing that spring to the sassafras corner of the Rich lands survey marked by a stone cairn, still with that path on the Rich lands up the hill to the intersection of the line of Block 4, with the line of said block to the intersection of Block 3, with the line of Block 3 to the beginning point.

Block No. 6

Beginning at the corner of Block 5, the culvert on the branch from Shingle Mill Hollow, thence with the road passing the mill to the gate in the water shed fence, with the line of said fence up the hill to the main level bench, with this bench to the right to the spring on the bridle path described in the line of Block 5, descending the branch with the line of Block 5 to the beginning corner.

Block No. 7

Beginning at the point in the wire fence on the bench which is a corner to Block 6, up the hill with this fence to the gate on the ridge road, or line of the Bear Knob Range, with this road to the rail fence, bounding the cultivated fields of Block 4, with the line of Block 4, 5, and 6 to the beginning corner.

This corner contains the Clift new ground field which has been rented to Tom Pigg.

Block No. 8

Beginning at the gate in the water shed fence on the Cow Bell road above the mill, thence with that road up the hollow to the main culvert on the Cow Bell Branch, a short distance below the falls, with the branch over the right hand falls to Reservoir Number 8, and passing that a little to the old bench logging road, with the logging road to the right Northeastward around the level bench to the intersection of the water shed fence, and the corner of Blocks 6 and 7, with the line of 6 descending the hill to the beginning point.

Block No. 9

Beginning at Reservoir Number 8, thence up the hill to the left of the logging road on the left hand side of the branch, with that road and a bridle path through a long hollow to the Westward to the intersection of the ridge road and line of the Bear Knob and Cow Bell Ranges, with this ridge road passing the Big Sink to the gate, corner to Block 7, with the line of Block 7 and the line of the

Subdivision of the Forest Preserve

water shed fence to the bench corner of Blocks 6, 7, and 8, with this bench, the line of 8, to the beginning corner.

Block No. 10

Beginning at the culvert at the corner of Block 8, thence with the main road up the hollow passing Reservoir Number 6 to the forks of the road, with the right hand fork to the entrance of the old Hoskins field planted to walnuts, thence with the old fence to the right up the hill to a bench path, with that path around the bench, passing Reservoir Number 7, to the logging road on the bench just above it, with that logging road bench around the hill to Reservoir Number 8 and corner to Blocks 8 and 9, with the line of Block 8 down the branch to the beginning point.

Block No. 11

Beginning at Reservoir Number 7, up the branch and main hollow leading in the direction of Robert Vier's house to the intersection of the old cultivated fields, with the fields to the right to where the fence in the timber crosses the dividing ridge road separating the Cow Bell and Bear Knob Ranges, with this road Northeasterly to the intersection of Block 9, with the line of Block 9 to Reservoir Number 8, with the bench road and the line of Block 10 to the beginning point. Block 10 to the beginning point.

Block No. 12

Beginning at the border of the old field in the hollow and the line of Block 11, with the line of Block 11 to the ridge road, with this road passing Robert Vier's house, to the county line road, with the county line road to a point where an old rail fence used to border a cleared field now grown up to sassafras and tulip poplars, with the right hand border of the field around below the old field growth to the beginning point.

This contains most of the land rented to Viers for tillage and pasture.

Block No. 13

Beginning at Reservoir Number 7, along the bench path with the line of Block 10 to the intersection of the walnut field, above the borders of that field to the right around to the old barn on the county road purchased of John Hoskins, with the county road and wire fence passing a gate leading to the hollow, still with the county road to the intersection of Block 12, with the line of Block 12 around the hollow and intersection of Block 11, with the line of Block 11 down the branch to the beginning point.

Block No. 14

Beginning at the forking of the main Cow Bell road, and corner of Block 10 above Reservoir Number 6, up the hill to the Northeast, with the borders of the old cultivated field now grown to young poplar timber, around the borders of this field to a tall standing sandstone rock on the top of the ridge, thence with the main Cow Bell road to the Burnt Bridge gate, opening to the county line road to the Southwest to the barn, corner of Block 13, with the lines of Block 13 and Block 10 to the beginning point.

Block No. 15

Beginning at the forking of the bench road directly opposite Reservoir Number 6, with this road taking the land above it to the North and Northeast, rounding the high point and continuing with the same road nearly South to the plank culvert at the foot of a deep hollow; with the logging path up this hollow to the high standing rock on the top of the dividing ridge and corner to Block 14; with the lines of Block 14 to the main Cow Bell road at the forks, and corner also to Block 10; with the Cow Bell road down the hill to the beginning point.

Block No. 16

Beginning at the point in the main Cow Bell valley where the pipe line from Reservoirs 9 and 10 enters the main line, from this point up the valley with the main Cow Bell road to the branching of the bench road opposite Reservoir Number 6; with this bench road including the lands below it, around the bench with the lines of Block 15, passing the culvert and Reservoirs 9 and 10; with the bench and proposed continuation of this bench road, to a high point overlooking the main Cow Bell valley; descending from this point with a spur of the hill into the main valley just above an old cultivated field, intercepting the main road at this point; with the road to the junction of the pipe line and place of beginning.

Block No. 17

Beginning at the point on the main Cow Bell road which is a corner to Block 16, with the line of 16 up the ridge to the point on the bench; with that bench and proposed continuation of the road to the head of a short hollow and into the lower part of the old Miller field; around this hollow and still with the bench to a gate in the water shed fence on a high point overlooking the valley; with this water shed fence descending the hill and crossing the creek to the gate on the main Cow Bell road; with said Cow Bell road to the culvert crossing the creek, up the creek to the point opposite Block 16; from this point to the beginning corner on the road.

Subdivision of the Forest Preserve

This block contains a small, cultivated field in the bottom lands adjoining the creek which has been rented to Tom Pigg.

From the head of the cove in Block 17 there descend on old bridle path which should be kept up and improved for convenience in travel and for a fire guard.

Block No. 18

Beginning at the main gate in the water shed fence just above the saw mill site, with this water shed fence crossing the creek, up the steep hill to the gate on the bench and corner to Block 17, with the bench below the fence to the head of the hollow where the old Roe cabin stands, crossing the spring branch into a similar bench road; with this bench road around the head of the deep part of the cove, crossing another branch and turning back to the West and North to a high point immediately overlooking the saw mill seat and house; from this point down the hill by a logging trace along the ridge keeping to the North of the house and garden reaching the main Cow Bell road; with this road passing the old lumber yard and mill seat to the gate and beginning corner.

This contains a large spring fed branch from the springs on the Miller land. A "T" was left in the main pipeline near the saw mill seat for the purpose of taking in this water at some future time. When this is done a reservoir on the two hundred foot level will be just below the bench road as it passes around the head of this cove.

Block No. 19

Beginning at the corner of Block 18 near the house and garden below the mill yard; thence with the old logging path and the line of 18 up the hill to the bench on the point; with this bench to the Northeast around a high point passing below a very high cliff of sandstone rocks, into a deep cove on the lands purchased of McHone and Fish; still with this bench, crossing a logging trail leading from the high lands below a high sandstone rock, into another prong of the cove which is the Northeasterly extension of it; crossing this and still with the bench around to a high point of land from which an old logging road and an old rail fence descends to the valley, descending the hill with this fence, striking the valley at the junction of the small branch from this enclosed cove with the main Cow Bell; thence up the Cow Bell to the beginning point.

This includes near the beginning corner a portion of the old field which was the Bill McHone field and in the main cove a large old field which was formerly cultivated by Ned McHone. The logging roads through this old field have been cut down deeply by the torrents of water from above forming dangerous washes and gullies which should be stopped up and protected at once

Subdivision of the Forest Preserve

before further erosion and damage are done. This would be a valuable field, especially in the upper portion, to plant up to black walnuts, poplars and yellow locusts.

Block No. 20

Beginning at the junction of the Buckeye Cove Branch with the main Cow Bell Branch, and corner to Block 19, up the hill with the old logging trace to the corner of Block 19 on the bench, with this bench or the general level where the bench is not well defined, to the stake corner of Ned McHone's land, with McHone's line to the Northwestward down the hill crossing the main Cow Bell Branch to the Cow Bell road, with this road to the lands of Sally Harrison, thence up the creek with Sally Harrison's East line to the beginning corner.

Block No. 21

Beginning at the stake corner of Edward McHone's land, and corner to Block 20, thence a Northeasterly course to his hickory corner; thence up the hill with the outside line of the Forest Preserve to a marked hickory on a high point, thence with our outside line South 24 degrees East 150 poles to the black oak and gum corner on the Bentley survey; from this point with the water course leading into the Big cove comprised in Block 19, thence around the bench with the lines of Blocks 19 and 20 to the beginning point.

Block No. 22

Beginning at the black oak and gum corner which is the North corner of the Bentley survey, with the Bentley line to the Southeast, South and Southwest to point "10" in the description of the Bentley land, thence a Westerly course to the head of the hollow leading to the Northeast corner of Block 18; around the bench with the lines of Block 18 and 19 to the point in the cove which is a corner to Block 21; thence up the hollow with the line of Block 21 to the beginning point.

Block No. 23

Beginning at point "10" in the old Bentley line, and corner to Block 22, thence with the Bentley line passing points "9" to point "8", the Two Pine Corner, thence with the water shed fence above the middle Roe cabin, passing around the cabin, descending into the valley to the spring branch below the cultivated field; still with the fence to the point nearest the lower Roe cabin and corner to Block 18; with the line of Block 18 to the Northeast corner of the same, thence with the line of Block 22 to the beginning point.

Block No. 24

Beginning at the Two Pine corner, keeping inside the water shed fence to the high cliff of rocks to the South and Southwest above the cultivated fields of the Roe land, with the top of this

Subdivision of the Forest Preserve

cliff of rocks to the water shed fence, with the water shed fence on the West side to the county road, with the county road along the front of the Roe house to the nearest point to a high cliff of rocks and a little West of the Roe garden and orchard; from this road to the brow of the cliffs and with the brow of the cliffs above the deep cove containing Reservoirs 9 and 10 to the nearest point to the cultivated fields in the Roe land, thence to the border of these fields and with them to the point on the bench road and corner to Block 17, with the line of Block 17 to the gate in the water shed fence, with the South side of this fence to the beginning corner.

Block No. 25

Beginning at Reservoir Number 10, thence around the proposed bench road to the North and Northeast to the intersection of Block 24; thence with the margin of the old fields and line of Block 24 and the line of the cliffs to the county road, with the county road to the entrance gate near the Burnt Bridge; through this gate, with the road to the high standing rock, from this rock descending the hill to the right, with the old logging train to the culvert on the bench road to the West of Reservoir Number 9; with the bench road to Reservoir Number 10 and the beginning corner.

Block No. 26

Beginning at the Two Pines corner and point "8" in the old Bentley survey, with this line passing point "7" to point "6" on the brow of a high cliff overlooking a deep cove, with the brow of the cliff nearly South to a spring fed branch where the water falls over a cliff of rocks at the head of the deep cove, from this point a line with the nearest hollow South to the intersection of the county road; with the county road to the intersection of the water shed fence; with the water shed fence to the beginning point.

Block No. 27

Beginning at the intersection of the line of Block 26 with the county line road; thence with the line of Block 26 to the cliff of rocks at the head of the deep cove, with the rocks around the South side of this cove to point "5" in the old Bentley line, with this line crossing a high ridge to the bottom of a deep hollow, with this hollow Southwardly and a continuation of the same, across to the county line road; with the county line road to the beginning point.

Block No. 28

Beginning at the corner of Block 27 on the county line road, with the line of Block 27 Northwardly to the intersection of the Bentley line; with the Bentley line past point "4" to a

Subdivision of the Forest Preserve

limestone corner at "3", from this corner with the Bentley line Southwest to point "1" in the Bentley survey on the county line road; with the county line road to the beginning point.

Bear Knob Range

Block No. 1

Beginning at the stone corner on the land of Anthony Burnell just West of the creek crossing at the end of the land between Anthony Burnell and William Burnell, from this stone to the creek, thence with the line of Anthony Burnell to the Southeast to the stone at the top of the Low Gap, thence up the hill with the line of the Cow Bell Range to the old field on the Rich lands; Westward below the line of this old field to the main Rich lands road, crossing this road into the edge of the timber below the Rich lands spring field, following that timber to the Spring Branch, down the branch to the intersection of the road at the corner of the enclosure around the Clift house and with that road down the valley to the beginning point.

Block No. 2

Beginning at the stone corner described for Block 1, with the line of the road up the valley and passing the Clift house and lot; thence up the branch to the entrance of the old field; with the borders of this field to the right up to the top of the dividing ridge; along this ridge to the North, with the old road a steep descent at the North end of the ridge to the land of William Burnell; with Burnell's line to the beginning corner.

Block No. 3

Beginning at the corner of Block 1 as it leaves the line of the Cow Bell Range, with the line of the Cow Bell Range until the old Clift fields are passed, with the line of those fields to the West and Northwest to the intersection of Block 2, descending the hill with the line of Block 2 to the spring branch, crossing that with the line of Block 1 to the beginning corner.

This block comprises the lands on the Rich lands farm purchased of the Clift heirs, but at present leased and cultivated by George Pigg, A.J. Wilson and Marion McQueen. Between portions of these fields are some narrow skirts of timber, mostly second growth timber, on old cleared lands that have been abandoned.

Block No. 4

Beginning with the corner of Block 2, in the line of William Burnell, thence up the hill and with the old road along the ridge to the intersection of Block 3; thence with the break of the cliffs to the Southward to the point just above a cultivated field, the most Northerly field on the land purchased of Sam Pigg; thence descending the hill along the North side of the field to a spring branch; crossing this branch and descending with the fence enclosing this field to the gate on the

Subdivision of the Forest Preserve

Ballard Branch road, with said road to the North passing a small house on the right, a part of the Matt Pigg purchase; turning the corner of the lot of this house to the East to an oak stump, or corner to Anthony Burnell; with Burnell's line Northward to a maple tree corner of William Burnell, and with William Burnell's line to the beginning corner.

Block No. 5

Beginning where the corner of Block 3 leaves the line of the Cow Bell Range, with the line of the Cow Bell Range to the South to the gate in the water shed fence, with the water shed fence to the West to a break of the cliffs towards Ballard Branch, with the line of the cliffs to the intersection of Block 4.

Block No. 6

Beginning at the gate on the Ballard Branch road, and a corner to Block 4; up the hill with the line of 4 to the brow of the cliff; with the brow of the cliff around the cove above the flax field cultivated by George Pigg, descending the point opposite Pigg's house to the intersection of the spring branch from his field with the main Ballard Branch, down the valley to the gate and beginning corner.

Block 6 includes the house purchased of Sam Pigg which was his home place, at present occupied by George Pigg as tenant, a considerable cultivated field in the deep cove above the house and a small field at the end of the Sam Pigg purchase. In the deep cove above the Pigg house is a small but valuable block of buckeye and sugar maple fit for the saw mill.

Block No. 7

Beginning at the corner of Block 6 at the fork of the branches, thence up the ridge with the line of Block 6 to the brow of the cliff, around the cliff with the line of Block 5 to the water shed fence, descending the hill with the fence to the gate in the front of John Kindred's house, following the fence to the North, passing in front of the house seat where Hiram Pigg used to live to the main fork of the Ballard Branch, with the branch to the beginning corner.

Block No. 8

Beginning at the gate which is the entrance to the water shed enclosure in front of the house called the Caretaker's House, now occupied by John Harvey Kindred, with the water shed fence to the Eastward, up the hill to the brow of the cliff, with the brow of the cliff passing above Reservoir Number 4 to a deep draw supplying the springs to Reservoir Number 3, with this draw down the water course past Reservoir Number 3 to the junction of the branch with the main Ballard Branch at the crossing of the road, with the road to the gate and the beginning corner.

Block No. 9

Beginning at the gate in the water shed fence in the line between the Cow Bell Range and the Bear Knob Range; with this line and the road to the South of the Big Sink to a bridle path descending the hill and passing through the old Hoskins sugar camp and along the bench above Reservoir Number 2; descending the steep hill again by the bridle path to the road leading to Reservoir Number 1; with this road to the intersection of Block 8; up the hill with the line of Block 8 to the brow of the cliff and around the cliff to the intersection of the water shed fence; with the fence to the beginning point.

Block No. 10

Beginning at the intersection of the line of Block 9 with the main Ballard Branch, with the road and bridle path up the hill to the ridge road, with the ridge road and the line of the Cow Bell Range passing the house of Robert Viers to the County Line road, with the County Line to the line of the land purchased of William Kindred, a chestnut corner; with the line of the Kindred lands into the deep valley above Reservoir Number 1, with the line of the main branch passing Reservoir Number 1, down the Ballard Branch to the beginning point.

Block No. 11

Beginning at the chestnut corner of the William Kindred land on the County Line road; with the County Line road to the Madison County road descending the Bear Knob hill through the Dick Davis field; with this Madison County road to the forking of a wood road to the right through the lands of William Kindred and John Kindred, following this wood road through the chestnut woods along the dividing ridge to a high point which makes the divide between the main fork of the Ballard Branch and the John Kindred fork, descending from this point through the old field to the intersection of these two branches close the gate by John Kindred's house; to the gate in the water shed fence; with the road toward the head of Ballard Branch to the intersection of Block 10, with the line of Block 10 up the branch past Reservoir Number 1 to the beginning corner.

This block contains most of the cultivated land on the William Kindred place and the lands on the Sam Pigg purchase now leased to John Harvey Kindred together with an old field used for pasture.

Block No. 12

Beginning at the intersection of the Kindred fork with the Ballard Branch, and corner of Block 11, thence up the hill and with the wood road and line of Block 11 to the county road; with the county road to the entrance lane to the John Kindred place; with this lane passing the house and

barn along the rocks to the North to a point opposite the North end of the bench field lying to the left of Reservoir Number 5, descending the hill passing the end of this field to the enclosure above John Harvey Kindred's house, with that enclosure around the side of the hill to the branch and the beginning point.

Block No. 13

Beginning at the entrance lane to the John Kindred place, thence with the county road Westward toward the foot of the Bear Knob to a pair of bars at the brow of the hill; thence through these bars with the wood road ascending the hill and with the right fork of this wood road along the bench to the lands of Nancy Loman; with the Nancy Loman line descending the valley to the border of the cleared land to the top of the ridge intersecting the line of Block 12; with the line of Block 12 to the beginning point.

Block No. 14

Beginning at the gate at the Southeast corner of the land occupied by John Harvey Kindred; thence with the main Ballard Branch road, thence descending the valley to a point in the field by a chestnut tree where there used to be a cross fence and gate; with the line of this old fence up the hill to the West around the fields cultivated by George Pigg; descending the hill to Northwest into the Bear Knob Branch, to the line of the Bear Knob tract; with the branch up the valley toward the Bear Knob to the lands of Nancy Loman, and corner of Block 13; with the line of Block 13 to the top of the ridge and the line of Block 12; thence with the line of Block 12 to the beginning corner.

Block No. 15

Beginning at the gateway in the John Harvey Kindred enclosure and crossing the branch to the East to the line of Block 7; with the line of Block 7 to the intersection of Block 6; with the line of Block 5 along the main Ballard Branch road to the gate corner to Block 6; thence crossing the valley to the West to the standing timber on the opposite side of the branch; thence with the line of this standing timber around the borders of the old fields of the Sam Pigg place to the intersection of Block 14; with the lines of Blocks 14 and 12 to the beginning corner.

Block No. 16

Beginning at the gate corner to Block 6 and 14; descending with the valley road to the lane leading to the West across Ballard Branch to the stake corner of the Matt Pigg tract and corner to Burnell; with Burnell's line to the maple corner; thence around the border of the old cultivated fields of the Matt Pigg place to the top of the hill, and descending with the border of the timber to the

Subdivision of the Forest Preserve

East and South, intersecting the line of Block on the hillside; thence crossing the valley to the East to the beginning corner.

Block No. 17

Block No. 17 includes all the lands of the Matt Pigg purchase lying between Block 16 and the outside line of the Matt Pigg survey against Burnell and Powell.

Block No. 18

All the lands of the Matt Pigg purchased lying South of the cultivated fields and from the locust corner of the Pigg and Bear Knob lands, and line East of South to the stake corner in the Michael Dowden fifty-acre survey and corner to Block 13.

Block No. 19

Beginning at the corner of Blocks 13 and 18; thence Southwesterly up the branch with the line of Block 14 to the line of Nancy Loman, following the line of Nancy Loman to the North and West to the bench road on the North side of the Bear Knob; with this bench road to the low gap between the Buck Johnson fork of Silver Creek and the Bear Knob fork of Ballard Branch; thence with the old Ober logging road to the Northwest into the deep hollow to the line of William Powell; with Powell's line to the Northeast to the intersection of Block 18; with the line of Block 18 to the beginning corner.

Block No. 20

Beginning at the corner of Block 19 in the Powell line in the deep hollow; passing around Powell's field to the West and North as far as the cultivated lands extend, ascending the hill to the West of Powell's land and the border of the old cultivated fields to an old road on the mountain bench; with this old road to the intersection of the wire fence on the dividing ridge; crossing the dividing ridge to the Southwest to the entrance gate of the Bear Knob tract; thence with the Bear Knob road up the hill and past the spring, keeping with the South and West border of the bench beyond the spring around to the low gap described in Block 19, descending the hill with the old road and line of that block to the beginning corner.

Note: This contains the Bear Knob house and cleared lands around a long bench, having a Northern aspect and the old cleared fields immediately above the land of William Powell, formerly the Buck Johnson place.

Block No. 21

All lands of Bear Knob tract lying to the West of Block 20 and all Powell's land bordering on the Southwest and West on the lands of Henry Becknell, and cornering on the Indian Grave and

also the small tracts of land purchased of Mr. Brewer lying to the West of this Bear Knob portion and surrounding the small tract of stone quarry land belonging to J. Burdette.

This block descends the steep side of the hill below the two Brewer cabins to his corner on the Berea and Bear Knob road about two hundred yards below the Bear Knob gate; with this road to the gate; with the line of Block 20 to the intersection of Powell's land.

Note: This block contains a small clearing and two small log cabins just below the Burdette stone quarry, purchased of Brewer.

Block No. 22

Block 22 includes all that portion of the Bear Knob tract above the land purchased of Samuel Burnell, which was formerly included in the old Fairchild's clearing and lying to the South of Block 20 and bounded as follows:

Beginning at the Bear Knob line just below the Bear Knob gate; thence with the upper line of the Burnell purchase and the line of Dick Davis; with the line of Dick Davis to the chestnut corner tree on the top of the Bear Knob; thence to the South with Davis's line to the Bear Knob summit road; with this summit road to the top of the ridge; from thence a bridle path to the East to a point opposite the Eastern extremity of the cleared fields; descending to the intersection of the bench road and Block 20; with the line of Block 20 to the beginning point.

Block No. 23

Beginning at the pair of draw bars on the Bear Knob county road and corner to Block 12; with the line of Block 12 to the Nancy Loman land; around her land to the bench road and corner to Block 20; with Block 20 to the line of Block 21; with the line of Block 21 to the top of the ridge; still with 21 descending the hill with the Bear Knob summit road to the Davis line; with his line descending into the deep cove on the West side of the Bear Knob and then an eastward course, crossing a high spur and descending into the Dark Hollow on the East side of the Bear Knob, intersecting the Bear Knob county road about a hundred yards below the cold spring; with this road up the hill to the beginning point.

Block No. 24

Block 24 includes that portion of the Bear Knob tract lying to the South and East of the Bear Knob county road and bounded on the South and East by the lands of Dick Davis, and Marsh and Dinsmore, and of Hawkins, including also the timbered lands of the William Kindred heirs purchased, until the cultivated fields is reached a hundred yards West of the Kindred house.

Block No. 25

Block 25 includes the portion of the William Kindred purchase lying West of the Bear Knob County Road and North of the county line road, extending to a sharp point on the county line, where it intersects the land of Hawkins.

This includes the William Kindred house, garden and orchard and several acres of old cultivated fields together with a boundary of standing timber to the Southwest.

Block No. 26

Beginning at the corner of Blocks 20 and 22 below the Bear Knob gate; descending the deep hollow with the line separating the Burnell standing timber from his cultivated fields and passing to the gate on the Bear Knob road in front of his barn; thence with this road to the Scaffold Cane and Silver Creek county road; with that county road to the corner of the land purchased of Brack Pigg; with Brack Pigg's line to the line of the Burnell purchase; with the line of Burnell and of Becknell to the brow of the hill and corner to Block 21; with the line of Block 21 to the beginning corner.

This block includes the standing timber on the Northern part of the Samuel Burnell purchase, the entire Bear Knob Road below the entrance gate and the house, blacksmith shop, stable and small clearing purchased of Brack Pigg.

Block No. 27

Block 27 includes the remainder of the Samuel Burnell tract, his house and barn with the cultivated fields lying above to the Davis line and a triangular piece of timbered land lying to the Southward between the Davis land and the lands of the Hart place.

Management Recommended for Different Portions of the Forest Preserve
Land: Indicated by Ranges and Blocks

Indian Fort Range

Block No. 1

This comprises two considerably distinct portions, the Western being trees of middle aged, mixed oaks of various species predominating, but containing a few hickories and considerably pine, scrub pine being in the majority, but a number of very nice, straight bodied, yellow pines from six to ten inches in diameter. This portion of the block contained a considerable amount of old white oak timber up to the year 1900, when it was logged over in a rather rough and careless manner before coming into the possession of the College. Since then it has received an improvement cutting by which a few saw logs were removed and about a hundred cords of wood. It will need some further attention during the next five years, as in quite a number of instances badly shaped and damaged trees were not removed as closely as should have been done and the growth of timber necessitate some thinning in the more dense portions, the preference always being given to the white oak, promising hickories and yellow pine. Next to these, black oak, scarlet oak and the scrub pine should be given the opportunity to make the predominant trees of the stand.

Beyond the old roadway, which cuts this block diagonally, from near the blue bank culvert on the pike Northwardly in a strip of land which was cleared by B. Harris in the Winter of 1900, preparatory to planting. The ground was never broken up and for the most part came in rapidly to the scrub pine and various species of oak.

A little further to the East and in the rear of the house and barn purchased of B. Harris the ground was clean cut two years previously and has come up in the same manner, now standing twelve and eighteen feet high. It is already time that this should receive a thinning, leaving it a mixture of scrub pines, white oaks, black oaks and hickories. The clearing of 1900 is scarcely advanced enough in growth to require a thinning but should receive attention in a few years more.

Around the North side of this block toward the East and is a considerable grove of the small hickory, *Hickoria odorata*, found mostly in stools or small groups, being sprouts from hickory that was cut some years ago. These are growing very rapidly, but would be benefited by a systematic thinning, selecting the straightest and cleanest poles of the stool, and a pruning of these of side branches up to six feet in height, would be a very desirable operation.

The extreme East end of this block lying along the side of an old wagon road is of an older growth of young timber, still containing some old trees of imperfect or decayed character which should be removed, and a general thinning should be made with a view to giving the space to the

most perfect specimens and valuable species. In all of these thinnings care should be taken that not too many trees are removed, as a point should be kept constantly in the mind of the forester that the trees should be crowded as closely as is possible without too severely retarding their growth in order to secure the shedding off of side branches and run the trees up into long, straight boles. It should also be kept constantly in mind that the white oak is the most valuable species of this mixture and is in constant danger of being overtopped by the more rapidly growing species of black or biennial fruited oaks.

The black gum trees, unless absolutely needed for nurse trees for other species, should be removed from this mixture. They are of themselves very tolerant, enduring much crowding and produce no valuable timber when they are grown.

Block No. 2

At the West end this comprises timber much like the East end of Block 1 and should have similar treatment. Further over toward the main branch from Moonshine Hollow the timber is older and larger and contains a considerable mixture of black gum and sweet gum and a good many maples. Straight bodied maples will grow into valuable produce in the future and should be preserved. All black gums that are of any considerable size should be cut out, and also many of the sweet gums. In this portion of the block there is more necessity for removing large sized defective trees than has existed farther to the West. To the Northward where the spurs of the hill set in there is much valuable young timber which has never received an improvement cutting and should at once be cut over, following the general principle of removing all trees which have no promise of valuable growth in them, all poor species, all younger trees or defective trees of the valuable species, and such perfect trees of the less valuable species as are crowding the more valuable.

On crossing the branch from Moonshine Hollow there will be found a considerable number of excellent white oaks. All of these which are sound and perfect specimens may well be allowed to grow for some time to come as they are enhancing in price as well as in size. Some defective trees showing signs of decay at the stump and dead branches in the tops should be cut out soon and their space given to better timber.

From this on to the East side of the boundary a much larger portion of pine prevails, the most numerous species being the scrub pine, many of them of very good shape and quality. These range in size from six to twelve inches in diameter and wherever they are good specimens are valuable growing stock.

All of this boundary beyond the old Harris road has received one improvement cutting, some lumber and many cords of wood being taken out. Some groups consisting largely of white oak, others of hickory and a few of chestnut oak, should be watched closely and thinnings carried on in the proper manner. The most of this portion of the block will stand without need of much attention for five years more, though a yearly inspection should be made to ensure that no straight and valuable white oaks are being closely pressed or overtopped.

Block No. 3

Comprises the land lying on a steep slope to the East and in the Eastern portion a steep slope to the South. All has been severely damaged by fire in recent years and the soil conditions throughout this area are bad. Considerable value might be obtained in the way of improvement cuttings, removing the most defective trees, but for the most part securing a proper canopy and soil cover should be the first thought on this land and more inferior species and individuals will be tolerated here for the sake of cover than would be in Block 1.

Block No. 4

Comprises a boundary in which the conditions are about as bad as they well can be, this having suffered repeatedly from fires, the last serious one being in 1900, although the Northern portion of this was burned again in the spring of 1905. Some of the coves and draws on the South side of the Wild Cat mountain contain some very good young growing timber. A good many old and defective trees might be worked into cordwood and taken out around the bench road. Over the top of the mountain the conditions are worst of all many of the pines injured by the fire of 1900 having blown down and lying in all directions. Probably little work could be done here which would promise any financial return for many years but it is very desirable that the main trail and bridle path from the low gap up and across the mountain to the East Pinnacle should be thoroughly cleared of logs and brush on both sides, so that a fire breaking out on the other side could be checked along this path and prevented from crossing the mountain. The Hazelwood land, lying below this to the North have been the source of two fires and are a special menace to the entire Eastern portion of the Indian Fort Range.

Block No. 5

Block 5 is another section which has suffered severely from fires but contains on the South slope of the hill below the Indian Fort and toward the low gap a small body of yellow pines which are the finest now remaining on the Forest Preserve. These should be given every protection and will rapidly grow into very valuable timber.

This boundary contains a great deal of worthless material which might be removed for the protection of younger trees and also large number of vines, especially through the richer portions, and many dogwoods. These should be cut in mid-summer to prevent their growing again.

All walnuts growing in the richer lands influenced by the limestone should be encouraged and with the removal of a good deal of the shade caused by the worthless material it is probably that number of old poplar trees growing on this boundary might seed up considerable of this area. Whenever a sufficient growth of young trees of a valuable species is established these old poplars, all of them defective, might profitably be cut, as every one of them will probably furnish some good logs.

A number of old black oaks near the Indian Fort Road on the top of the ridge have outlived their usefulness and might be cut for fuel without much delay.

Block No. 6

This block, at the East end especially, contains a valuable growth of young pines, there being many straight bodied young yellow pines four to eight inches in diameter among these and a fine growth of scrub pine. There will be found on this block quite a number of old trees, few of them of sufficiently good quality to make it worthwhile to keep them, but around the head of the cove about the springs on the lower part of the John Williams land and on the lands purchased of McHone there will still be found some very good trees. A considerable amount of logging might be done from this portion of the Preserve and perhaps while the mill is operating near the Silver Creek Bridge during the present winter it would be a good thing to bring out a number of logs from this block. Much in the way of thinnings and improvement cuttings could also be done here, and the wood produced being near enough to town would a little more than pay the expense of cutting it out.

Block No. 7

The exposure here is so direct to the South and Southwest that good conditions are hard to maintain. Improvement cuttings have been carried over a portion of this but a good deal of value might still be removed. As in Block 3 much poor quality of trees can be tolerated here for the sake of preserving the canopy and soil cover than would be admissible on better land.

The greater part of the land belongs to Dr. Barton.

Block No. 8

There are two natural divisions of this block, the Eastern portion lying in the head of the cove containing much valuable middle aged timber comprising ash, walnuts and poplar which

should not be touched more than is necessary for the removal of defective and crowding specimens. Over the top of the hill will be found a considerable number of white oaks. The logging here will be difficult and perhaps some of the timber will have to come down over the Davis land, but the most of these trees are somewhat defective through fires and should not be allowed to stand too long. If a deal could be made with Dr. Barton for the acquiring of the Eastern portion of his holding, leaving him only the West Pinnacle Knob proper, I think it would be advantageous one for the College. The sandy portion of the top of this mountain above the cliff was most severely burned a number of years ago and contains a large amount of chestnut sprout growth which is not yet large, but in time may become valuable as telephone poles.

Block No. 9

Block 9 contains above the cultivated field and the head of the cove on the Roe purchase some very fine young growth timber of poplars and white oaks, which ought to receive special care.

All such land lying along limestone rocks is much subject to the growth of grape vines and dogwoods and the thinning and clearing of this entire block would be a great advantage.

Block No. 10

Block 10 contains considerable suitable land at the East end next to the Ike Davis line which I have recommended renting to Mr. Eversole. Further around the mountain to the Northwest there is some very good growth of young timber which should be carefully preserved. The chief value of this block is the boundary of old timber bought of John Davis which contains a large amount of valuable white oak besides some black oak, chestnut oak, ash and linn. There is probably enough there to pay for setting a mill, a good spot being found on the branch near the old sycamore corner on land purchased of Kelley, and a little work will secure a good road out of this up the bank on the North side and out into the county road, over the Kelley and Moore lands.

Block No. 11

This block contains the bottom lands which were in the old Sam Davis fields, and along the upper margin toward Block 10 this land has grown up to a mixture of short leaf and scrub pine, but including also some hardwood trees. This growth is generally somewhat too scattering to admit of the timber growing to the best form. The growing space is so great that the side branches are not shed off, and so the trunks are thick and stocky at the bottom, tapering rapidly, having a poor form factor and live branches are retained so low that much of the timber growth is too knotty to be of value. These trees are too old to admit the planting in of young trees as their low branches have already occupied the space, and probably the best thing to do is to allow them to grow about as they

are for a number of years. Then perhaps a reasonable number of them will be fairly well cleaned up. The others will make timber of inferior quality but will have considerable fuel value and will have the advantage of holding the ground and improving the forest floor.

A number of deep washes and cuts through the yellow clay soil in this block ought to have attention at once by stopping them with small dams of brush, worthless trees and stones or any such material as may be at hand. Quite a portion of this block nearest the branch is a flat, cold, heavy clay land that has been so much grazed that it has not been seeded up at all. After laying out the proposed roadway the remainder of this land should be planted up. A mixture of scrub pines, Spanish oaks and red maples would do well planted here and the timber growth would doubtless prove to be quite rapid.

Block No. 12

This block includes about twenty-two acres of land lying along the Blue Lick Road North of the Mitchell school house. The soil is rather cold, yellow clay, becoming a little gravelly over the ridge to the East of the school house. Beyond this ridge is a small creek valley with some narrow wet portions of bottom land, the land rising again to the Northward, passing over a high clay ridge where it tapers to a point at the Mitchell corner.

This land had been considerably cut over when purchased from Mrs. Moore, but there still remained about forty-thousand feet of saw timber of black oak, scarlet oak and white oak, with a small admixture of pine and hickory. About a hundred and seventy-five cords of wood were cut from this boundary in addition to the saw timber, besides fence posts and some white oak spoke material. Among the small trees cut into posts were a good many post oaks, *Quercus minor*. The greater part of this cutting was done in the year 1906.

In the sale of the land to the College the contract permitted cutting of all trees down to two inches in diameter on the Northern portion of the land and through the pine growth East of the school house down to eight inches in diameter. This fact will be of value in future study of this block, as an index of the nature and rapidity of the growth which may follow.

There are large numbers of scrub pines of the thicket and early pole stage growing over the Northern part and at the Southern a pretty fair stand of trees of from four to eight inches in diameter of scrub pine, *Pinus virginiana*. The majority of these older trees will be suitable for cutting into light saw timber in about twenty or thirty years. Over the Northern portion, if protected from grazing, there will soon doubtless be a dense stand of this species of pine of young growth combined with a good deal of oak and hickory.

It would be advisable at once to cut the tops and coarse brush of the old timber into such shape that it can be piled for burning and have the whole burned in the more open spaces through the damp weather of winter when there is no danger of fire.

This land lying so near town and immediately along a much traveled public road offers great temptation to pilfering for firewood and ought to be fenced up at once.

The strip purchased of Mr. Kelley contains considerable old timber of inferior quality which could be cut for cordwood during the coming winter, the young trees of promise especially white oaks, pines and hickories, being preserved for the future stand.

There is no immediate necessity for the construction of the proposed road through this as the Davis road is sufficient for present needs.

Block No. 13

Block 13, comprising the Indian Fort lands, will be treated more from the pleasure ground standpoint than as a profitable portion of the Forest Preserve. Immediately within the Indian Fort entrance are a good many old trees of inferior character which are yet preserved for the shade they afford and their contribution to the beauty of the landscape. As these are cut off young pines and chestnut oaks will take their places rapidly and this change should be gradually brought about.

On the Northwest side of the block between the Robe Cottage and the Southworth Cottage is a very fine stand of young chestnut oaks, with some admixture of hickory, which would profit by a little thinning preserving the straightest and best specimens, and thinning somewhat more severely than would be done for commercial purposes only. This will in a few years become a beautiful growth which will be capable of adding very greatly to the enjoyment of all visitors to this remarkably picturesque and sightly spot.

The historic interest of this spot, from the face of its being a walled enclosure of some ancient people, evinced by the stone wall at the entrance and fragments of similar walls around other portions of the boundary should be kept in mind by all future caretakers of this property. In the College Museum are seven stone axes, or fleshers, which were found by William Robe in digging a cistern near his house on the property in the year 1899. These were found quite near the surface and all within a space that could have been covered by a bushel basket. Mr. Robe believed that the soil contained traces of the decayed wooden handles, which must have been attached to these. It is supposed that the spring in the shallow draw at the border of the Forest Nursery in the next block was the source of water supply for this beleaguered people, who had entrenched themselves within this stronghold.

A fact of further interest in this connection is that at the small spring in the "Rock House", beneath the cliff, small fragments of clay and muscle shell pottery were found, possibly of a broken water vessel. This clay work was of a type commonly attributed to the "Mound Builders".

Block No. 14

Block 14 includes about fifteen acres of cultivated land lying upon the highest portion of this mountain. The narrow South end of this field and Western border through the entire length has a soil rather thin and stony. The slopes on the other side of the spring and the portion rising to the highest point in the center and lying over the ridge to the North are still quite rich in spite of many years of cropping.

This land is of a sandy, clay nature, being dry from the soil lying entirely above the limestone, but is of an excellent quality for fruit. One of the best uses this field could be put to would be to plant it to an apple orchard. In order to secure the fruit when it comes into maturity a high fence should be run around it, but with a faithful tenant and caretaker on the property and such a fence I think the greater portion of the fruit could be saved.

There is a narrow fringe of timber surrounding this entire field upon soil too stony for cultivation and this timber is of much value in protecting the field from sweeping winds.

Two long, stony ridges run out from the East side of this to a quarter of a mile, each terminating in high cliffs of rocks. The soil is very thin and poor upon these ridges but there is a considerable stand of young chestnut oak and pine, which is worth careful thinning and extension.

It is only by preserving the timber growth on such a locality as this that any soil can be retained.

Block No. 15

This block comprises a strip of mountain side land sloping to the West and Northwest, broken through the middle lengthwise by the regular mountain bench at the top of the Waverly shales. Along this and on the slopes above it until the outcropping rocks are reached, lies a very good growth of young timber—oaks, poplars, hickories, black locusts and walnut being the chief species. Considerable old and damaged timber should be cut out and promising young growing stock given an opportunity.

A portion of the block below this bench has been badly treated in the past but contains some good trees of mixed oak and hickory and occasionally groups of poplar and pine.

In the lower portion of this land is a small cabin surrounded by a clearing which we have not been very successful in keeping tenanted the former occupant of the land cut this over so severely

that but little promising growth remains. Anything to secure a cover will be the policy on this portion for some years to come.

Block No. 16

This block lies in the lower lands adjoining Block 15 to the North and Northwest. It needs thorough cutting over looking towards a regeneration in pine, oak and hickory, as it was severely burned over South of the old road in the spring of 1900. Many burned and defective trees ought to be cut out from this portion and utilized as cordwood and the promising young pines and sprout growth of oak, hickory and maple allowed to occupy the ground.

The portion of this North of the old road, especially at the Northwest corner, comprises some of the best middle aged pine regeneration that we have. Yellow and black pines formed the mixture here, which will develop into valuable saw timber in another twenty years. This portion of the lands needs about the treatment suggested for the pine portion of Block 2.

Block No. 17

Block 17 is in part a continuation of the condition on the Northwestern portion of Block 16, but there is a considerably greater mixture of hardwood timber with this.

In the cove below the spring and garden of the old Johnny Pigg property, is a very fine growth of mixed hardwood and pine timber which would have been much more valuable but for the recent removal of a good many hickories and small bodied white oaks for carriage spokes. A good deal of wood could be removed from this land in the way of improvement cuttings, leaving a fine stand for future growth.

Block No. 18

Block 18 comprises a cove on the Westerly portion of the land from Mrs. Robe and is very similar in character to the lands of Block 17, requiring similar treatment. A judicious improvement cutting would furnish large amounts of cordwood material and put this boundary in fine growing condition. There are in both Block 17 and 18 a few old trees of inferior quality, which should be cut and their room given to promising young growth.

Block No. 19

Block 19 including the two houses on this Mrs. Robe tract and the cultivated fields, should be managed from the agricultural standpoint. The greater portion of this land has been cleared for long time and is pretty well worn. Rotations including grass, corn with cow peas, and oats, followed by cow peas should be the extent of the field cropping. With the right man as tenant much might be done on this land in fruit raising as several portion are finely adapted to this industry.

On all three of the Blocks—17, 18 and 19, will be found much valuable building stone of the gray green free-stone character. This stone perhaps comes out in larger blocks around this cove than are found on any other part of our forest preserve boundary, though the layers are not so thick as in some other outcrops. It is of excellent quality and will be fine place to send for stone of special dimensions for door steps, sills and similar purposes.

Block No. 20

Comprises a long narrow strip of land lying immediately under the cliff of rocks forming the north parapet of the Skinner purchase. This land still contains a considerable quantity of very good sugar tree and a little buckeye which could be brought down through the land of Garland Laws to a mill seat on the Northwest portion of the John Robinson tract whenever that tract is cut. The land around this bench is very rich and has in former times supported a magnificent growth of poplar and black walnut. No better use could be made of this land than to again plant it up to walnuts and poplars with the sugar tree as a protecting and nursing tree to carry the others up to the desirable long clean growth.

Block No. 21

This block comprises the most Northerly portion of one hundred and sixty-five acres purchased of John Robinson. It lies between the wagon road leading to the Horse Cove in the South, and the land of Mrs. Lewis on the North. This land is deeply cut up by the main Horse Cove Branch and a number of small branches, all having narrow valleys sharply cut through the black Chattanooga shales.

The timber of this land originally comprised a large amount of chestnut oak which was cut and peeled for the tan bark about eight or nine years ago. About the same time some short leaf pine was removed from the boundary. The year after the College acquired the property considerable cordwood was cut from the chestnut oak which had been left lying on the ground. The timber at present standing comprises a large volume of white oak and some yellow pine, the most of which could be profitably cut within the next few years. The more Southern portion of this contains considerable young growth timber which only needs the removal of the old trees from over it to enable it to develop into a very good young pole forest.

The recent fire which severely damaged the central portion of this Robinson tract was easily kept from crossing this road forming the Southern boundary of the Block—an excellent argument for a thorough system of roads from the standpoint of fire protection alone.

In my judgement there is a sufficient amount of timber upon this land to justify the setting of a mill for the harvesting of this without reference to the other portion of the tract, but when the mill is set the remaining old timber in block 20 will most profitably be brought down to this seat.

Block No. 22

Block 22 comprises the most Westerly portion of the John Robinson purchase, the lands lying on the slope of the mountain, descending from the limestone cliff by a steep slope to the narrow bench and from this bench by long spurs and hollows to the Eastern boundary line. This includes the most valuable white oak on the Robinson purchase and also in the upper boundary towards the limestone a number of very fine yellow oak or chinquapin trees, *Quercus acuminata*. This later oak when sound and well grown furnishes timber of a very superior quality. It lacks the redness of the white oak, having a little more of a hazel brown color, is finer in grain and considerably stronger and heavier. One white oak just above the bench path in this boundary measures fifty inches in diameter.

Many of these trees are beginning to show by the dead branches in their tops that they have passed the most active period of their growth and are actually going back a little.

The Southern portion of this boundary was severely burned in the recent incendiary fire, and as a mill is to be set for the cutting of the burned timber on this and Block 23 it will be wise to take out the trees in the unburned portion which give the greatest evidence of unsoundness or over age. Just before the purchase of this land from Mr. Robinson a large number of the best white oak trees were cut on this boundary.

Before the fire very many young trees, both of white oak and chestnut oak, could be seen coming in all over this tract and in the upper portion above the bench where the soil is considerably influenced by the limestone wash from above very many young ash and walnut trees may be found. It seems probable that over the burned area the tops of the young trees only are killed and that a sprout growth of considerable density will soon come up but of course, the young pines once scorched by the fire never sprout. There are standing a considerable number of middle aged trees of both the black pine and the yellow pine, and with the receptive surface in which this burning will leave the soil it is probable that a dense seeding up of pine will take place in the next few years if a good many of these trees are left as mother trees.

Block No. 23

This block comprises the portion of the John Robinson purchase lying South of the Horse Cove Road and extending to the first deep hollow on the Owens' line where it meets Block No. 24.

This land has been very severely cut over but there is a good deal of middle-sized pine, and white oak remaining and where not too severely swept by the fire, which was kindled at the Northeast corner of this block, this young timber may serve as nurse trees for the regeneration of the block. There will be a large amount of cordwood and some valuable saw timber to remove when the mill is set. It seems probable that a great amount of sprout growth will come up which will pretty nearly hold the ground. A careful inspection should be made to find all thrifty middle sized trees which were not burned sufficiently to cause rot and decay and leave these standing to aid in the regeneration.

Where sound trees are cut the stumps should be cut highest in the middle, sloping to the sides, so that water will not enter it and cause it to decay. This method will secure sound stumps for regeneration where decayed stumps would be apt to send up but few sprouts.

Block No. 24

Comprises the more level lands of the Southeastern portion of the Robinson purchase, although this block is cut through by a number of narrow valleys eroded deeply into the black shale. This block was largely comprised in the clearing of an old farm occupied before the Civil War, and but a small portion of it has been in cultivation since that time. The greater part of it had come up to a very handsome growth of mixed pine and hardwood, very fine examples of the yellow pine being conspicuous in this growth. White oaks, black oaks, Spanish oaks and mockernut hickories form the most important part of the broad-leafed growth.

This portion of the land was so severely swept by the fire that the greater part of this young growth will be best cut for cordwood, only a few of the pine trees being large enough to be worthwhile to take to the saw mill.

Careful inspection will show that in spots where the fire burned with the least force there will be considerable number of trees not sufficiently scorched to be injured. The fire was a great disaster to this entire block, which contained throughout a large amount of valuable young growth, together with the ripe oak and pine ready for the mill.

As in the previous block I strongly recommend that here thrifty young trees be left as far as possible as mother trees to seed up the land. There will be sufficient number of yellow and scrub pine for this purpose if they are carefully selected by the supervising log cutter, their winged seeds being carried so far that six or eight trees to the acre will be ample for this purpose. By leaving all of the white oaks of sound character up to twelve inches in diameter, and with some hickories, black

oaks, and chestnuts, I think there will be a sufficient number of seed trees to fill up the land not seeded by sprout growth.

Block No. 25

Block 25 comprises for the most part the lands purchased by the College from Sant Baker.

The Northern portion of this block running from the road up to the point of limestone rocks is very well stocked with scrub pine with a considerable mixture of black and white oak. These trees are about of medium age, probably forty or sixty years old. Many of them are of good length of bole and well cleaned up for the first and second cuts.

This is as good an example of the best of the scrub pine, *Pinus virginiana*, as we have in the Forest Preserve. While these trees will never make first class timber of large dimensions, in twenty years from now a very good amount of scantling and some fairly good board timber can be cut from this. This should receive some attention in the way of thinnings where it is crowded and especially any white oak that is being overtopped should be looked after.

The Southern portion of this boundary is much younger but contains a very fair regeneration of mixed scrub pine, oak and hickory, and white oak being especially good on the South side of the branch toward Hazelwood's line.

In the deep slate cuts on the creek is a small grove of hemlock commonly called spruce pine in this section, which while not of great value as a timber tree, as it grows in this situation, is very interesting as representing this species, which is here far out of its main range and only able to survive in cool, moist situations like this which it occupies. This little crop will be a very interesting one to students in forestry, being about the only available representation of this species for a good many miles.

Block No. 26

This comprises the cultivated lands of the old Si Baker place, now very much worn, lying in the first deep hollow of the Baker purchase. This includes considerable young growth timber immediately above the barn road, the lower being pine growth which gives place to red bud, hickory, ash and walnut higher up in the slope where the soil is better in quality. Many grape vines have come in, and these with the red buds should be cleared out giving the better trees the opportunity to occupy the ground. This block also contains a considerable stand of yellow locust along the upper borders of the old grown up field. This will make a very rapid growth and have already reached a good pole size. In 5 or 6 years a very considerable number of excellent fence post can be cut from this boundary. In the central portion of the valley the land has been cultivated until recent years and

a small field was cultivated by the present tenant last year. Crop returns were but meager however and the only thing that will prevent the complete exhaustion of this land is cropping in cow peas until it recovers a little, so that grass and clover will take hold. It would be better on the whole to let this cove be entirely stocked up with timber and abandon it for cultivation. Another alternative would be cropping with peas for a time, say two seasons, then seeding to grass and clover as thoroughly as it can be done and allowing the tenant to use this as a pasture for his stock. By fencing one or two gaps at the head of the cove, the front, and the sides the spurs leading down to the valley, the pasture will be enclosed with very moderate expense. A portion of the Eastern side is already fenced down the ridge from the high cliff of rocks and this fence would only need the addition of two more wires to make it secure for all kinds of stock. There is sufficient water in the lower part of part of the season and a shallow well dug in the level bed of the bottom land above the road would supply water in an emergency.

Block No. 27

This block comprises a horseshoe shaped tract of timber lying on the steep mountain sides above blocks 25 and 26, containing a very considerable number of poplar trees of good quality, a small amount of pine and a variety of mixed hardwood timber, the most valuable of which are white oaks. This timber is sufficiently ripe to be ready for cutting and if not brought out to the mill set proposed on the pike road and sawed the coming winter or spring it should be taken care of within the next few years. There is already a large amount of young growth timber on this land and if the old timber is carefully removed damaging the young growth as little as possible the entire boundary will soon come into a profitable growing stand. In order that the young growth may have the best opportunity, there should be removed not only the merchantable trees which are taken to the saw mill but any old trees of whatever character that are shading and retarding young and valuable growths.

This boundary will support a large number of poplars and black walnuts and a considerable number of ash in the more moist portions. Wherever chinquapin oaks come in they should be encouraged as they make a rapid and valuable growth on limestone soil. This ought also to furnish considerable numbers of the valuable hickories which would help to form the more dense mixture in the younger years of the block and would be cut out for spoke timber with the thinnings and partial cutting of the middle ages, say at from 30 to 40 years old.

Block No. 28

This comprises the cultivated lands in the second hollow of the Baker purchase as a considerable boundary once cleared and cultivated but for more than 40 years allowed to grow up in timber. This second growth timber is now in the advance pole stage and contains some pine of very good development, much valuable white oak and hickory and considerable number of black locust. This has received a partial improvement cutting at the hands of Mr. Bryant, the tenant, during the past year, but this work should be continued, removing most of the red buds and such other trees as are crowding those capable of growing to the best dimensions. The lands at present in cultivation are badly worn, and the uppermost field I would recommend planting in black locust from the Government Forest Nursery for the development of a crop of locust posts. These seed trees in the nursery should be transplanted to this ground quite early in the spring. There are about ten thousand of them they should be set about the usual corn hill distance, 3-1/2 X 3-1/2 feet.

Block No. 29

This comprises a second horseshoe shaped boundary of timber lying around the upper portions of the second Baker cover, heading at the low gap between the Indian Fort and Wild Cat Mountain and under the perpendicular cliffs of the Indian Fort proper. Beginning well around towards the base of the Wild Cat Mountain this growth is largely sugar maple and buckeye with a few other species mixed in. This portion in the low gap was partially cleared over an area of about five acres some ten years ago but many old trees are still standing there. This land is very rich and productive, and where it does not lie too steeply and too much broken would make valuable corn land for a number of years to come. I would recommend that the tenant be allowed to clear out a field of as much as ten acres in this portion and prepare it for crops. The old fields which are now in cultivation have been cropped for more than 30 years. While these lands would make valuable growth of timber if the old trees were removed and the young trees given a fair opportunity, the interests of the whole place would seem to indicate that this be put into a cultivated field. In order that the College may be able to keep a desirable tenant on the property he must have some lands for cropping which will give him fair results for this labor and some encouragement for remaining there. The welfare of the entire boundary on the north and East side of the Indian Fort depends on having a trustworthy and reliable tenant in this Baker house. The College has expended considerable money in repairing the house and fencing the door-yard and garden, and with this additional field, it is probably that Mr. Bryant or an equally good man may be induced to remain upon the place.

These 29 blocks comprise the entire boundary lying North of the Berea and Big Hill Pike, which I have designated as “The Indian Fort Range.” *

*At some future time, I hope to be able to complete the plans for the treatment by blocks of the Cow Bell and Bear Knob ranges.

S.C.M

Improvement Cuttings

Improvement Cuttings

By an improvement cutting is meant not so much a cutting for the securing of some definite forest product as one made for the purpose of improving the general growing conditions of a particular body of timber. Such cuttings may be made at all stages of growth from the early pole stage, through the pole stage and mature high forest and after the heavy logging cuttings have been made. In cuttings in the early pole stage the general object will be thinning for the purposes of giving the growing trees more space, the removal of worthless species and the removal of unpromising or worthless individuals of better species.

Over the greater part of our Forest Preserve the stand will be a more or less miscellaneous mixture of several species but the character of this mixture will vary greatly with the locality, exposure and soil, so that with any given block, as the forest lands are divided, some particular set of conditions will prevail, and some few species of trees will be the principal ones for this block and the others will be accessory. The principal species should be one which will have an opportunity in the final growth of mature high forest timber. An accessory species will be one which is allowed to grow for a time to contribute to the well-being of the principal species either in crowding it up to a better height growth or in shading the ground and making a cover to protect the soil. These accessory species may have a minor value in furnishing forest products, as fuel, poles, light carriage stock, light wagon spokes, or in some cases small sizes of saw timber.

In the mixture of various species the forester should make a close study of the relative height growth of each and their ability to endure shading or their demand for light. Wherever a principal species is one which is highly intolerant, or light demanding, as in the case of poplar, ash, black walnut, black and red oak and yellow pine, care must be taken that these species are never overtopped by other trees, as from their very nature they are apt to perish soon after this occurs. Wherever young trees of this character are growing they should be watched closely and if other trees of more vigorous growth begin to crowd them or threaten to overtop them such should be cut away, or in the younger stages of forest growth, the advanced thicket or younger stages of forest growth, the advanced thicket or early pole stages, these crowding trees may be lopped back, cutting them off from two to four feet from the ground. This will allow them to follow the other trees up, giving the soil the benefit of their foliage protection and the principal species of tree the benefit of their shading on either side to keep off side branches and compel it to make a long, clean bole.

With trees of the nature spoken of as intolerant, or light demanding, and several other species might be included here, such as the hickories, persimmon and yellow locust, care must be taken that they are never entrusted with the task of making a complete canopy for the soil. They do

not make a sufficient crown, or leaf surface, except during the few earlier years of their lives, to enable them to do this. So if they do not have mixed with them during their earlier years species like the sugar tree, beech, elm, white oak, post oak, black gum or the scrub pine, the soil will lack for proper shade as the trees get older and the right condition of humus will not be kept up.

It will be found that complete shading of the ground and maintaining the quality of the soil will be harder to secure on the sunny slopes of the mountains than on the northern. One reason for this is that many of the best shading species refuse to grow there. Another is that the humus formed decays much faster in these hot and exposed situations and a third and very important reason is that these localities are much more exposed to the damaging action of fires, snow melting there most quickly and rains drying out most rapidly. It follows that in such places almost any kind of a tree which will help to make a cover had better be left. If such cover can be secured it will follow some of the most valuable species will delight in this warmer locality.

Taking up the matter of improvement thinnings in a more definite way, it will be found that in mixtures containing the white oak, at quite an early stage, usually when they are from two to six inches in diameter, a period when the growth of the white oak is not very rapid, they are apt to be over-taken and overtopped by some species of the black oaks.

The scarlet oak, *Quercus coccinea*, is not in itself a very valuable tree except for fuel and is one of the worst in overtopping other trees. As it passes from the pole stage to the high forest stage it grows in height with great rapidity, and has a remarkable power of suddenly branching out and expanding a large top which will in some cases overshadow and destroy five or six more slow growing trees which may be caught beneath it.

While protecting the white oak against overtopping in making thinnings it should be remembered that the white oak itself is rather tolerant, and unless pretty closely crowded on the sides will retain a good many older branches and make inferior timber. It should, then, be crowded as closely as possible and secure vigorous and healthy growth, and at the same time guard it against overtopping. In the management of the mixtures containing the Jersey, or scrub pine, special care should be taken to prevent this tree from producing large, coarse side branches, which it is strongly inclined to do unless very closely crowded from the sides. It can sometimes as a young tree be carried up as closely as two feet apart each way, or two feet by four feet, until it has reached a height of twenty or twenty-five feet. It ought then to be given somewhat more space but can stand at a distance of four feet apart each way until it is thirty or forty feet high. In this way the side branches are prevented from reaching much size until they are shaded off and so remain too weak and soft to

become permanent knots. After about two log lengths are secured fairly clean and clear the wood should be thinned somewhat more to give the trees greater growing space, but a much larger number can be held on an acre than of the yellow pine. This scrub pine seems to do very well mixed with black and white oaks and hickories, as they furnish as young trees a good deal of shade and yet being more deeply rooted give the pine a better chance than some other trees would do. This pine does well in groups of three or four surrounded with oaks. As I have said in my general description of it, we can only expect it to become a tree of second size and importance, it very seldom making the large, fine growth that the yellow pine will make so readily.

In thinnings and improvements it should always be kept in mind that a damaged tree, one which the fire may have scorched, or which has been carelessly chopped into or is misshapen, should not be allowed to grow where the conditions are such that a young tree of good character might take its place. There will be cases where the necessity of preserving the forest stand and keeping a complete cover will warrant allowing imperfect trees to grow for this purpose and as other trees enlarge and progress, these, of course, should be the first to be taken out. The nearer we can come to having the entire growing stock composed of valuable species and perfect individuals the higher will be the return from the land when harvest time comes, either a partial harvest of thinnings or the final harvesting of the main crop.

In many places on our lands dogwood bushes up to the size of small trees, black gums and grape vines are growing, greatly to the detriment of the valuable kinds of timber. In warm spots in rich cove lands the grape vines are especially bad, and much valuable young growing stock is today being misshapen and checked by their encroachments. The cutting off of grape vines in midsummer is the surest way to prevent their renewal. If cut in the winter or spring the trees may be helped but a new crop of vines will soon grow and become as bad as the old. However, it might be a good motto to cut a grape vine whenever there is an ax or hedge hook handy.

In much of our timber of somewhat advanced age, that is, in the pole stage of from six to ten inches in diameter and height from forty to sixty feet, the removal of imperfect specimens, those which have sustained some injury and could never in the long run become perfect mature trees, is very important part of the forester's work. Here considerable returns for the labor can be realized in cordwood and sometimes even a few spokes secured. Among pines of this age a good many poles may be taken out which will make rafters or other light building material for the cheaper farm buildings or even for roofing small houses, and sometimes plates or joists could be hewed from

long, straight black oak poles which need removing for the purpose of giving more growing space to better trees.

Many of our young poplar thickets need protection for a time against the sassafras. Sassafras trees ought to be watched very closely as they propagate enormously, both from sprouts and from seeds, and wherever young poplar seedlings are coming up among them the sassafras should be slashed back with a free hand to give them room. Once the poplar growth is out of the thicket stage and clear of the sassafras neither that nor anything else can overtop it. Where a nearly pure poplar stand has become established they may need considerable thinning against one another after the lower boles are well cleaned up, as they seem disposed to grow in such crowded condition as to exhaust the soil.

It is probably that a little later many of the poplar poles removed in such thinnings can be utilized in the manufacture of excelsior. It might even be worthwhile for the College at some future time to put in an outfit of excelsior machinery if no shipping market for excelsior bolts can be developed. Good excelsior is always a scarce commodity in city markets.

Another class of improvement operations perhaps as much needed as anything is work upon recently cut-over timber lands. A good example of this can be found in the Cow Bell Hollow where the logging was recently completed. Here many trees are still standing of sufficient size to shade the ground and so hold back the young growth which is struggling for an opportunity, yet trees which in themselves have no future, being either decayed, hollow, or in some other way worthless in character. Something might be realized from many of these in working them into cordwood, but on the whole this class of improvement cuttings is likely to end in actual expense of outlay. It is none the less important that such worthless trees should be chopped down their tops chopped up and spread out on the ground where they will decay quickly, or else be gathered into piles and burned, so that the growth of the new timber may not be interfered with. This advice is of special importance all over the Waverly shale land where so much of beech and sugar maple has been growing. The removal of old chestnuts which are of similar menace to the ground is also important, but this has already been spoken of under the head of the chestnut species.

With so large an area some of these improvements should be going on all the time. Otherwise, a great amount of time is lost and a waste of soil material is also taking place.

There are some exceptions to this advice about general removal of worthless trees. Crippled trees will bear just as good seed and sometimes more of it than sound trees, so that wherever a tree of a good species, though a poor individual, is in a favorable situation for the purpose and is needed

Improvement Cuttings

to scatter seeds for the stocking up of any adjacent lands, it should by all means be allowed to stand. This would be especially true with poplars, black walnut, ash, white oak, chestnut oak and the pines.

Brush Burning & Forest Cleaning

With the best of care some forest fires will occur in a boundary so exposed as that which we possess and made up of hardwood, broad leafed timber species which produce great quantities of leaves. Every precaution then should be taken to have the forest land in such a condition that when a fire does enter the land it not only may be confined within narrow limits but the damage be as slight as possible.

As long as there is a good deal of old timber standing of a valuable species scattered along the hill sides a good deal of regeneration will take place and the new timber growth be replacing rapidly the old, but with the cutting off of the old trees or their natural decay with age if the young timber crop is lost there will not be mother trees upon the land to again stock it up. So for this reason the suppression of fires and controlling of heavy damage by fires is of the utmost importance.

Upon cutting over timbered lands the best forest practice demands that the tops and brush shall be cut down and piled up in open places and burned, selecting for this burning some damp quiet time in the winter season. It is advisable that dead trees, old snags, and old logs should be burned also. When a fire enters the land these quickly catch fire, the fire gets into the hollow heart of the log or into the deep crevices and is very hard to put out. It will smolder there perhaps for several days after the main fire is out, ready to be fanned into a dangerous flame to furnish sparks and fragments of burning material whenever the wind shall arise. If such materials are near a fire line where the advance of the fire has been checked, without the greatest of care the fire is often blown across and the devastation continued. Within a burning area, all tops, brush and down logs and materials of that kind feed the advancing fire into an intense heat which greatly increases the damage done to the standing timber.

This has been very vividly illustrated in the work of the incendiary fire which has just been suppressed on the east half of the John Robinson timber purchase. The tops remaining from chestnut oaks cut for the bark before we owned the land and from some timber of our own cutting were very abundant in this land. At the point where the fire was stayed by backing fire along a narrow old forest road it was only by the most intense exertion that the fire was kept in check. At the most critical time about thirty men were scattered along this line, but the smoke was so heavy and the heat so intense that it was a matter of considerable heroism that the fire was held in check at all. The danger was increased by a number of old standing snags, worthless for purposes of timber or fuel, but which took fire with great rapidity and were with difficulty chopped off and thrown back into the burning area. One of these actually fell back into the unlighted grass and leaves and it was

only because of the immediate presence of seven or eight men that the fire was whipped out and prevented from advancing into such a rough territory that it could not have been controlled at all for another half mile, if, indeed, it could have been stopped before it reached the pike road.

All of this points to the wisdom of our making considerable expenditures in cleaning up and burning brush over our main most valuable forest tracts.

It will be remembered that I urgently recommended this procedure to the Prudential Committee at the time when logging operation were begun in the Cow Bell Hollow. It may not be remembered by all the Committee that the most influential advice in preventing this course being followed was given by the member who was retained on the Committee at the same time he was the head of a department at the College, this departure from established Trustee rules being explained on the ground of his knowledge of local conditions was so important that his services could not be dispensed with. With the object lesson of this last disastrous forest fire before us all I want to take this opportunity to urge again upon the Prudential Committee the importance of having a great amount of this brush and tree top material in the Cow Bell cleared up and burned. It not only menaces young timber if a fire should sweep through, but great quantities of it lie along the roads and logging trails in such positions that the heat of its burning and the sparks and brands if a high wind should prevail would make it almost impossible to check the advance of the fire across these safe guards.

Such an expenditure will, I know, seem like dropping money into a hole, but it should be regarded as making an investment in forest property to bring its return in the future timber harvest, and although this future may be a remote and distant one and compound interest on such an investment bring the total sum up to a high figure yet I feel sure that the rapidly enhancing prices of all classes of timber in our country will amply justify such expenditures and leave a handsome profit in favor of the Forest Preserve when such a harvest time shall have arrived and the balance be struck.

Of the same nature as this will be outlays for the minor roads and trails which I am recommending throughout the forest. Last summer I made an urgent request for \$300.00 to expend in the employment of a squad of students during the summer vacation in road construction. This was refused and I fully appreciate the necessity of this refusal with so many calls for expenditures in all departments. At the same time it must be called to mind that the damage from the two recent fires upon the remote sections of our forest property could not be computed within less than \$1500.00, five times the sum for which I asked. It would not be logical to claim that the

appropriation if granted would have been expended on roads in these particular tracts, but it would have been expended in making roads on tracts which are to-day in just as great danger and where the damage would have been as great or even greater if the fires had been lighted in these sections. If an appropriation of about this sum or even a larger one can be made every summer for such work before many years will elapse a complete system of fire guards and trails will be developed so that with the breaking out of a fire or a threatened invasion from the outside the forest tenants could at once resort to these fire guard roads and it would be a comparatively simple matter to hold any ordinary fire within a boundary of from ten to twenty acres.

With the careful and methodical methods of the German foresters fires have been practically eliminated from their calculations. In three months spent in studying their forest conditions, traveling over half the entire German Empire, I saw evidences of only one or two recent fires, those over very small areas. The only trace of a large burning was one which occurred over thirty years ago.

It is true that our conditions, both of climate and the face of a large predominance of broad leaved timber trees, renders this danger from fire much greater in our territory. This only makes it more important that we should exercise every precaution and skill in the prevention of such ravages.

Special Management of Certain Species of Timber in the Forest Lands

Jersey Pine, *Pinus virginiana*

Of the two species of pine found on our forest lands this is the smaller and more inferior in the quality of its timber, but possesses several very valuable characteristics, the first among them being that it is exceedingly prolific of seed and the seedlings possessed of great vitality, so that on all the lower lands of the Chattanooga and Waverly shales this is coming in and occupying the ground with every opportunity.

Silviculturally, it is a tree which grows under a good deal of shade, that is, it is one of the species which the foresters class as tolerant, or shade enduring. This means among other things that the side branches are very difficult to get rid of, not being deadened and shed off by the tree's own shade, but persisting in trees that are not closely grown and forming numerous knots, much to the detriment of the timber.

This tree is a rapid grower in height and on most kinds of soil in volume, but does better on the rather moist, clay soils and shales than it does on the dry, sandy upland regions. It is one of the few coniferous trees producing a tap root. Owing to this tap root, it is able to reach down into the moist layers of soil and so survive quite severe drouths of the summer time.

Where the species grows in rather open order as a young tree it forms numerous side branches which soon become hard and resinous, so that even if these die with the advancing age of the tree they are not quickly pruned off by decay, as in the case of the branches of the yellow pine, but persist as hard, brittle subs, which being enclosed by the advancing growth of the trunk produce knotty timber. But where there is a close stand of pure pines or of pines mixed with oaks or other species making considerable dense shade, these pines will run up quite rapidly in height and from the shading the lower branches are killed off while mere soft little twigs, so the bole is cleaned up to a considerable length. This, of course, is an essential to the securing of clear, fine quality of timber as the growth is added.

This tree forms heart wood quite rapidly, having at no time more than half an inch of sap wood, unless when the trees are very young, and as a tree of small size the timber is quite strong and stiff. It does not resist decay well when exposed to the weather. Trees from four to six inches in diameter used as studding, plates, rafters and for similar purposes in the framing of buildings are strong and durable. For many kinds of farm construction poles of this character removed as thinnings from growing stands of from fifteen to twenty years old will have considerable value and it is entirely possible that at no very distant future such poles straightened perhaps on two sides to get

nailing surfaces by passing them over a small saw, would have considerable use in the construction of houses. In Germany very considerable buildings are framed from pole timber dressed to building surfaces with a hewing ax and while the probability is rather remote, with the rapid disappearance of the old growth timber in our forests such pole stock is likely to have considerable value and this possibly at a much earlier date than we now anticipate.

These trees will stand at about the rate of four or six to the square rod, running up to fifty or sixty feet high at thirty or forty years old. By the time they are forty or forty-five years of age they will furnish small saw logs which will yield to the acre a large amount of light framing stuff, such as two by four, four by four, and two by six, in lengths of twelve, fourteen and sixteen feet.

A nearly pure stand of this timber on a little round knoll of about three acres owned by William Burnell near the Narrow Gap was very carefully studied by me three years ago and the average increment for the entire period of its growth was found to be about the same per acre as that of the best Scotch pine forests of Prussia at a similar age. Probably the quality of timber would be somewhat in favor of the European tree, but a surprisingly large amount of very valuable scantling timber could to-day be sawed from this little grove which was a corn field less than fifty years ago.

This tree at maturity, excepting in very favorable situations will be only a second or third class tree in size. From the very large number that can be maintained on an acre of ground and still have them make a rapid growth the most profitable policy in the management of this would be probably to work it on a rather short rotation, not exceeding in any case sixty or seventy-five years, but much of the timber harvested at forty or forty-five years.

I have carried out some experiments in pruning up the trunks of this tree where they have grown a little too openly to entirely shed off the lower branches and find that an active man with a light, long handled ax cleaning up the trunks as high as he can reach, followed by a man with an automatic pole pruner, can clean up the trunks from the ground to about sixteen feet for trees not more than three to four inches in diameter at a rate which will make this a decidedly profitable operation in our forest tending.

As this is one of the most abundant trees on our Forest Preserve, by far the most abundant pine, the College may look for a large income from this source within the next twenty or thirty years and there are very considerable numbers of these trees which may profitably be harvested in ten or fifteen years.

Yellow Pine

The short leafed, or yellow pine, *Pinus echinata* of the revised botanical lists, is the most valuable timber pine growing upon College property. It differs from the Virginia pine, already described, in preferring higher and dryer soils, although the two are not infrequently found growing together.

It is a tree capable of growing to a great size and of living to a greater age and furnishes a far more valuable quality of timber than the scrub pine.

In former years large numbers of these pines grew along the high dividing ridges and to some extent in the lower lands all about Berea. They furnish such long, clean stems and are so rapidly cut into saw logs and so easily handled that they were naturally among the first trees to be cleared out. The only grove of older growth of this pine now left upon College lands is a small group near the low gap between the Indian Fort and the Wild Cat Mountain. Probably from thirty to fifty thousand feet of this timber was cut about the head waters of the Cow Bell. There are a good many small groups of trees from three to ten inches in diameter scattered over the Preserve in many places, some of the most easily noticeable being found on the old field growth of the Rich lands soon after entering that boundary from the pike road.

These trees may be distinguished from the *Pinus virginiana* by having much longer, cleaner boles, coarser and stiffer branches, longer and straighter leaves and by the coarser scales of the grayish bark.

As the trees gain a little size the bark from the ground upward for two or three feet becomes remarkably thickened, affording much better protection against forest fires.

In silvicultural habits this tree differs in a very marked way from the scrub or Virginia pine. While in many localities it seeds abundantly, in our section it is much inferior to the scrub pine in this respect and there is a lack of seeding up of young trees which is hard to explain, there being in places considerable groups of seedling pines of older growth.

During its earlier years this pine grows very rapidly, so that the trees are often found twelve or fifteen inches in diameter and seventy-five feet high at forty or fifty years of age. It is a very intolerant tree for a pine, being quickly killed with a very little overtopping and shading, growing rapidly in height in order to keep its head above its competitors and quickly shading off its lower branches if grown in close order at all, either in pure mixture or with other trees. It affords but little shade for the ground and does best grown in a mixture with other trees which are capable of

forming a canopy and keeping up the quality of the soil. Where it comes in by itself as the trees increase in height and shed off their lower branches from the influence of their own shade so much light is admitted to the soil that other species very soon come in and take possession, forming an understory. This may be worthless briars or small scrub trees of other sorts or occasionally they may be a valuable species. With a tree of these characteristics and on producing such valuable timber it would be an excellent plan to procure from other sources seeds to be sown in nurseries or to purchase from some of the large southern nurseries supplies of young trees for planting out. In the mellow, sandy lands of the upper zone of the Forest Preserve small groups of these trees planted in the open spaces would come forward very rapidly if they were given a little care and with the other species which produce more shade to shelter the ground the whole forest would be well preserved and these would be valuable members of the mixture.

To secure this tree, however, in sizes for the best timber products, long stick capable of producing large framing timbers or fine finish lumber, they must be brought to a great age. The fine, large trees that are being cut at present for heavy framing work are from a hundred and fifty to two hundred years old. Probably with the better care which a well-managed forest would receive very good results would be secured from yellow pine trees at a hundred years old. In German forests the equivalent of this tree is the Scotch pine which is grown to about a hundred years old for the main crop. When harvesting this they leave ten or twenty trees to the acre standing and the ground is planted up again to young trees which grow along with the old trees with the expectation that the crop will be harvested in another one hundred years. The two hundred year old trees will have reached a majestic size and are expected to furnish a very high quality of large timber and to net corresponding prices.

While I have spoken of this tree as growing to its best size on the high zone of sandstone lands, very good specimens are produced in the better drained situations upon the Waverly shales. We have a good many valuable crops growing rapidly in such localities, some of which may be seen from the pike road in Block Number 1 of the Indian Fort Range. Many other small groups may be planted in the open spaces on this and similar lands with great profit.

Tulip Poplar, *Liriodendron tulipifera*

The poplar or tulip poplar has on the whole been the most valuable forest tree of the Appalachian region. The desirable qualities of its timber, together with the fact that it is light enough to be easily floated to market, have caused this to be almost the first timber exploited, and millions of feet of it have been driven down the small streams, rafted down the rivers and sawed into lumber at the great milling centers.

The natural soil for this tree seems to be a rich, mellow, sandy loam, although the greatest size and best quality is usually reached where this loam is reinforced by a limestone base.

In many of the rich north coves of our forest tract the poplar trees have in times past attained enormous size. The accounts go to show that in Cow Bell alone two or three million feet have been cut.

Poplar trees produce immense numbers of seeds somewhat of the character of the samara, or key, so light and so winged as to be scattered over great areas by the wind. Were it not that a large percentage of these seeds are usually abortive, every available rod of land would long ago have been stocked up with young poplars as thickly as weeds. As it is, very large numbers of young trees gain a foothold but unless there is abundant light they soon perish. Along logging trails and where heavy clearings have been made in the old forest great numbers come up, but the heaviest stands are found where old cultivated fields of a mellow, sandy nature are abandoned. Here over considerable areas poplar has come up in nearly complete stands.

These young poplar trees are of a very intolerant nature, not enduring much shade but growing in height with immense rapidity, often making in height with immense rapidity, often making an average gain of four feet a year for the number of years. During early life the trees make quite a dense canopy, but as they get older the crown of the tree is very small in comparison to its trunk diameter, so that, they afford but little shade, and a forest of old poplars will have a dense understory growth of other species.

None of the old fields on College property are of as great age as some on adjacent lands, but in a few cases old field growth of forty or fifty years can be found. Some of these trees are twelve to eighteen inches in diameter.

The poplar tree, however, is one which begins to form heart wood but slowly and the high value of poplar timber is based entirely on its production of yellow or heart wood growth. So poplar poles of small sizes, in fact, anything under fifty or sixty years, have very little value except for light,

small stove wood and where produced in sufficient quantities to find a market for the manufacture of paper pulp or excelsior.

Such numbers of trees can be maintained upon an acre, however, and the growth is so rapid and the product so valuable when mature age is reached that young poplars grove has a prospective value for beyond that of most species of timber. On many of our forest tracts where the young poplars are coming up, they are accompanied by such large numbers of sassafras as to be much crowded and overgrown by them in their early years. Here it becomes very important that the sassafras should be lopped back and be prevented from suppressing the poplars. Once the young poplars are established and have their heads above the other growth, nothing can overtop them.

Over considerable areas of our cut-over lands in Cow Bell young poplars are already beginning to come up since the logging operations, but there are frequently inferior or worthless trees of considerable size shading the ground sufficiently to prevent any valuable development of the young poplars unless considerable further clearings are made for this purpose. Some of these trees would furnish some fuel; others would simply be chopped down to ride the land of their presence.

As the poplar after the first stages shades the ground but little, other species are sure to come in with them and in forest management some interference and direction in such matters is quite important. The sugar tree or sugar maples is a tree enduring a good deal of shading and as a young tree grows quite rapidly in partial shade. It is a good tree to have mixed with the poplars or with the black walnut in considerable numbers as an understory. Its foliage is very good for enrichening the soil. It keeps a canopy over the ground and grows rapidly enough in height to help the poplar by causing it to shed off its branches and form the long, clean boles so valuable in producing commercial timber.

White Oak

Another abundant species of tree on the better quality of our shale lands is the white oak. This is the most important oak of Kentucky commerce. Vast forests of it have been cut and worked up into cooperage stock and large quantities are consumed in the manufacture of fine furniture, flooring, and finish lumber.

The tree is of decidedly slow growth especially as a young tree. An average stand of mature white oak trees from eighteen to thirty or thirty-six inches in diameter will be found to run from two hundred to two hundred and fifty years old. A good deal of important American history is included in the period since these trees were acorns. Realizing this fact and the fact that but few good bodies of white oak trees remain accessible to railroads we see why far sighted foresters and timber dealers are anticipating enormous advances in prices of white oak timber within the next few years. Another grave feature in the situation is that of what are called the age classes; that is, of trees ranging in age from seedlings and thicket to poles, standards and on up through the various ages of young forest, fifty, one hundred and a hundred and fifty years old; the middle and higher age classes are almost entirely wanting in this country and the same is almost entirely true in foreign countries. In Kentucky with the harvesting of the large sized white oaks wherever the timber lands have lain sufficiently near the railroads to justify hauling, that is, distances not more than ten or twenty miles, nearly all the middle class oak trees have been hewed into cross ties and sold to the railroad companies.

Quite recently considerable boundaries of young timber have been cut over in a very wasteful manner in the manufacture of large sized wagon spokes. This second growth stock brings very high prices, not as high for the producer as for the manufacturer, however, a set of wheels of the best quality of second growth of white oak for a heavy transport wagon costing \$60.00 and \$75.00. The market price for this class of stock at present is \$40.00 a thousand for spokes of about four inches square. I have given these details of the use of the white oak in order to show the importance of the white oak in order to show the importance of preserving the young white oak trees upon our forest lands.

As a young tree the white oak is the most tolerant or shade enduring of our oak trees, being able to hold out under quite a little over-topping of other trees, and this habit along with its rather slow growth as compared with the black oak species often puts it in very great danger. Before the fact is realized such species as the Spanish oak, the true black oak and more particularly the scarlet

Special Management of Certain Species

oak will have over-topped the white oak trees and so suppressed and stunted them while they still appear quite vigorous and thrifty, that their future development is very greatly impaired.

At the same time, as the white oaks clean the trunk of side branches with considerable difficulty, rather close shading is needed that the tree may be forced up to a considerable height, producing a long, clean bole free from knots at as early a date as possible. Perhaps no other tree in our Forest Preserve calls for a higher degree of skill and judgment on the part of the forester than the white oak. On our forest lands at the present time are large numbers of young white oak trees in imminent danger of being over-topped by other growth, and others have already suffered. One of the most profitable thinning and tending operations that could be put on foot would be to go over the entire boundary and adjust the conditions of the young white oaks in the most skillful manner. Considerable has been done toward this on Blocks 1, 2, and 3 of the Indian Fort range, and something has been done on Blocks 1 and 2 of the Bear Knob range. Nearly the entire area of Block 1 of the Cow Bell range needs taking in hand immediately with this end in view, and there are a considerable number of other important areas which need the same treatment.

The Chestnut

Over considerable areas of the higher portions of the Cow Bell and Bear Knob Ranger, the chestnut is the prevailing timber. It is also found to some extent in the soils below the limestone on the Waverly and Chattanooga shales, but the sandstone ridges, familiarly known to the people of the country as chestnut ridges, are its principal homes.

The chestnut is a tree of very rapid growth, decidedly intolerant in its habit, quickly shedding off its lower branches and sending its top up to the light at a rate of from two to six feet a year during its early life. It attains its best dimensions where it is considerably crowded and forced up by the shade below, but in the case of sprout growth there is some danger that over-crowding may force up such long, slender sprouts that they will not have the strength to sustain the weight of the top and so droop over and become ruined for timber purposes.

From the smallest size the chestnut begins to form heart wood, so that in any large timber cut not more than a half inch or an inch of quickly decaying sap wood will be found. This makes the chestnut poles of small or medium sizes of considerable value where the other trees only produce heart wood at a much more mature age.

Of all the species of trees upon our forest boundary the chestnut sprouts the most readily from stems or roots when the old trees are cut down or die from old age. Other trees may sprout considerably when cut back during their earlier years but the chestnut will send up vigorous sprouts from the oldest and most inferior roots. Much of the most valuable chestnut growth upon our lands is in the form of sprouts from stools resulting from the cutting of trees forty and fifty years ago. Such stock as this has become the accepted form of telephone and trolley line pole stock throughout this section of the country. Where grown in rather close order they reach a considerable height without too great a butt diameter, but where the growth is more open the taper of the stem is so great that a pole of inconvenient size at the butt is grown before the necessary length and top diameter is reached.

Of a crop of shoots coming up from an old stool a considerable portion will be either too slender or defective in character and so of no future value. A careful thinning out of such stools, reserving the proper number of straight poles, is the correct treatment.

There are still upon our forest lands, especially about the head of the main prongs of Cow Bell Hollow, a considerable number of very large old chestnut trees which are too defective in

quality, either from decay, wind shake or worm holes, to be worth cutting down and hauling to a saw mill.

I had hoped at one time to secure a market for this in the form of five feet bolts, which were being shipped to the Big Stone Gap for the manufacture of tanning extracts. This trade was interrupted, if not permanently destroyed, by some manipulation of freight rates, so that at the present time we have no use for these trees, except in a very limited way in the making of rails for the repairing of our fences. The chestnut wood has a very low fuel value and they would not pay their way to the markets for this purpose.

As single trees will shade the ground over from four to eight square rods so as to prevent any young growth of value, my conclusion is that it would be best to cut these old trees, which are worthless as they stand, burn the smaller limbs and brush, or perhaps the entire trunk, and in the light space so created, allow a valuable growth of chestnut sprouts of those of the chestnut oak to come in and be making a useful increment upon the area.

It would also be good forest practice to go through the chestnut wood in the latter part of the winter and cut as many as possible of the young trees having defective bodies, working the valuable portion into fence posts and allowing the stumps to send up sprouts from which a more valuable growth may be secured. Wherever large blanks or open spaces occur in good chestnut soil it would be desirable to have young trees of either chestnut oak or chestnut, grown from seed in nurseries for the planting up of these spaces.

Since the inauguration of the College electric light and telephone systems all of the poles so used have been furnished by the Forest Department, but this has afforded an outlet for but a small fraction of the valuable stock. So far, the local telephone managers have secured their poles at exceedingly low prices through fortunate job lot contracts, purchasing the timber over a large boundary for a mere trifle from owners who did not realize the value of it, as is has had but little commercial importance in the past. Such opportunities as this are about exhausted, however, and future supplies of poles for replacement or new construction by telephone and trolley line companies are sure to command such prices as will render all such stock valuable assets.

Black Walnut, *Juglans nigra*

The black walnut produces the highest priced timber that has ever been grown in Kentucky. The richer portions of our Forest Preserve, especially the bench lands and the rich coves where the soil is largely influenced by the limestone formation, must have abounded in walnut trees of magnificent size in earlier days, if we may judge from the stumps which, on account of their resistance to decay, existed in considerable numbers since the property has come into the possession of the College. Several years ago we had a large number of these stumps grubbed up and sold to dealers in "figured" woods. Even a small piece of sound walnut from the stump to the curve of the roots, if it contains a curled grain, brings fancy prices for cutting into veneers. If by chance one secures an entire curly tree, of which there are traditions in the neighborhood of our Preserve which trees have long ago been destroyed, the price realized is something fabulous. A single tree in one of the eastern counties of Kentucky, beginning in its exchange at \$100.00, finally brought \$1600.00 before it reached the Ohio River.

Black walnut delights in a rich, warm, well drained soil with an abundance of humus, just the kind of a soil which is produced in our rich coves from the disintegration of the limestone, mingled with the sand from the rocks above and all dark and rich with the accumulated mold of centuries.

There are a good many promising young walnut trees now upon College property. Wherever these occur they ought to be set free by removing any other trees that are severely crowding them. At the same time, they should not be given too much space and light, for the walnut, while a very intolerant, or light demanding tree, running up to a great height with a long, clean bole, if compelled to do so, will if it has room enough, begin to form its top low down and will produce a broad, spreading, much branched top, having little timber value.

The black walnut is often associated with the yellow poplar in rich, cool coves, but perhaps needs a stronger soil to bring it to its best growth. At any rate, the finest walnut stumps which I have found as indicators of the old growth have been at the level of the outcropping limestone or below it.

In two of our fields where it has not been deemed desirable to leave the soil in cultivation on account of the wash toward the branches feeding the reservoirs, I have begun the planting up with walnuts. Both of these fields had some fine young walnut trees growing in them, indicating a favorable condition of the soil. One lies above the John Kindred spring in the shape of a deep crescent or horseshoe, running up to the border of the timber above. Of this only the extreme left-

hand side has been planted. So far the stand is a very incomplete one and I have not yet succeeded in protecting the nuts from being dug by squirrels until germination can be secured.

As a guide for the future, a record of failures is sometime nearly as valuable as a record of successes. The first plantation made without any treatment of the nuts was pretty largely dug up. In the next the nuts were planted in the fall still in the hulls and each pile was drenched with a solution of crude carbolic acid, about an ounce to the bucketful of water. This serves to make the men pretty uncomfortable who planted the nuts but rather seemed to guide the squirrels to them the following spring. I have had this fall a number of bushels of walnuts gathered, the most of them near the Coleman Kindred place, and shall have them buried in moist sand until spring. I think that then the carbolic acid treatment will be sufficient to keep the squirrels away until the young trees are started.

The other field lies in the head of the cove and the extreme head of the main fork of the Cow Bell branch, the old field purchased of John Hoskins individually sometime after the main Hoskins purchase. This is a considerably larger field, terminating at the south end abruptly with a high cliff, at the top of which lies the road along the Rockcastle and Madison line. As to percentage of a stand secured the experience here has been the same as on the Kindred place.

There are quite a number of other such spots as this, although the most of them of smaller areas. Wherever places of this character of soil occur, even affording room for only small groups in the wood, black walnut may be profitably planted. There are large numbers of such spots on the Rich lands, several other on lands purchased of Dan Skinner and on the lands which I sold to the College. In all cases this mellowness of soil and the proximity of limestone will be the indication. One little area from which considerable valuable walnut timber in the form of scraps and roots was sold to a dealer, there being just enough of the old stumps to indicate what the former timber had been, is the bench at the foot of the high cliff, terminating the Indian Fort field at the northeast. This bench lies immediately above the lands of Garland Laws and John Settles in the Horse Cove, and consequently is a part of the Indian Fort range of Block Number 20. This bench will probably always be inaccessible to a wagon, but a safe sled road or bridle path can be readily be made to it from the great white oak bench around the point above the Garland Laws tract. Nothing can be more suitable for the planting up of this stretch of rich land than black walnuts and poplars, with the sugar maple to follow them up, as will be explained later on.

The black walnut, like most intolerant, or light demanding species of trees, is also a rather thin foliaged tree, shading the ground but imperfectly. Such trees as this should never be grown in large numbers in pure forest, but are best mixed singly or in small groups in a matrix of some shade

producing tree. A tree which is decidedly tolerant and shade producing, a valuable timber tree, and often grown naturally in mixtures with the poplar and black walnut is the sugar maple, commonly known as the sugar tree in this region. This seeds freely and the seed has great vitality, so that with every opportunity of light and mellow soil great numbers of them are coming up. Of the treatment of this tree as a whole I shall speak in another place, giving it a chapter to itself, but here recommend that it is the best matrix for surrounding the black walnut trees and bringing them up into the long clean stems which they must possess as poles in order to develop into the valuable saw timber of a century hence.

In mixture with the walnut it must be carefully regulated, securing in the first place sufficient crowding to force the trees up and cause them to shed off their lower branches, but in the second place giving them sufficient room not to interfere with their growth and root development, and above all avoiding any overtopping. The walnut, if given sufficient growing room is capable of making a taller tree than the sugar maple, which insures its always keeping its head out to the light. But, if at any time the walnut is caught up with and overtopped by another species, even one so open foliated as the poplar or yellow locust, it will very quickly die. This tree seems to possess the minimum of power of endurance, if only slightly overtopped.

The foliage of the sugar maple is abundant, decays rapidly, and next to the beech is one of the best in its ability to improve the quality of the soil. The shading power of the tree is sufficient to effectually prevent briars, weeds or grass from coming in to rob the soil of the nourishment needed by the timber species.

As there are not mature trees of the maple for seed sowing sufficiently near these walnut fields which I have spoken of, nor to many of the other places which my description of the soil and locality will suggest, the better plan will be to gather the seeds, produced almost every year, and grow the young trees in nurseries in some mellow, rich, sandy cove soil. As seedlings they make abundant root systems, and will be in fine condition to plant out at two years old, when they should be set about as thick as corn hills in the soil surrounding the walnuts. If the walnuts are allowed to become three or four years old before the maples are set in I do not think it probably that the maple crop would ever overtop them.

I do not think the completed high forest should anywhere contain more than at the rate of a hundred or eighty walnuts to the acre, and forty good walnuts to the acre at a hundred years old would probably prove a veritable gold mine.

Special Management of Certain Species

The black walnut as a young tree grows rapidly and produces a rather slow growth of heart wood with a wide zone of sap. This sap wood decays very rapidly while the heart wood, next to the mulberry and osage orange, is one of the best woods to resist decay which has ever been grown in this region. By the time the black walnut trees are a foot in diameter, if they have been well pruned and cleaned as young trees, the stems will contain a sufficient percentage of heart wood to make them valuable for sawing into table legs and other small articles of furniture which can be turned from pieces of three by three or four by four inches. This will afford a market at remunerative prices for such thinning as it may be found desirable to cut from a walnut grove.

One hundred years is a long look ahead for a timber market, yet we must face the fact that the walnut trees of great size and high market value which have been sold from this country were probably two hundred years old, so that hundred years would be as short a rotation as could be thought of for this species. When we consider that even to-day common walnut logs will bring \$60.00 and \$100.00 a thousand feet, and consider the prices that good walnut timber, or poplar, are now bringing in England or Germany, there can seem to be no question that hundred years from now a crop of black walnut timber will bring prices that will justify all the labor that has been put into it added to the price of the land as capital, and the whole computed at a fair rate at compound interest.

Sugar Maple

The sugar maple is decidedly out of its normal range in the Kentucky mountains and the evidence of this is the fact that it is chiefly found on cool, northern hill sides. This tree delights in a limestone soil, is fond of good drainage and on our forest lands is chiefly confined to the zone of soil affected by the limestone and to the cool, northern exposures.

In cutting the sugar tree into lumber it is one of the few trees in which the sap wood is more valuable than the heart wood. For a good many years the white sap layer is very heavy and sometimes in younger trees the heart wood is so light colored as to be scarcely distinguishable. With the old trees that have become somewhat defective the heart wood is apt to assume a dark brown color. This detracts a good deal from its value when sawed into lumber.

Kentucky winters are so uncertain that the peculiar conditions of sharp frosts at night and thawing during the day seldom occur for sufficiently long periods toward spring to give the sugar making season much value. Occasionally a few gallons of syrup or a few pounds of sugar are produced, but on the whole it scarcely pays for the labor. In the Forest Preserve there are still standing in the head waters of the Ballard Branch, especially in the neighborhood of Reservoirs 1 and 2, large quantities of sugar maples of very fine diameter and height. In the shade of these deep-cut, northern valleys these trees run up to an unusual height in order to secure the light they need. While as a young tree this is decidedly tolerant, or shade enduring, yet as they advance in age they run up rapidly and though the crown will be quite dense is carried up to a great height and long, clean boles are secured, which produce several lengths of excellent saw timber. In this respect the sugar tree growth is different in character from that which is usually found in the northern states.

These trees seed freely, the seed ripening and falling to the ground in autumn about the same time the leaves are shed, so becoming covered with a layer of leaves and keeping moist through the winter. The seedlings come up in the spring in great numbers, and if there is not too much humus to prevent the roots from reaching through to the mineral soil they soon establish themselves and make a rapid growth. While enduring considerable shade, if too much shaded the little trees become slender, crowded and dwarfed in habit, so that they are slow to recover.

Over quite large areas of our forest lands th having the desirable limestone nature young maple trees are coming up in great numbers. It seems quite probably from present indications that the character of much of the forest growth in this zone will change, giving the maple more exclusive control than it ever had in the primeval forest. This is so valuable a growth that such a fact need not

Special Management of Certain Species

be regretted as the sugar tree is our best source of fine flooring lumber at present and the supply of this in the future can hardly be too great.

It will be a good thing, however, if throughout the sugar maple regenerations, black walnut, poplar and white ash are allowed to grow wherever they come in voluntarily, and where they do not little groups should be planted in. These three, polar, walnut and ash, are all intolerant, thin foliated, light demanding species of rapid upward growth. For this reason, in themselves they are not capable of fully shading the ground, even should all three be mixed together. But either one of these in a matrix of the shade producing maple will find excellent conditions for its development, the only precaution being that the sugar maple is not allowed to crowd them too closely nor to overtop them.

The sugar maple is one of the species which, from its tolerant nature as a young tree is able to grow together in such numbers that the whole block may become dwarfed or stunted. This condition of things can be detected by one who has experience or learned by anyone in charge for the Forest Preserve with a little close observation. There is a hard, unthrifty look to the poles and a lack of expansive upward growth which is quickly recognized with a little experience. Where groups get into this condition the usual corrective is to go in with a heavy bill hook or a hedge pruner and slash down a number of them. Such a thinning judiciously made will increase the growing opportunity for the better ones and start them upward into prosperous and valuable pole and standard growth. The cut off stumps and tops will decay rapidly so that in short time the whole stand will assume a much improved appearance.

White Ash

This is not a very numerous tree in our Forest Preserve, but when it does occur it is found in about the same zone with the sugar maple, walnut and poplar, and sometimes is found making a pretty good growth on the Waverly shale soils. It seeds freely as a middle aged tree, dropping the seeds in the fall and germinating the plants the following spring. Comparatively a small number of mother trees are left upon the Forest Preserve in any portion, so that to increase this tree in the mixture along the limestone zone it will be necessary to plant seeds in nursery beds, transplanting the young trees into small groups in the opening of the young in favorable localities.

Large and very old ash trees are apt to be doty and decayed at the heart and the lumber is too brash for any purpose but inside finish or manufacture of furniture. Ash trees of middle age, however, of quick, rapid growth, and up to twelve and sixteen inches in diameter afford very valuable wood for purposes where moderate lightness, elasticity and strength are to be considered. In various parts of agricultural machinery, hoe and rake handles, scnathes (?), and in a variety of other similar purposes tough, second growth ash wood can be replaced by no other. For this reason, young ash trees of the future can hardly fail to be in good demand and to command excellent prices. It is very seldom that ash anywhere grows as a pure wood, excepting perhaps some species of swamp ash in the north.

The white ash is usually found singly or in small groups mixed with other hard wood trees which afford more shade for the protection of the locality. It is much like the black walnut in its demands and should be distributed pretty generally throughout the Forest Preserve where the soil and exposure is suitable.

The Beech

The beech tree is found only in the cooler and moister portions of the Forest Preserve, and chiefly on the Waverly shales where they have a northerly exposure. This is much more a moisture loving tree than the sugar maple and requires less in the way of drainage and so it is apt to be found down along the water courses, although it mingles with the sugar maple in its upper limits.

Clean, well grown beech possesses considerable value for sawing into timbers and flooring, but it is a very tolerant, shade enduring tree, in Europe being considered the standard for those qualities. So it is with much difficulty that the lower branches are shade off and the trunks run up into clean boles. No other tree in the forests of Europe has a better reputation for its ability to improve the character of the soil upon which it grows, the decay of its foliage producing the most rich and improving soil humus of all.

It is planted in Germany largely as a companion tree and nurse for the development of the best quality of oak timber, the beech furnishing the shade to run the other tree up into the desirable form of long, well cleaned boles.

In seed producing capacity the beech is much more irregular, years of abundant production of fertile seeds being so far apart and so momentous in importance as to be noted and recorded in the annals of German forestry. In the Berea Forest Preserve, while a considerable number of very fine beech trees were originally standing in the Cow Bell and some small ones remain, and very large and fine ones are yet growing in Ballard Branch, this tree is reproducing itself less satisfactorily than any other species in the Preserve. This is in part due to the infrequent beech mast years already alluded to, and probably in equal degree to the fact that when the mast is produced it becomes the immediate prey of squirrels and numerous other animals. While the most of the large, well grown beech should doubtless be cut when the saw mill is moved into their vicinity, I doubt whether it is worth while for us to make any serious attempts at reproducing the beech within the Preserve. Where young trees are already growing upon steep hill sides in poor localities it is probably as well to let them remain for the present, as they will be restoring the quality of the soil as rapidly as anything can do and other more valuable species may begin to take their places in years to come. It is certainly better to have a good stand of beech holding the soil in place and preventing erosion than to have these clays exposed to washing away down to the rocks and shale.

The Small Hickory, *Hickoria odorata*

This is a hickory which is very abundant on the Forest Preserve land, especially on those soils formed by the disintegration of the Waverly shales. Blocks 1 and 2 of the Indian Fort range are excellent examples of the occurrence of this hickory.

It is a rather slow growing tree, sprouts readily when cut at the right season and the sprouts grow with great rapidity. Throughout Block Number 1 there are large numbers of clusters of these sprouts where small or middle sized trees have been cut some seven or eight years ago. This tree may be classed as rather tolerant, shedding off its branches with some difficulty and making, after the stems are cleaned, a compact growth of very strong and tough wood.

I have called the attention of expert wagon wheel men to this hickory, which they had not recognized in the wagon stock purchased as being different from the shell bark and mockernut species. They at once pronounced it a first class spoke hickory, furnishing what is known as "A" class stock when it is grown clean and smooth.

Carriage wheel manufacturers are at present greatly agitated over the outlook for carriage stock in the country and from a careful study of the situation they realize some facts not known to the general public; first, that the growth of hickory is confined to the Atlantic states and a portion of the Mississippi Valley east of the Great Plains, the Rocky Mountains and the Pacific states not furnishing any hickory at all or any wood which is its equivalent. Hickory is grown only in the United States and is the only wood known to the world possessing just the requisite qualities of hardness, elasticity and rigidity combined, which makes it so valuable in wheel manufacture.

In addition to this, hickory is consumed in great quantities in the manufacture of tool handles, so that the scramble for this stock is becoming at the present time a very intense one. Further than this, the best hickory stock is grown in rather cool, northern localities, or at any rate not farther south than Kentucky. Kentucky stock ranks high but stock from Tennessee or states farther south is inclined to be soft and spongy. Again, the best carriage stock is only produced on clay soils, sandy land hickory being a lighter and more porous growth which throws it at once into the "C" and "D" classes of carriage stock.

Large areas of our forest lands are of soils well adapted to the growing of high grade hickory stock and we have considerable quantities growing of not only this hickory mentioned but of the Shell Bark and Mockernut, or white-heart hickory.

Special Management of Certain Species

Returning again to the characteristics of this small hickory. It has a tendency to retain small side twigs except when very closely shaded while a young tree, but this may be overcome by the use of the pruning knife or shears and I have experimented with this work sufficiently to be ready to recommend that large numbers of these rapidly growing young trees from one to two and a half inches in diameter or perhaps even up to three or four inches should be pruned up, giving them clean stems as rapidly as their top growth will admit of. This pruning must not be carried high enough to force the top into a heavy growth so that its weight will cause it to bend over and cause a crooked stem, but as a rule the small sized stems can be safely pruned up to five or six feet high and the larger sizes accordingly. If this were followed up with many thousands of these young trees, especially over Blocks 1, 2, and 3 of the Indian Fort Range, and not only there but wherever similar conditions occur, these being cited as good examples, I am sure that this labor would be amply justified and in fifteen or twenty year's time a very large volume of spoke timber of the highest quality can be harvested.

Yellow Locust

The yellow locust is a very common tree over a considerable portion of our Forest Preserve, and does best on rather well drained, sandy, loamy soil and upon hill sides where it gets some influence from the limestone disintegration. It seeds with great readiness, being prominent on old field growth. In silvicultural character, it is an exceedingly intolerant, or light demanding tree, not thriving long after it is overtopped or shaded. It is a very interesting fact that I have probably been the first to work out and call attention to that this species will keep pace in height growth with the very rapidly growing *Liriodendron* or tulip poplar up to about thirty years old. After that age the poplar gains on it so rapidly that the locust is soon suppressed, but it has by this time reached a size for large and fine quality of fence posts and its harvesting has only the effect on the ground of a good thinning, which the poplars by this time need, so that this double crop is very readily produced on good soils.

The locust will grow to a diameter sufficient for a good sized fence post without splitting in sometimes from seven to ten years, very frequently by twelve years. At fifteen years old the butt cut will often split, furnishing two posts. The trees will admit of quite a close stand, so that an acre will produce a large number of them.

As the entire Blue Grass region is pretty nearly destitute of timber and are rapidly consuming what they have remaining, they will be drawing more and more as the years go by, on the adjacent mountain counties for fence posts and other supplies.

The locust borer, a beetle which has ravaged the locust plantations of the Western states, though present here, does very little damage to our trees.

For these reasons, I regard the yellow locust as one of our most valuable forest land assets. The important financial consideration of being able to realize on the investment within a few years, avoiding the terrible accumulation of compound interest, renders it a species very desirable to grow and encourage.

Road Systems of the Forest Preserve

Forest material is always a heavy article for transportation, so that adequate road systems are a necessity in every well-organized forest for this reason alone. They are, however, made to serve a double purpose of means of communication and transportation and of fire guards. In comparatively level tracts of forest land the road systems are usually laid off something on the plan of the surveys of the western prairie states; that is, parallel lines north and south checked by parallel lines east and west, dividing a timber tract into boundaries of various sizes by main roads, secondary roads and fire lines, or schnaza, as the Germans have it.

But in a forest boundary so broken as ours the system of main roads, secondary roads and lanes must correspond with the peculiar physiographic features of the territory. We are fortunate in having one main pike road dividing the forest lands into two unequal tracts, this road being what is known as the Berea and Big Hill pike through the narrow Gap. With the exception of the further side of Narrow Gap the grades on this are very good and easy and the bringing of forest material into town is a simple matter.

The back line of the forest preserve is at present the dividing ridge for more than three miles between the Kentucky and Cumberland waters and the line between Madison and Jackson and Rockcastle Counties. This is not a recognized county road and hence has received but little work. Excepting in two or three places the grades are easy and the road lying along a sandstone ridge is for the most part dry and well drained and easily kept up. Through the generosity of Miss Fay the rocks at the worst places, known as the Burnt Bridge have been blasted out this summer and this is a very passable roadway now and these improvements have been carried around to the lands lately purchases of William Kindred where the Madison County road leaves this county line and drops down the mountain to the rear of Bear Knob and the Scaffold Cane Pike, past the Hart Schoolhouse. These two roads together, although the county road comes down some steep grades, furnish a passably good outlet for all of our timber from the plateau lands on the back part of the preserve and if the county line road were widened out and cleaned up and put in better order it would furnish an excellent fire guard along one of the most vulnerable portions of our preserve, as fires are of frequent occurrence in the Clear Creek Valley. We have just finished fighting out a rather disastrous fire in the southeast portion of our territory.

There are five main classes of roads lying in our forest lands; first, roads up the bottom lands along the creek valleys; second, roads following the nearly parallel spurs or ridges pushing out from the steeper hill sides toward the bottom lands; third, roads following the rather peculiar natural benches or offsets on the hill sides, the main bench occurring near the top of the Waverly shales and

just below the gray freestone which is quarried for building purposes; fourth, roads difficult of construction, overcoming the heavy vertical distances between the valley roads and the benches and the bench roads and those of the fifth class; fifth roads along the nearly level, high, dividing ridges which represent what erosion has left of the original plateau. The third or bench class of roads form the most marked feature of the entire road system as, in the aggregate, this bench is well marked and prominent for a distance equal to more than half of both sides of our main creek valleys and deviating but little from a common level. To illustrate: this bench in a rather narrow form is encountered on the west side of the West Pinnacle mountain and can be followed in and out of the windings of the coves, along the front past the sand chut, into the deepest part of Moonshine Hollow, around the spur of the mountain below and the Indian Fort cove to the Wild Cat Mountain and clear around the south side of that mountain to a point in a line from the Narrow Gap Church to the East Pinnacle rock. The same bench appears on the south side of Cow Bell Hollow to the opposite of the Sally Harrison house and can be followed with but a few breaks through the Deep Buckeye Cove, around the mountain point and into the cove leading to the Miller tract, around the face of the next mountain into the cove occupied by Reservoirs Numbers 9 and 10, from which a road is already constructed around the next mountain to the south joining the main Cow Bell road opposite Reservoir Number 6.

For the sake of fire protection alone all of these bench roads ought to be worked up and kept clear. They afford an outlet for any timber and fuel which may be merchantable as well as offering a good fire guard. When a fire does start in land composed of deep valleys and deep mountain sides the natural draft of the fire is up narrow draws and mountain faces where it travels with terrible force and destructiveness, its action being not unlike that of a fire up a great chimney throat. The ability to back fire and so arrest the advance of an oncoming fire half way up a mountain side is of great importance in fire fighting strategy.

The next important lines for roads are those along the divides and high ridges. As an illustration, when the high ground of the Rich lands is reached there is a continuous ridge of comparatively level lands quite narrow in places and again broadening out into considerable fields which separates the Ballard Branch from the Cow Bell drainage and extends clear through to the place occupied by Robert Viers. At no place along this ridge is the grade too steep for the hauling of a very good sized load of material. There are several other shorter ridge roads of less importance and still of great value both for the moving of material and as fire guards.

It will be evident at once that the most difficult problems in road making lie in connecting the valley and main pike roads, first, with these systems of bench roads, which lie about three hundred feet above them, and second, in connecting these bench roads with the ridge roads, three hundred feet still higher up. To do this most effectively, we must take advantage of the long spurs pushing out into the valleys, the sides of the valleys and coves around which ascending roads can be wound on easy grades and of the sides of the high hills least indented with deep hollows and least broken by sheer cliffs.

During the seven or eight years that have been occupied in the purchase of these forest lands I have been studying these road problems with every opportunity and think I have pretty fairly solved the question of ascent from one series of levels to another. The mountaineers' method of dealing with the problem is to take his road nearly straight up some long, prominent ridge which while it compels him to take grades of from ten to twenty percent requires but little road working except cutting away such tree stumps as prevent the pass of his wagon or digging out here and there a few rocks where the ledge must be passed. The carrying of these roads around a grade of from five to seven percent is going to be a matter of considerable expense, both in labor and in culverts and small bridges to take care of the drainage. But it will be well worth all the cost when these are completed.

From the exceedingly varied description of our hardwood timbers the system of forestry which we must necessarily follow for the greater part of our lands is that which is known as the selection system, modified here and there into the group system wherever we may expect clean cutting to be done and complete planting up to follow it over small boundaries. This selection system calls for the keeping up of a very extensive system of roadways in passable condition for logging and heavy hauling. In more level lands where we can cut over good sized compartments, passing on from one series of compartments to another, it is only necessary to keep the roads in sufficient repair for horseback riding and foot passage, except where the removal of timber is actually going on. With our system while considerable bodies of timber will be drawn upon at one time from certain localities, yet there will be supplies of one grade or another to be cut and removed practically over the entire boundary every year, and any road system must be in fairly passable condition all the time.

This is a desirable thing from the standpoint of fire fighting. The financial value of these forests depends upon keeping the land up to the best productive service during the entire life time of the trees. As trees of considerable difference in age will be occupying the same tract of ground

there is never a time when a fire can with safety be allowed to run through any of these. While judicious thinning and the cleaning out of comparatively worthless material in favor of the more valuable species and individual trees will always be a matter of great importance, yet of vastly greater importance is the problem of keeping fires entirely out of the whole tract.

The fires not only damage the young timber, putting the land back, destroying the increment which has been made by seedlings and straight growth up to the time the fire reached it, but the fires burn a vast wealth of humus in the form of leaves, twigs and other decaying vegetation which is the very fertility of the forest soil.

The power of the soil to absorb the rain as it falls, arresting and holding and turning it into the soil and through the porous rocks to be delivered during the dry portions of the year through the springs and streams, depends almost wholly upon the forest floor of humus and decaying material. With the portion of our lands which is enclosed within the water shed area this is of double importance as the supply of spring water for our system is dependent upon the percolation of rain fall through the forest soil into the ground, through the porous sandstone, capping the upper hills, which forms reservoirs of a thousand times the capacity of our ten little reservoirs connected with the pipe line.

In the following description of roads for the Forest Preserve I shall describe the entire road system proposed under two heads—roads projected, and roads completed.

Indian Fort Range

Road No. 1

Beginning at the pike road a short distance beyond the entrance to the Kelley farm, winding through the level land of Block 1, then rising by several sharp curves and a steep gradient to the main bench opposite the deep cove between the West Pinnacle and the next knob, with this bench to the Southeast to the spring on the line between the lands purchased of B. Harris and that purchased of Edward McHone, both being a part of the old Johnson tract.

Road No. 1 Projected

Will follow the bench from this spring into the deep cove to the Northeast nearly to the foot of the high cliff, on which the Robe house stands, being for the last quarter of a mile on the lands of Dr. William E. Barton; thence crossing the line into the Harris tract and into the head of the cove known as Moonshine Hollow; still with the bench to the South and Southwest, passing the old cabin formerly occupied by John Williams, here meeting a road which follows the bench to the junction of the main Indian Fort Road.

Road No. 2

Leaving the Berea and Big Hill pike road at the gate opposite Caleb Johnson's house, continuing through the woods nearly a direct line along a low dividing ridge between two parallel hollows until it reaches the foot of the steep spurs at a point about opposite the present end of Road Number 1. There instead of following the old logging trail it should meander to the East along a suitable grade to be selected by the Surveyor until it can make a proper grade and reach Road Number 1 on the main bench.

Road No. 3

Leaving Road Number 2 about a hundred yards from the pike, meanders to the Southeast, East and Northeast along the North side of the Spring Branch from Moonshine Hollow, continuing until it reaches the ground near the springy portion of the hollow too steep for ascent.

Road No. 4

Leaving Road Number 3 at the bend where it first approaches the Spring Branch from Moonshine Hollow, crossing this branch to the Southeast and reaching in the level ground back of the old Harris house and barn the old Harris Road which used to lead to the Moonshine Hollow. With this old road a corrected and easy grade up the spur of the mountain to the bench road where it meets the continuation of Number 1, coming from the John Williams field.

Road No. 5

Leaving the pike road at the foot of the Narrow Gap hill and the corner of the land of William Burnell, crossing the little branch, passing around Burnell's Northeast corner to the rear of his house, reaching the divide between two parallel hollows and continuing Northeasterly until the ground is too steep for wagon travel. A continuation of this as a bridle path and fire guard road should be carried up the mountain spur, meeting Road Number 1 on the bench about a hundred yards to the South of the junction of Road Number 4 with the bench road.

Road No. 6

Narrow Gap and Indian Fort Road. Leaving the pike road at the top of the Narrow Gap hill, following the meanderings of the dividing ridge until it passes through the gap in the old Indian Fort, still with the dividing ridge on the level, completely around the head of the cove to the house built to William Robe and sold to Berea College.

Road No. 7

Leaving Road Number 6 toward the ridge at a point on the bench opposite the junction of number 1, projected, and Number 6, following the bench on nearly the same level to a point immediately below the low gap between the Indian Fort and the Wild Cat Mountain.

Road No. 7 Projected

Continuing this road and with the bench and the general bench level where the bench disappears, around the Eastern extremity of the East Pinnacle to Hazelwood's line.

Should the Hazelwood land ever be acquired there is a possibility of extending this road still around the bench on the North side of the Wild Cat Mountain and into the cove on the lands purchased of James Baker.

Road No. 8

Branching from Road Number 6 near the narrowest portion of the dividing ridge on the William Robe land, continuing over the highest point of this land Northeasterly, crossing the very narrow divide on the solid stone ledge known as the Burn Bridge Rock and reaching the field purchased of Dan Skinner; with the Western border of this field to its Northern extremity and with the dividing ridge descending a steep hill to the top of the Horse Cove Gap.

Road No. 9

From the Richmond and Big Hill pike to the Si Baker Cove. This road leaves the Richmond and Big Hill pike at a point about half a mile Northwest of Settles' place, the old state road tavern stand and junction of Berea and Big Hill pike, passes through the lane on the lands of Mr. Hays,

ascending a steep hill along the line of Grant Abrams; then through the flat woods owned by Jeff Robinson to the black oak, which is a corner to Jeff Robinson and to the John Robinson and Baker purchases of the College lands; thence through the lands purchased of James Baker to the house formerly occupied by his father, Si Baker, passing this house into the old field at the head of the cove.

Road No. 10

Road from the Big Hill pike to the Horse Cove. Leaving the Richmond and Big Hill pike about a quarter of a mile Northeast of the branching of the Red Lick road from the pike and at the point near a small store on the John Robinson farm, the road passes through a lane on the land of the John Robinson estate and up a rather steep hill by the side of a draw, or ravine, enters the land purchased from John Robinson by Berea College, follows a nearly Westerly course through the flat woods until it nears the land of the Garland Laws, curves to the right still on College Land, and passes into the land of Garland Laws at the maple tree corner on the banks of the main Horse Cove Branch.

Road No. 11

From the Blue Lick Road to the Horse Cove Gap. A portion of the road nearest the Blue Lick public road is to be constructed. The road now constructed begins at the line of Isaac Davis in front of the old Duff Clark house in his land about a hundred yards from the corner stone of the land purchased from Dan Skinner and from Mrs. Robe, thence through the woods over the low spurs of the hills until it crosses the Maple Tree Branch, thence following the sides of the cove rising to the regular mountain bench on the Waverly shale, following this bench to the Northwest until a curve can be secured turning to the Southeast and rising to the top of the Horse Cove Gap, meeting Road number 8.

Road No. 12

Beginning at the entrance gate in the West line of the land bought of Mrs. Robe, leading through the old cleared field and to the left of the main hollow, gradually ascending the dividing ridge between the main hollow and the West hollow of this property to the old Johnny Pigg cabin.

Road No. 12 Projected

A continuation of this road would pass the cabin and spring and get into the regular Waverly bench leading to the South; following this bench around the mountain, crossing the line of the Mrs. Robe land into the land of the Dan Skinner purchase; still around to the East and Northeast into the

foot of a cove leading from the top of the Robe land, crossing this and intersecting Road Number 11 at its turn to ascend the ridge to the Horse Cove Gap.

Road No. 13

Branching from Road Number 12 about a half mile up the mountain and leading to the left below the North field of the Mrs. Robe land, striking the dividing ridge near the North line of these lands overlooking the Blue Lick Valley; follows this divide to the North face of the hill, the most of the way on Blue Lick drainage, to the house built by William Robe on the top of the mountain nearly to his East line.

The passage from the Blue Lick County Road to this road is for a short distance on College land. Then over the land of E.D. Mitchell. Should he ever object, the College has a roadway purchased in part of S.C. Mason and in part of Curtis Kelley leading from the Blue Lick road one-fourth mile beyond the Mitchell school house to the lands of Isaac Davis.

There is at present a road leading from the Davis outer gate to the Duff Clark house within two hundred yards of the Mrs. Robe entrance gate. Should this ever be barred the entrance road leads still around to the Horse Cove branch on land purchased of Kelly to the land purchased of John Davis and Hannah Davis Bratcher near the Ike Davis mill seat and within one hundred yards of the maple corner of the land purchased of Dan Skinner. Davis is obliged to cross the lands of Berea College purchased of S.C. Mason at the top of the ridge North of the Mitchell school house. In consideration of this he has agreed to give the College a passway from the John Davis and Hannah Bratcher purchases across the narrow portion of his land to the College land of the Skinner purchase. From here a new road would need to be constructed, meeting Road Number 11 at a convenient point on a ridge leading around the Northeast corner of Davis' land near the old Duff Clark house, previously referred to, into the old field of the Mrs. Robe land and so joining Road Number 12. All of this road from the Blue Lick county road over the lands purchased of Kelley, crossing Davis and other College lands, should be considered as the beginning portion of Road Number 11.

Road No. 14

Beginning at the foot of a pine ridge on Road Number 11 West of the Maple Tree Branch a convenient point to be selected by Mr. Seale as surveyor from notes given him by me, this road will meander the side of the ridge in such a manner as to secure a good grade and reach Road Number 8 at a point on the bench.

Cow Bell Range

Road No. 15

Leaving the Berea and Big Hill pike in the Narrow Gap valley at the gate just beyond Jesse McHone's line, leading nearly South over the low ridges of the Todd purchase, passing the Northwest corner of Ned McHone's line, continuing over the Todd lands to directly in front of Sally Harrison's house, passing her corner, and following the creek bed and the nearby creek valley land up the Cow Bell Branch finally at a point a hundred yards below the Twin Falls, from this keeping up the steep sides of the main Cow Bell valley on the left, passing Reservoir Number 6, leaving the main valley for the Deer Pen Fork, meandering up the hillside of the Hoskins old field to a high standing rock on the dividing ridge, from thence Southeast through the Burnt Bridge gate to the County Line road at the North end of the Burnt Bridge.

Road No. 16

Leaving Road Number 15 about thirty poles from the pike road, branching to the right and meandering with the spurs of the Hills not far from Jesse McHone's line until the mountain bench is reached, with this bench meandering around the mountain side in a Westerly course to the intersection of the road at the top of the Low Gap.

Road No. 17

To be constructed. Leaves Road Number 15 at the junction of the Buckeye Cove Spring Branch with the main Cow Bell Branch, meanders through this Buckeye Cove for a suitable grade until it reaches the main branch at the main bench at the Eastern extremity of this cove at a point to be determined by the surveyor.

Road No. 18

Branches from Road Number 15 at a point directly opposite Reservoir Number 6, ascends the grade to the rocky mountain bench, follows the meanders of this bench around the high point and through the deep cove past Reservoirs 9 and 10. From here a new road is to be constructed joining several portions of several old logging roads, continuing this bench level around the spurs and into coves on the East side of the Cow Bell passing successively the Miller lands, the Spring Branch and the Buckeye Cove until it reaches the extremity of this bench and of the Forest Preserve lands at the Southeast corner of the land of Edward McHone.

Road No. 19

Branches from Road Number 15 about two hundred yards above Reservoir Number 6, leads around a ledge of rocks to the right and up the right side of the main Cow Bell drainage into the walnut field on the John Hoskins purchase.

A continuation of this might be made in a horseshoe shaped road leading first along the left hand side of the field near to the county line, still rising around the right hand side, and returning Northwardly until it reaches the level of the chestnut ridge whence it would turn back in a Southwesterly direction and strike the County Line road at a gate in the water shed fence.

Road No. 20

Leaving Road Number 15 at a point a hundred yards below Reservoir Number 6, crossing the main Cow Bell Branch on a high bridge; passing around a bench to the West and Southwest, passing Reservoir Number 7, ascending a grade on the West side of the spring branch below Number 7 Southwardly, reaching the main bench at a high point overlooking the Cow Bell valley; following this bench to the Northwest passing above Reservoir Number 8, ascending a long hollow to the West, reaching the ridge road which is the dividing line between the Cow Bell Range and the Bear Knob Range. This road will be new construction from near Reservoir Number 8 to the dividing ridge road.

Road No. 21

Leaving Road Number 20 at the curve of the bench after it makes the ascent from Reservoir number 7, following along this bench Southwesterly, passing above Reservoir Number 7 where it is now an old logging trail following the spring branch. But a new road should be built to the right at first, then crossing to the left side of the branch about half way up, following the side of this branch, passing all the springs and entering the old Hoskins field now occupied by Robert Viers, following a meandering course around the sides of this field, securing a proper grade until it reaches the main dividing ridge road leading past Vier's house.

Road No. 22

Beginning at the North corner of the Rich lands just inside the lane crossing the land of William Burnell and Anthony Burnell; thence Southwesterly through the old cultivated fields and pine woods, crossing the Maiden Branch and following a draw to the top of the Low Gap, passing through this Gap a nearly level grade along a narrow bench above the lands of Sally Harrison, descending the hill and intersecting Road Number 15 at the old lumber yard site.

Road No. 23

Leaving Road Number 22 at a point near the South line of Sally Harrison's field, gradually ascending the steep mountain side through the timber and around a high point where there has been an old log roll off into the North side of Shingle Mill Hollow, keeping a Northwesterly course and gradually ascending the side of this hollow until the main mountain bench is reached; passing the head of the right hand prong of Shingle Mill Hollow near the Sassafras Corner of the Rich lands survey marked by a stone pile in a long hollow; thence turning sharply to the South and ascending the hill, around the high point into the middle prong of the Shingle Mill Hollow; continuing the ascent of this hollow until the dividing ridge road which forms the line between the Cow Bell Range is reached about a hundred yards North of the gate in the water shed fence.

Road No. 24

Leaving Road Number 20 just above Number 8 and on the level of the main mountain bench, following this bench to the Northeast, North and Northwest, passing through the gate in the water shed fence on a high point overlooking the saw mill seat; thence around the West side of the Shingle Mill Hollow still with the bench level, intersecting Road Number 23 at a point a little below the sassafras and stone corner of the Rich lands.

Road No. 25

Branches from Road Number 22 before crossing the Maiden Branch, keeping on the right hand side of this branch until it passes the house purchased of Cash Clift's heirs; then crossing the branch and ascending the hill a steep grade to the main bench at the level of the Rich lands spring; still ascending the hill through the old field to the dividing ridge between the Cow Bell and Maiden Branch waters; continuing a Southerly course, the line between the Cow Bell Range and the Bear Knob Range along a narrow dividing ridge, passing the gate in the water shed fence, passing to the left of the Big Sink, formerly a corner to the Rich lands survey, and the Sam Pigg survey, still with the divide to the old fields of the Hoskins land occupied by Robert Viers, keeping to the left of Vier's house and intersecting the County Line road.

A modification of this road giving a better grade leaves Road Number 22 at the Low Gap, turning back to the West, circling the side of the hill, and reaching the main bench on the spring level previously described. This will be a difficult piece of road to build but will secure a much more desirable grade.

Road No. 26

Branches from Road Number 25 at the bench on the level of the springs, passing through the grove to the Southward just below the spring; heading the cove above the old cultivated field, reaching the dividing ridge between the Maiden Branch Hollow and the lower hollow of the Sam Pigg land in the Ballard Branch to the West just above this old field; following this dividing ridge to the Northwest and North and beginning to drop down to the right as the ground rises toward a high point, keeping a steady downward grade down the side of the mountain above the Clift house and lot, and Northwesterly above the old Clift fields until the dividing ridge is reached at the Northwest extremity of these fields, then descending into the valley, intersecting the Ballard Branch road near the stone corner of Anthony Burnell.

This road is new survey and construction from the Rich lands spring and will be chiefly valuable as a fire guard.

Bear Knob Range

Road No. 27

Beginning at the same point as Road Number 22 just inside the lane through William and Anthony Burnell's land, ascending the hill to the West of the land of Berea College and on the lands of William Burnell as it descends the grade, thence on the lands of Anthony Burnell's Turpin place at the Southeast corner; then entering the lands of Berea College; all of this a well traveled neighborhood road; continuing the same road through the bottom lands purchased of Sam Pigg, passing the old Sam Pigg house and barn and forks of the main Ballard Branch with the John kindred Branch, thence keeping upward through the lands purchased of John Kindred, passing the house on that place and intersecting the Madison County road, known as the Bear Knob road, just South of the house.

Road No. 28

Branching from Road 27 to the right just above the Turpin place of Burnell, continuing to the house and barn purchased of Matt Pigg, and passing beyond these to the cultivated field in the cove.

Road No. 29

Deflecting from Road 27 toward a large elm tree on the Bear Knob fork of the Ballard Branch, following a course yet to be determined by the Surveyor up a dividing ridge, through the lands purchased of Sam Pigg onto the Bear Knob tract; following the side of this Bear Knob fork to the West and Southwest until the main mountain bench is reached, following this bench to the Westward toward the low gap separating the Bear Knob from the Ober ridge, following along the side of this low gap until it intersects Road Number 32.

Road No. 30

Leaving Road 27 at the forking of the main Ballard Branch and the John Kindred Branch, following the valley of the Ballard Branch to a little below the intersection of the pipe line from Reservoir Number 3, there deflecting to the left and taking the grade of the hill a gradual ascent until it passes just above Reservoir Number 3, crossing the branch by a sharp bend to the right, ascending the face of the hill until the main mountain bench is reached; following this bench through the old Hoskins sugar camp, passing just above Reservoir Number 2, still with the bench until it ends at the head of the hollow, making a strong return bend to the Northwest along the hill side, rounding a high point over-looking the Ballard Branch; keeping an ascending grade around the right hand side

of the cove which supplies Reservoir Number 3, crossing the head of the cove and bearing strongly to the Northwest just above a bench of limestone rocks, still to the Northwest but more Northwardly around a sandstone point and with the long hollow ascending to the dividing ridge at an oak tree marked with four hacks. (This divide is the separation between Ballard Branch and the West side of the Big Sink). Thence curving to the right, it follows the rim of the Big Sink until the dividing ridge road is intersected.

This road is new work from the point where it deflects from the valley near the pipe line junction and will be one of much difficulty both in surveying and in construction, but is a most important road to be built as it gives road communication between these two great water shed valleys; that is, the Ballard Branch, with its Reservoirs—1, 2, 3, 4, and 5—is by this road put in easy communication with the Cow Bell Branch by way of Reservoirs 8, 6 and 7, so that the caretaker can pass safely and rapidly from one to the other in the worst conditions of road and weather.

Road No. 31

Deflecting from Number 29 near the junction of the pipeline from Reservoir 3 with the Number 1 pipeline, following the gradual ascent of the hill on the left side of the main branch of the Ballard Branch and number 1 pipeline until Reservoir Number 1 is reached. The lower part of this is only a narrow sledgeway constructed by the contracting company, but should be broadened into a wagon road.

Road No. 32

Leaving the Scaffold Cane and Silver Creek county road at the lane between the lands of Samuel Burnell and the land purchased of Brack Pigg, ascending the left hand side of the valley toward Bear Knob property, passing the dividing ridge on the North spur of the Bear Knob between the old Bear Knob house and spring, following the upper side of the bench near the free stone ledge around a long curve to the low gap on the Northeast side of the Bear Knob mountain; still with this bench curving to the right around the flanking spurs of the Bear Knob, passing through the lands of Nancy Loman, where it leaves the bench and begins an ascending grade until it intersects the Bear Knob county road at the border of the old John Kindred orchard. This is new construction except as an old logging trace exists part way from the Bear Knob spring onward.

Road No. 33

Deflects from Road 32 near the Bear Knob spring, passing to the right and above it, following the sides of the Bear Knob to the Southeast and South, crossing a point of land belonging

to Dick Davis, curving around the South and East sides of the Bear Knob, and finally reaching the summit by an abrupt turn to the West.

Before the last turn of this road is made a bridle path branching from this along the dividing ridge of the East spur of the Bear knob descends that spur by a steep grade and intersects the Bear Knob County Road at a point one hundred yards West of the intersection of Road 32.

Road No. 34

Deflects from Road 32 West of the Bear Knob house, follows the dividing ridge to the Northwest and North, descending to the regular mountain bench, following the course of that bench to the limit of the Forest Preserve lands at the Northern extremity of the Bear Knob purchase.

Road No. 35

Leaving Road Number 18 on the bench on the South side of the cove heading at the corner of the old Miller field, making a curve of fifty feet radius as it leaves this bench, rising toward the border of the old field and circling the cove through the field to the Northeast and North, entering the old timber to the North, rounding a narrow high point which has an old cabin on top necessitating a heavy cut through a ledge of limestone as it rounds this point, then entering a long, narrow valley, passing below the cabin to the North, crossing the Roe field by a dividing ridge between the first cove and the right hand fork of the Spring Branch cove, finally reaching the sandstone plateau at the rear of the old Jimmy Roe place, passing by the old road, through this place and intersecting the County Line road in front of the house.

The completion of this road gives an outlet for the old Roe and Miller fields, which contain fine fruit and corn lands, so that, with the completion of the bench road, Number 18 back to Reservoir Number 10 produce from these fields can be brought down into the valley and so find a market.

Road No. 36

Leaving the bench road, Number 18, near the lower Roe cabin, following the line of the water shed fence up the hill on the right hand side of the Spring Branch until the right angle turn in the fence is reached, passing through this fence where a gate should be built, still keeping to the right of the branch, along the foot of the Roe field until it reaches the high cliff of rocks at the head of the cove.

This road will afford an outlet for the produce from the lower part of the Roe field and communication with the middle Roe cabin.

Road No. 37

Leaving the county line road on the Baxter lands at the foot of the hill to the Northeast of the Roe cabin and beyond the corner of the water shed fence, following a nearly level course through the oak woods to the Northeast to a point near the Two Pine Corner in the Bentley survey and on a dividing ridge between the Spring Branch Hollow and a deep cove on the Lucas land, and nearly above the middle Roe cabin.

Road No. 38

Leaving the county line road at what is known as the old Edna Baxter place, passing the old house site, and crossing a shallow draw filled with sassafras to the Northwest, thence curving more to the West following an easy and nearly level grade to the rear of the Baxter lands and into the narrow strip of land purchased of Andrew McGuire, which lies between the Baxter land and the Lucas land.

Further Purchase of Forest Lands Recommended

Further Purchase of Forest Lands

As ample and as gratifying as are the present Forest holdings I am fully convinced that the acquiring of other properties greatly increasing the boundary will be a matter of wise foresight on the part of the College authorities. In Eastern Kentucky and the Appalachian region in general a very large percentage of the lands are better adapted to timber growing than to any other purpose. Probably not ten percent of the lands of Eastern Kentucky are best adapted to agriculture, either as farm lands, fruit lands or for grazing. This fact makes the acquiring and holding of a large timber boundary managed according to the most scientific principles of Forestry a great object lesson for the people of this region whom Berea College is dedicated to uplifting and education. This reason only might not seem to justify such large holdings were it not that they promise in the future to be wise financial investments in insuring timber supplies for maintaining important mechanical industries in the College and for future fuel and building purposes. Systematic Forestry in Europe, only proposes to offer to capital a return of from 2 to 4 per cent on the investment. But when we see that these roughest and poorest forest lands are capitalized at prices which compare well with our best agricultural lands in this county and realize how rapidly America is exhausting her timber supplies and sweeping towards European conditions in this respect, we shall see that the purchase of timber lands at the prevailing prices of from \$2.50 to \$10.00 per acre, at which lands may be acquired in the vicinity of Berea, will be a most wise piece of business foresight.

Following is a list of holdings the purchase of which I strongly recommend:

Adjacent to the Indian Fort Range, the two acre lot and house belonging to Jesse McHone; the small boundary at the curve of the Pike just Eastward of that belonging to Edward McHone; the portion of the J.K. Harris lands held by Wm. Burnell at the foot of the Narrow Gap Hill; the portion of the Kitty Harris dower lying on the North side of the Pike; the land now held by Curtis Kelly, a part of the old Sam Davis estate; the lands of Isaac Davis in the deep cove North and West of Indian Fort; the lands of E.D. Mitcheal lying on the East side of the Blue Lick Road; and small house and lot owned by Mrs. Holloway adjoining the North end of the Mrs. Moore tract sold by me to the College; about 15 acres of land held by Mr. Benge adjoining the Kelley and Davis lands.

These I consider to be very important urgent purchases to be made as soon as there is opportunity. I also consider it very desirable that the College should acquire all the lands lying East of the Blue Lick Road as far North as the Clay Pit known as the "Crater," and from there up to the top of the Blue Lick mountain meeting the Mrs. Robe purchase. Adjoining the Indian Fort Range on the North and East the lands held by John Settle in the Horse Cove, the lands of Robert Turbin and of Garland

Further Purchase of Forest Lands

Laws are three tracts which should by all means be secured. If in the future the lands of the widow Lewis and the timbered portion of the lands of the John Robinson estate set apart as a dower to his widow and adjoining the lands purchased by me could be secured, they would be very valuable additions. It would also be desirable to own the present holding of Jas. Owens lying East of the John Robinson tract and of Jeff Robinson lying on the South side of it. The lands of Hazelwood lying South and East of the Baker purchase should by all means be secured as they offer constant menace from fire. Between Hazelwood and the pike and boundary running to the point at East Pinnacle should be acquired from the lands now owned by Mark Settle at the Cross Roads.

The present Cow Bell boundary should acquire the lands of Sallie Harrison at the earliest possible moment and ought also to add the land the Jesse McHone, carrying the present Cow Bell Range o the top of the Narrow Gap Hill, and with the line of McHone and Burnell along the mountain ridge to the Southeastward. If the opportunity ever offers for the purchasing of Edward McHone's present holding this should also be secured.

Desirable future additions but perhaps rather too remote to anticipate would be the old Perky property now owned by Sherd Baker and the large tract at the foot of the Big Hill belonging to Robert Lucas.

The property of John Hoskins across the road from the head of the main drain of Cow Bell Hollow undoubtedly furnishes drainage through what is known as the Bear Wallow towards the spring which feeds reservoir No. 6. For this reason I believe it would be a desirable thing to purchase this property so that the sanitary conditions around the place may be under College control. It lies on the edge of Rockcastle County and consequently outside of what has been decided to be the boundary lines of possible purchases. In my opinion this decision is a mistake for two reasons. In the Wolf Pen Branch and in the main fork of Clear Creek lying above it are numerous springs affording a large flow of water which might at some time be pumped across into the supply of No. 6 greatly increasing the capacity of the present water system. Another reason is that a large boundary of very productive timber land might be bought at a very low figure in this region and if enough were secured to warrant the keeping of a reliable resident forester on the property, this land would be as safe from fires and depredations as some portions of our present boundary.

Adjacent to the Bear Knob Range are a number of properties which it would be greatly to the interest of the College to own. Some of these have frequently been discussed and probably the most desirable to secure is that of Anthony Burnell lying just South of the Pike on the Narrow Gap Hill and also in two small boundaries within the Ballard Branch, one being the former Turpin place

and the other a portion joining Caleb Johnson and the Kitty Harris dower. Probably, if Anthony Burnell ever sells, his father, Wm. Burnell, who has about 60 acres adjoining him will sell also. I think it would be an advantage to own the Caleb Johnson property, carrying the College holding to the plank culvert on the pike road at the point known as the Blue Bank and then to own all in the rear of the cultivated lands fronting the pike from this point on around to the Westward including all of the Buck Johnson Hollow which heads just below the Bear Knob and all of the mountain tracts lying to the West of that Hollow, down to the Scaffold Cane and Silver Creek road. From the Brack Pigg and Samuel Burnell tracts Northward to the corner of the Harris Fork of Silver Creek, now owned by Bill Davis and from there around to Blue Bank culvert, just mentioned, would include a large boundary of very productive and valuable young growth timber land. And, acquiring of this would have an additional advantage of bringing the Forest Preserve down to the public highway instead of leaving the outside lines on a ridge adjacent to other holdings, a situation which is always more exposed to fires and depredations from stock. Since Dick Davis sold his large boundary of timber lying North of the Bear Knob road through his property, I am inclined to believe that this portion of his land may be purchased at a reasonable figure at an early date. The ideal would be to secure all of his, all of Hawkins' and Waddell's and two small boundaries on the County line belonging to Shearer and Witt. This would extend the Bear Knob Range with the County line to the Scaffold Cane road near the Macedonia Church House, then with the Scaffold Cane road down the hill around the great Horseshoe bend with the pike to the Hart place now owned by Samuel Burnell and from that with the Silver Creek Road to the present holding purchased from Pigg and Burnell.

There is an opportunity to purchase at very low figures, two tracts of land of five or six hundred acres each, lying in the direction of Boone's Gap, one being the mountain lands of the Lester estate and the other the old Elisha Witt property now owned by Wm. Smith, of Richmond. By purchasing with these several small holdings along the slope towards the Scaffold Cane Road and pike a new range of the Forest Preserve might be created, possibly to be called the Boone Gap Range, which would have for its farther limits the North Prong of Little Clear Creek heading opposite Weddell's house and extending Southwesterly to the Railroad some distance beyond Boone's Gap; then with the Railroad Northward as far as the culvert which the Slate Lick Road passes under and with the Slate Lick Road to the Brushy Fork. This would include in addition to these large tracts named, the Bert Green place, the old Silas Williams place and the Mehaffey property, as well as several smaller holdings. This would bring the boundary down to the land

Further Purchase of Forest Lands

purchased from Fairchild and leased to Prof. Marsh. Beyond the Fairchild property going out with the Scaffold Cane Pike from Berea, it would be necessary to secure a portion of the old John Williams farm now owned by John Hoskins and beyond that the detached portion of the Lester farm, Mrs. Logsdon's little property, the John Davis farm, the land of Tom Hazelwood, two tracts formerly belonging to the Hart estate, the land of Joe Jones in the head of the Lester Hollow and a few other small boundaries. This would make the entire area of the new range approximately 2,000 acres. It contains at the present time a great deal of young forest regeneration in a very fine condition of growth. While the greater part of this boundary will be acquired at from \$2.50 to \$5.00 an acre, about \$10.00 an acre would have to be paid for some of the small holdings to round out the property, and lying as near to the College and situated as it is, the future value of much of this timber would be greater than that of more distant portions of the Preserve on account of shorter transportation. It would be a boundary also which could be reached much more readily with working squads of students. Large blocks of timber lands will lie within a mile to a mile and a half of the College buildings.

I wish to take this opportunity to place on record my firm conviction that this would prove a very profitable investment of gift funds and that the advance in land values alone in ten years time would amply justify this purchase, saying nothing of the timber increment. This boundary includes enough of fairly good agricultural lands that desirable tenantry could be kept on all parts of it. While it is not as well watered as the Bear Knob and the Cow Bell Ranges there is sufficient water on all of it for stock and family use.

Concluding Remarks

Concluding Remarks

The preparation of the foregoing work has been made under great stress of other work; my Fall term teaching work having been increased by an extra class instead of my having been increased by an extra class instead of my having the relief that I should have had for this additional undertaking.

The descriptions of boundaries of block can only be entered accurately upon the map when Mr. Seale shall have time to survey some of the topographical features of the Preserve which will enable the precise locating of these boundaries. It will be seen when these surveys are made that the system of plotting the Preserve in blocks is comparatively simple, there being four horizons:

First – The lower stream valleys.

Second – Mountain slopes up to the mountain bench.

Third – The mountain slopes from the mountain bench to the brow of the cliffs.

Fourth – The mountain tops lying above the cliffs.

When such surveys and topographical notes as I have suggested are completed, the arrangement of the blocks along these four horizons or zones will seem to be comparatively simple.

In the same manner the descriptions of the roads I have proposed and numbered will be found to be quite simple and the system easily located, when these surveys are made.

This, therefore, is one of the very important pieces of foundation work needing early completion. If Mr. Seale could spend a large part of next summer's vacation with two good student assistants on this work it would be a very great advantage.

These surveys once completed and plotted into the large map, tracings should then be made on convenient sized sheets overlapping each other sufficiently to afford a complete map of the whole, and numbered in a convenient serial order. From these tracings other maps should be prepared, one most important of all for the working forester, being a map showing the divisions into ranges according to my description, and these ranges into blocks. A water color scheme could easily be devised which would make this range and block system distinct and definite with a glance at the map. The preparation of these maps would be considerably aided by referring to several German Forest Maps, which I secured while abroad, and which are the property of the department. After the preliminary organization which is covered by plotting into blocks and ranges and the location of the roads, the work of greatest importance is the description of each block, its soil, varieties of timber and proposed future treatment. This, in the time at my command during this Fall term could not possibly be accomplished.

Concluding Remarks

This work has been done in a somewhat imperfect way for the Indian Fort Range, and I wish to here record that I consider this only an imperfect and superficial attempt at a working plan. I would gladly have completed the entire working plan after this imperfect manner if time had allowed and I had longer in charge of the Preserve. My idea was to make a really exhaustive working plan for each of these blocks, which would require an immense amount of careful work. To do this in a proper way a forester should have the aid of several competent assistants, each block should be gone over entirely, enumerating the trees of each species and callipering them for their diameters; approximate notes on the height being recorded at the same time then throwing these trees into diameter classes, sample trees of each class should be cut and their rate of growth studied by the method called "Stem analysis." This would put the forester in position of precise information as to both increment and height growth of his growing stock. He would then be prepared to make recommendations as to thinnings, growing space, and the relations of different species in the mixtures. Such details as these can only be of fullest value when supplemented by an intimate knowledge of the species themselves, their behavior in different soils and aspects and in the manner of light and shade. The average European forester has to deal perhaps with ten or twelve species of trees on the forest boundary entrusted to his care, often with not more than five or six. There are perhaps 75 species of trees upon the Berea College Forest Preserve, fully half of these of high economic and silvicultural importance. While this forest boundary if protected from fires and left to nature will make a growth of immense values, paying good dividends upon the investment, the highest results can only be obtained with the skillful and scientific management of the boundary in accordance with the outlines I have suggested. This makes it of great importance that the College should secure at the earliest moment a man of scientific training along forestry lines and of natural aptitude for such work in its most practical bearings, both from a financial stand point and from the standpoint of affording a great object lesson in forestry to the people of this region.

With these concluding remarks I respectfully submit this report, realizing its imperfections but hoping that it may form a basis for such a development of the Forest Preserve as I have hoped and planned for.