

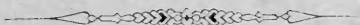
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*Forests and Forestry.*









# FORESTS AND FORESTRY.

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A

## LETTER

ADDRESSED TO

VERPLANCK COLVIN, ESQ.,

Superintendent of the Adirondack Surveys,

ON THE

IMPORTANCE OF FORESTS, THEIR MANAGEMENT

IN GERMANY, WITH A SHORT REVIEW OF

THE HISTORICAL DEVELOPMENT

OF FORESTRY,

BY

S. V. DORRIEN.

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NEW YORK, November 4, 1878.

DEAR SIR:

When I had the pleasure of meeting you in the Adirondacks in the Autumn of 1877, our conversation turned to the importance of preserving the forests of those regions, and I promised then to give you some details on the scientific management of forests in Germany.

I gave this promise presuming that some book might have been recently published, which would convey ideas on the science of forestry in my native country in such a plain manner, that a layman even would readily comprehend them.

Endeavoring to obtain such a book, I found a great many excellent works written for professionals exclusively, but none adapted for my purpose.

I was therefore compelled to rely principally on my knowledge and experience, gained during many years of practical study, which assisted me in making abstracts from the above-mentioned works and composing these into an essay, which I take great pleasure in transmitting to you.

The delay in making good my promise, was caused by the time-absorbing task of modeling abstracts from scientific works into a shape suitable for non-professionals.

I have divided this essay into three parts, of which  
*The First* treats on the latest experiments and their results respecting the influence of forests on the climate,  
*The Second* on the scientific treatment of forests, and  
*The Third* on the historical development of forestry.

## CHAPTER I.

### THE INFLUENCE OF FORESTS ON THE CLIMATE.

THE First Annual Report of the Commissioners of State Parks of the State of New York, submitted to the Legislature, May 15th, 1873, treats on the influence of forests on the climate, especially with regard to the abundance or lack of water, and reference is therein made to the researches of HUMBOLDT, BONPLAND, DE SAUSSURE, BOUSINGAULT, and others.

In relation thereto I will quote some portions of a work, written by Dr. Ernst Ebermayer, Professor of the Central Forest Academy at Ashaffenburg in Bavaria.

For five years observations have been made in the kingdom of Bavaria, at seven different points, respecting the influence of forests on the temperature and moisture of the atmosphere, on the evaporation of water, and on the quantity of rainfall, &c.

Most all the facts stated in the above work, are based on 5,000 different observations, made during the years 1868 to 1872, with the help of instruments most ingeniously constructed for that purpose. With these, twice every day, at fixed hours and at all seven points, the temperature of the soil was measured, for comparison in the forests as well as in the open fields, at the surface and at a depth respectively of one-half, one, two, three, and four feet. According to these the mean annual tempera-



ture of the "*forest soil*" is, on an average, 21% lower than that in the "*open field*," and the mean annual temperature of the "*atmosphere in the forest*" is on an average 10% lower than that in the "*open field*."

They furthermore show the equalizing effect of forests in lowering the extreme summer's heat, and in lessening the extreme winter's cold.

The quantity of moisture which the atmosphere may contain without a formation of clouds, etc., being dependent on the temperature, we see how important the above experimental observations are with regard to the enquiry, whether the abundance or lack of water of a district is influenced by forests, and if so, to what extent.

The higher the temperature, the more moisture the atmosphere can absorb and retain without discharging it in the form of dew, fog, rain, or snow.

As a rule the atmosphere never contains as much moisture as it could hold in accordance with the prevailing temperature.

The proportion which the moisture actually in existence bears, at the same temperature, to that which the atmosphere could hold, if fully saturated, is called "*relative moisture*." Observations prove now, that the "*atmosphere of forests*" has more **relative** moisture than "*that of the open field*," notwithstanding the equal degree of **absolute** moisture in both, and consequently a falling of the temperature will affect the condensation of moisture more, and produce a greater volume of water in the former (the forests), than in the latter (the open field). These observations give us the relative moisture on an average to be 6% greater "*in the forest*" than "*in the open field*;" the difference being 9% in summer, and

about 5% in the other seasons. From the above we therefore arrive at the conclusion, that forests make a climate more humid, their influence being mostly felt during the summer season and greater in more elevated locations.

In the higher mountain regions the difference between the relative moisture "*of the forest*" and "*the open field*" is considerably greater than in less elevated localities.

Not less important is the influence of the forest and its surface soil on the water supply of a district, retaining as it does the humidity of the soil.

Examinations made in relation hereto, have proved that if in **the open field** one hundred parts of water evaporate, in **a forest the uncovered soil** exhales but 38 parts, and **the covered soil** (with leaves, moss, or humus, *i. e.*, vegetable earth), but 15 parts of water.

No wonder then, as Professor Ebermayer justly remarks on this occasion, that the volume of water in rivers is greatly diminished, that springs and brooks dry up, or flow but periodically, in districts where large tracts of woodland have been cleared.

In a forest the foliage resists successfully the violence of even the fiercest storms, and breaks the force of the heaviest rainfall, which gradually reaching the soil, penetrates it but slowly, as the surface covering of leaves, moss and humus, acting like a sponge, absorbs and retains it. On the other hand, in an open country, much less water penetrates the soil, as the rain coming down with unbroken force, rushes from hills and mountain sides through valleys and fields, only feeding brooks and rivers, carrying off in its course quantities of fertile soil and

cutting deep ravines, which in time enlarge and become the beds of torrents.

The above will prove to what an extent woods affect the humidity of a climate, and I have tried in particular to point out their importance in connection with the abundant water supply of a district. Some additional quotations from the same work of Professor Ebermayer, will also show the highly important bearing, the moisture of the atmosphere has on the climate in other respects.

The principal distributor of warmth over the whole globe is the moisture of the atmosphere, without which it would be excessively hot in some countries and freezing in others. Should the atmosphere be perfectly dry, the earth would exhale in the course of the night all the warmth it had been receiving during the day, and even in summer nights the temperature would then sink to the freezing point.

A striking illustration of the foregoing we find in the great desert "Sahara," where the dryness of the atmosphere causes a falling off in the temperature after sunset to such a degree as even to permit the formation of ice in some parts.

Again, this moisture is the principal cause that the atmosphere can retain part of the warmth emanating from the sun. Remove the moisture from the atmosphere of England but for a single night, remarks Professor Tyndall on a similar occasion, and it will inevitably destroy all the plants which frost would kill.

Having thus shown the importance of preserving the forests on account of their beneficial influence on the climate, I shall now try to show how they, belonging either to a State or a great land-owner, may be preserved and eventually made profitable.

## CHAPTER II.

### THE SCIENTIFIC TREATMENT OF FORESTS.

IT is the task of forest economy to use to the utmost advantage the land intended for the cultivation of woods, under full observation of all secondary considerations. Where there are no secondary considerations, the most profitable usage is identical with the highest possible returns to be netted from the capital invested.

The secondary considerations which may exist are:

1st. Where forests serve as protection to open districts or for similar purposes.

2d. Where they are to supply in certain sections the demand for different specialties of timber.

3d. Where they are only intended by their owner to beautify the natural scenery, and are solely used as pleasure grounds and deer parks.

If a forest contains the different kinds of trees best suited for climate and soil, standing so closely as to leave no waste space, being of various ages, in such quantities as to permit every year or after certain periods of years the felling of an equal quantity of timber, then we have before us a picture of a "*standard forest*."

If we consider secondary motives as not existing, the creation of such a forest would be the highest perfection forestry may attain.

*Explanations.*

Climate and soil must be well considered for the prosperous thriving of the different kinds of timber, as each species has its own peculiar demand in that respect.

To arrive then at the most profitable result, there should be timber suitable to both climate and soil. The trees should stand so near to each other as to leave no openings at all, not however so closely as to interfere with each other's growth.

In order to get from a forest every year, or at regular periods, an equal quantity of timber, there should be represented in like quantities different stages of growth of each species.

Take for instance, as illustration of the above, a pine-wood extending over 1,000 acres of equally good soil, and presume, furthermore, that 100 years would be the most profitable age, in which to cut the trees, then 10 acres would have to be cleared every year in order to yield uniform profit.

Each of these 10 acres should be covered with timber of a different stage of growth, from 1 to 100 years. The whole tract would then be divided into 100 sections, of which the one of the oldest growth (100 years) would have to be cut in the first year, and the youngest (one year's growth), at the end of 100 years.

Although it is almost certain that we shall never see a forest in so perfect a state, it is necessary to keep in our mind such a picture, in order to judge the existing con-

ditions of a forest from a fixed base, upon which to attempt its utmost perfection.

In the following I shall try to describe as briefly as possible the system which, with occasional deviations, is applied in the different parts of Germany for the purpose of forming the plan for the management of State or private forests. The system is termed "*Betriebs-Regulierung* or "*Forsteinrichtung*," "*contrivance of plans for the management of forests*"—"Forest-Regulation."

*THE FIRST PREPARATORY WORK* is, to ascertain by surveying the exact extent of the whole forest and of the different districts, which for the purposes of management have to be treated as separate parts; and furthermore, to attain the geometrical base for the drawing of the necessary maps.

#### *Explanatory Remarks.*

The confines of the property must be surveyed with the utmost care, and marked by easily discernible signs. The variations of the ground, such as hills, ridges, valleys, waters, roads, as well as any other important objects or points of observation should be included in the plan, and there should be measured all areas, distinguished by their diversity in the quality of the soil and by their variety of the timber as to kind and age of growth.

All minor items which are not lasting and of no value to the future management, need not be considered.

To facilitate the management of large tracts of forest lands, and to make supervision easy, it is often necessary to divide the forests into "*administration districts*."

Where natural boundary lines do not exist, these are marked permanently by straight lines being cut through the woods.

Previous to the surveying of the plan, or at the same time, a thorough examination into the "*interior conditions*" of the forest should be made with regard to the quality of the soil, to the timber and its varieties of kind and age, in order to form a base for the subdivisions of the forests or their districts.

All those portions of a forest of some extent, which distinguish themselves from their surroundings by either soil, timber, growth, or age, and which form a homogenous entirety, are known by the technical term "*Bestaende*," "*sets of trees*."

*THE SECOND PREPARATORY WORK* consists, if not already completed in the foregoing, of a thorough examination of all those conditions of the forest, which influence the production in its present state or which may be of importance for the valuation of its future yields.

These examinations are termed "*forest estimations*," and comprise the following three branches.

- I. The Capability of the Standing Place of the Trees.
- II. The Conditions of the Different "*Bestaende*" Sets of Trees.
- III. The Product and Cost of the Forest up to the Present Time.

#### *Explanation to I.*

The capability of the standing place of the trees depends upon the locality, *i. e.*: on the climate, soil, country, whether it be level or undulating and upon the exposures toward N. and E. or S. and W.

The preceding furnishes the base for :

- (a) The proper selection of timber, its "*kind of management*" as well as the "*time of rotation.*"
- (b) The calculation of the capacity of producing for every "*class of management.*"

NOTE TO (a).—To make the proper selection of the timber, it is essential to be well acquainted with the locality, as has been explained before.

We distinguish three different "*kinds of management.*"

- 1st. "HOCHWALD." "*Timber forests,*" "*seed forests,*" "*forest of tall trees.*"

Forests which have reached their maturity and progenerate themselves from the seeds falling from the trees, or which are restocked by planting, are termed "*Hochwald*" "*forest of tall trees.*"

- 2d. "NIEDERWALD." "*Coppice.*"

"*Niederwald*" "*Coppice*" is a forest where the trees are cut down at such an age that reproduction may be obtained by shoots from the stumps and roots.

- 3rd. "MITTELWALD" "*Middle-wood,*" a combination of 1st and 2nd.

"*Mittelwald*" "*Middle-wood*" is a combination of the above two systems of reproduction on the same tract, the fresh growth being obtained from both seeds and shoots.



Besides these three principal "*kinds of management*" we distinguish several others which, however, are only of importance in certain localities and under exceptional circumstances.

Of these I shall only mention here one, namely:

4th. "*Plaenterbetrieb*" or "*Femelwald*" "*Felling by selection*," a method according to which the timber will be cut wherever it is found, without considering reproduction or any other rule observed in regular systems.

It is the most primitive "*kind of management*," and, as will be easily understood, ruins a forest and produces only irregular and imperfect "*Bestaende*" "*sets of trees*." This system has therefore been excluded, for considerable time past, from the economy of State forests, and is only permitted in localities, which do not allow a clearing of large tracts for the purpose of reproduction, as, for instance, in mountains where precaution against natural phenomena requires an uninterrupted growth of wood.

Wherever the "*Plaenter system*" is still found in a regulated administration of forests, certain rules are observed which diminish its disastrous consequences, *viz. :*

1st. The forest is divided, if possible, into divisions in accordance with the different stages of growth.

2nd. The wood to be used during the year is cut, as far as possible, in one and the same division.

3rd. The principles as to reproduction observed in forestry are, as much as possible, adhered to.

Not all kinds of trees have the capacity of reproducing lost parts by shoots, as for instance Pine trees. A special "*kind of management*" can therefore only be determined upon after a selection of the species of trees, under full consideration of the "*capability of the standing places.*"

"*Rotation.*" The period which elapses between the planting of a "*Bestand*" "*set of trees,*" and its maturity combined with reproduction, is termed "*Umtrieb*" "*rotation.*" The end of this period coincides with the age of the timber when cut down, and is termed "*Haubarkeitsalter*" "*Age for felling, Felling Age.*"

The time for felling trees will come around sooner in less favored localities than in those where all conditions for the prosperous thriving of trees exist.

NOTE TO (b).—(The calculation of the capacity of producing for every "*class of management.*") It is very seldom that we find a large forest in such a condition, that the different species and quantities of timber, as well as the represented "*classes of age,*" allow a uniformity in "*rotation*" "*Umtrieb*" and management. As a rule, it will be necessary to divide the forests into different parts, each of

which, independent of each other, will require a separate management. Those parts of a forest which in reference to management are treated as one, form what is termed a "*Betriebsklasse*" "*class of management.*" For the formation of these classes an exact knowledge of the locality is absolutely necessary.

*Explanation to II.*

(The condition of the different "*Bestaende*" "*sets of trees.*") Investigating into these conditions, we have:

- (a) To ascertain the "*kind of management*" hitherto in use.
- (b) To ascertain the species of trees on hand in each "*Bestand*" "*set of trees,*" whether it is pure or mixed.
- (c) To examine whether the trees stand crowded or scattered, or whether there exist any uncovered places.
- (d) To examine the age of the trees in the different sets.

The term of rotation is to be divided into 4, 5 or 6 periods. A rotation of 100 years, for instance, into five periods of 20 years each, namely: 1st period, 1-20, etc. However, the time of each period is not necessarily to be fixed at 20 years, but also at 5, 10, or 30 years, as it may suit the purpose.

- (e) To estimate the present stock of timber of the different "*Bestaende*" "*sets of trees.*"

(*f*) To calculate the yearly increment which may be expected up to felling time.

NOTE TO (*e*) AND (*f*).—The different methods in use for determining the stock on hand and the yearly increment of the forest, need not be mentioned here, as it would lead us into details rather foreign to the purpose of this essay.

In examining the "*interior conditions*" of the forest, the forester must consider at each single "*Bestand*" "*set of trees*," what would be the best "*kind of management*" for it, although the final decision in reference to the future working plan can only be given after finishing all preparatory work.

#### *Explanation to III.*

(To ascertain the product and cost of the forest up to the present time.)

In forming an opinion as to what we may expect from the future, the experience of the past is of the greatest importance. The forester must therefore inquire most minutely into the manner of the former management, produce and revenues of the forest. It is furthermore necessary to examine the so-termed "*general exterior conditions*" of the forest, especially with regard to the neighboring property, inasmuch as it may bear great influence on the realization or sale of the forest's products.

**THE THIRD PREPARATORY WORK CONSISTS OF THE DRAWING OF THE MAPS,** which are to give a right view of the general conditions of a forest, as ascertained by surveys, calculations, and examinations.

Their purpose is to show the entire work of the surveying, and to calculate thereby the size of the different areas.

They consist of :

### I. The Special Map.

These maps are drawn at a scale of 1 to 5000, and based upon the surveys mentioned above, using the notes taken during the examination of the "*interior conditions*" of the forest and contain :

1. The boundary lines of the entire forest.

2. The boundary lines of its administration-districts, *i. e.*: districts into which it is divided to facilitate its administration.

The dimensions of these districts, which are placed under the control of a scientifically educated officer, vary from 3,000 to 17,000 acres. According to their extent they are again sub-divided into several circuits, each of which is under the supervision of a practical forester, whose duty it is to protect his circuit from any possible damage, and to superintend the work that is to be done in conformity with the instructions of the administration office. These circuits vary in their dimensions from 1,000 to 4,000 acres. The supervision of a number of administration districts is generally concentrated into one department, at the head of which a scientifically educated officer, called the Forest-master, stands.

3. The boundary line of its divisions.

To facilitate the management of a forest and all necessary operations, it is essential, in connection with the

occasional division into districts, to divide it into certain parts, which are termed divisions, and are marked by using natural boundary lines such as roads and brooks, or by cutting straight lines through, which are to be kept clear of wood. Where there is danger of fire, such lines should be at least 30 feet wide.

It is usual to make the divisions not larger than about 200 acres.

4. The boundary lines of the different "*Bestaende*" "*sets of trees.*"

5. Unwooded areas, such as roads, meadows, waters, etc.

6. Notes of the surrounding districts to the extent of about 300 feet, including villages, roads, meadows, waters, etc.

7. The name and extent of the different districts, year of survey, names of the roads, waters, etc.

Roman figures are to be used for the designation of the divisions, and arabic figures to designate the sub-divisions.

## II. Bestandskarte.

### (MAP OF THE DIFFERENT "SETS OF TREES.")

The purpose of these maps is to give a right view of the present form and condition of the forest, and furthermore to show the existing kinds of timber, the "*kind of management,*" as well as the different "*classes of age.*" For these a scale of 1 to 20,000 is sufficient.

In drawing a map of a "*Hochwald*" "*timber forest*" the different kinds of trees are to be marked by different colors.

For instance: Oak trees, carmine; Beech trees, green; Birch, yellow; Spruce, blue-black; and Pine trees, black. In forests stocked with mixed timber, the intermingled wood is designated by marking small trees of a peculiar shape in the space showing the respective color of the predominating kind of wood.

The difference in age is designated by different shades of the same color, the darkest shade representing the oldest, the lightest shade the youngest class.

The "time of rotation" "*Umtriebszeit*," as already mentioned, being divided into several periods of age, we can have only as many shades as there are periods in a "rotation" "*Umtriebszeit*."

"*Niederwald*" "*Coppice*" is designated by one color, for instance, purple; and "*Mittelwald*" "*Middle-wood*" by the same color, distinguished only by adding the form of small trees.

"*Plaenterwald*" is to be designated by the respective colors of its principal growth of trees, and is to be distinguished from the other classes by small white triangles of different size.

Parts not covered by wood remain uncolored. The roads, lakes, brooks etc. should be marked by opaque lines of a red or blue color. As on the special maps, the names, etc., have to be written in, together with an explanation of the respective colors.

### III. Maps Showing the Character of Ground and Soil as to their Inclinations and Fertility.

These maps are intended:

1st. To show the variations of the ground, such as valleys, ridges, ravines, mountains, and the degree of the latter's declivities.

2nd. To show the different classes of the soil's capability and the different species of rock composing the mountains.

3rd. To give the administration and division lines as well as roads and waters. A scale of 1 to 20,000 would also prove sufficient for these maps.

*THE PREPARATORY WORK* may now be considered as finished, every basis having been gained for determining on a future plan of the forest's administration.

Examining the various notes that have been made during the investigation of a forest's "*interior conditions*," we proceed with the help of these items to form a systematic working plan; and keeping in mind **that it is neither our intention to live at present at the cost of the future, nor to suffer want when we have in reserve**, we strive to equalize the yields in stated periods on areas of, if possible, equal extent.

The motives we have been acting upon in determining the respective management for each separate "*Bestand*" "*set of trees*," must be mentioned. Furthermore the general principles, by which the future administration is to be guided, have to be defined so clearly that even in cases, where the adopted rules have to be deviated from, they can still as a whole be adhered to. The notes which have to be made respecting the working plan of the future administration, include of course the manner of reproduction, the re-stocking of cleared tracts, as well as the necessary drainage and the periodical thinnings of the woods "*Durchforstung*."

It will often suit the purpose to make a special supplement under the title "**GENERAL DIRECTIONS FOR MANAGEMENT**," in which the leading motives for the method of



administration respecting the founding, culture, and yielding of the "*Bestaende*" "*sets of trees*," are laid down.

EXPLANATIONS.—It is a well-known fact that an old tree occupies a larger space than a young plant; consequently the same area will be found to contain of old trees a smaller number than of a younger growth, the trees standing in both periods as thickly as possible.

The wood which in every systematic management is to be removed from a forest during the time between its stocking and felling age, is taken away by periodically repeated thinnings, termed "*Durchforstung*," "*Interlucation*."

It may be mentioned here that the working plan, being destined for a number of years, has to be considered with particular care, and laid down in a clear and concise form.

Having proceeded so far, we have to draw now :

#### IIII. The *Hauungsplan-Karte* "felling plan map."

They purpose to show the intended future condition of the forest, and to serve as a guide for the felling and cultivation. By comparing this map with the "*Bestandskarte*" "*map of sets of trees*," we understand at once the object the forest regulator had in view, when deciding upon the working plan.

These maps comprise :

1st. The boundary lines of the forest's districts and its respective divisions.

2nd. The roads, brooks, lakes, etc.

3rd. The different working periods which, as already mentioned, are indicated by the various shades of the respective colors.

The plans for cultivating and felling the different "*Bestaende*" "*sets of trees*" are made every year, sometimes for a number of years, and are based on the working plan; in accordance with those the forest is managed.

It is the custom in Germany to review these plans every ten years for the purpose of comparing the proceeds of that period with the working plan, and, in accordance with the result, to decide whether modifications are proper or not.

For the work incidental to the regulation of a forest, it is not only necessary to possess a particular ability for taking geometrical measurement, but it is also very essential to have a thorough knowledge how to appraise and calculate the stock, etc. For that reason only experienced and able foresters are endowed with such offices, and they, in their turn, are again assisted by one or more well-informed juniors, as circumstances may require it.

It is apparent, however, that these rules can only be adhered to in countries, where the science of forestry has already attained a high degree of perfection, and where a number of well-educated foresters can always be found, to carry out the plans of regulation and administration.

"As will be shown in Chapter III., the present advanced state of forestry in Germany has only been attained gradually during a long period of practical experience and study; and although the people here may have the benefit of the experience gained by others elsewhere, it will be at first attended with great difficulties

to produce a systematic working plan. However I feel confident that whoever takes the first practical step in that direction and undertakes to organize a systematic plan for the management of our forests here, will ingratiate himself into the hearts of his fellow-citizens and connect his name forever with the history of this country ; for the Americans of the future will then recognize the importance of a thorough system of forestry just as much as the necessity of preserving the forests is felt and acknowledged by them at present."

To aid the understanding of the foregoing chapter, I have prepared two maps of a certain wood district and a summary description of the different "*Bestaende*" "*sets of trees*" with disposition regarding the future management, both of which you will please find affixed below.

I believe I may close with this, the chapter on forest regulation, trusting that from the foregoing you may be able to form an idea of the methods observed in Germany in the administration of forests.

In conclusion I shall try to show, as briefly as possible, the historical development of German forest economy in giving quotations and abstracts from a work by August Bernhardt, Royal Prussian Forest-Master and Director of a division for experimental forest matters at Neustadt-Eberswalde.

### CHAPTER III.

#### HISTORICAL DEVELOPMENT OF FORESTRY.

AS early as the 13th century we find certain regulations, laid down by owners of extensive forests in regard to the management of their woodlands. They are, however, very simple, and relate mostly to the cultivation of such parts as had been cleared. Some of them contain also records of the rules, established in the course of time, with reference to the use and preservation of the common "*Mark*," especially of the "*Mark-forests*."

The term "*Mark-forests*" is applied to woods whereon the owners of farms, which are within the limits of the mark, have certain rights of usage, though the right of possession remains with the liege lord.

Beginning with the 15th century, we find forest ordinances proper, *i. e.*: laws of forest economy for every one given by a person having authority by Right of State, or dispositions over his own and other estates, made by him who is the bearer of the public power and who represents the economical interests of all, as for instance, the forest laws for the Rhinegau of 1487, and the Nassau provincial laws of 1465 and 1472.

Among the oldest forest ordinances, regulating the economy of State and other forests, we find one given by the Elector Joachim of Brandenburg in 1547, also one respecting the forests owned by the Count of Mansfield, given in 1585 by the Elector August of Saxony by vir-

tue of his right of sovereignty. In both cases, the forest ordinances emanated from Germany, and were not, as many contend, of French origin. The earliest French forest laws date from the 16th century, and are consequently of more recent date than the first German ordinances.

NOTE :—Civilization at the time of the Reformation (1550) was yet depending upon the mental productions of the Romans. In Roman literature, however, we find no works on forestry; very little attention has been paid by Roman writers to the science of forest economy, while they wrote freely on the nursery of trees. The key to this we find in the climatic conditions of Italy. The mildness of its seasons did not require a large supply of fuel, the necessary demand being easily supplied from gardens and parks, and the Alps and Appenines furnished all the necessary timber for building purposes.

But the cultivation of trees was of far greater importance, as they furnished not only shade alike to man and beast, but also those juicy and delicious fruits of all kinds, which were the pride and boast of Italy. Everything pertaining to the nursery and cultivation of fruit and shade trees had even at that remote period attained a high perfection. Varro (116–27 B. C.) already discriminates distinctly between sowing, planting, ingrafting, and propagation by layers. Cato, the experienced statesman, called the Wise, gives very good instructions for the laying out of Arbustus (tree-gardens). His directions for the cultivation of Olive trees, Elm trees, Vines, Fig trees, Pines and Cypresses, as well as his advice for the treatment of nurseries, loosening the soil, etc., may even to-day be called perfectly correct. Columella, who lived in the first century of our era, also teaches in quite a rational manner the laying out of nursery gardens (arbustus), giving full directions as to spading in the fall, sowing, weeding, transplanting, and lopping of the young seedlings when three feet high. He considers the fall after the equinoctial storms the best time for planting.

Reflecting upon the state of forestry in Germany about the year 1700, we may assert that everywhere, excepting perhaps the northeastern portion, the science of forest economy was caused and promoted by sheer necessity.

About that time there appeared the first symptoms to secure a lasting use of the forest, either by dividing the woods into sections of equal extent, or by regulating the yearly revenues according to the total stock of the forest,

and to change thereby the "*Plaenter system*" hitherto in use, to a more regulated productive management. Then also efforts were made to replace the consumed timber by the cultivation of waste lands.

Yet, notwithstanding all these efforts, the science of forest economy still fell short of the requirements of the time, and it is not till more than a century later that we meet with well-instructed foresters.

Game and forest keepers with a more than usual knowledge of forest matters became the first real foresters. Principally among these we count J. G. von Langen, a native of Brunswick, who in the year 1740 introduced the first systematic working plan in the Harz Mountains. About the same time we find in Prussia the transition from the irregular "*Plaenter system*" to systematic management of the forests.

Frederick the Great, of Prussia, soon after his accession to the throne (1740), made it a law to divide the forests into equal sections and to fell the timber accordingly. Forest Academies were established in the years 1783, 1785 and 1790, at Berlin, Hohenheim, Kiel and Munich, and from this time dates the scientific knowledge of forest matters. But its full importance was only recognized at a much later period, when it was deemed advisable to consider the laws of nature and to apply the rules of general economy to the administration of forests; when political economy favored commercial industry to such a degree as to break the absolute sovereignty over forests; when the fast progress of natural science became in a high degree beneficial to technical experience; and when men like G. L. Hartig and Heinrich Cotta began to lay down certain rules for the scientific management of

forests ; then indeed the knowledge of forestry was entitled to be called a science.

In Germany, laws which regulate the relation of the state to the forest property have sustained, since the beginning of the nineteenth century, alterations of the highest importance, influenced by new theories rapidly gaining ground.

By representatives of the doctrine on the Freedom of Possession (Adam Smith and his followers,) all interference on the part of the government with the economical administration of property belonging to subjects, was looked upon as impracticable and exposed to the stigma of clinging to an old-fashioned and absolute government.

Liberating private property from all restrictions caused frequent devastation of entire forests, whereas, according to Smith's principles, it ought to have led to the highest state of prosperity.

However, those devastations of forests are not to be attributed to Adam Smith's doctrines only, but they appeared at that epoch rather like a general disease spreading throughout Europe, hastened on by the then prevailing ideas and theories respecting the absolute freedom of private property. Even state forests were not spared at that period of revolution. Sales took place, fortunately in a small degree only, principally in Prussia and Bavaria.

Great financial distress may have been the motive power for this, although Baron von Stein, who recommended the sale of state forests at that time most energetically, was a strict follower of Adam Smith's principles.

It appears that the first impulse for the sale of state forests was given by France, at least it was recommended in an essay written at Paris by a Mr. M. Mustel in 1784.

Fortunately the financial calamity did not last long, the selling of the state property was no longer a necessity, and quieter considerations checked in a great measure the innovations begun so hastily and recklessly. The extent of forest area was also lessened by the redeeming of liens on forests. In order to be relieved of privileges the people had on state forests, parts of these were transferred to them and almost always converted into farming lands, meadows and pasture grounds.

In Prussia the extent of state forests was diminished about 875,000 acres during the period from 1820 to 1865; but from that time to 1873 it was increased about 75,000 acres. Since 1820 Germany has shown a lively interest in the cultivation of forests. Frederick William III., King of Prussia, paid great attention to the propagation of oak and beech trees in Brandenburg. The Agricultural Society of Bavaria offered premiums for forest cultivation, and on the banks of the Rhine atonement was made for former sins by re-wooding the Eifel Mountains. At that time the sowing and planting of trees grew to a high perfection; pine woods, particularly, were cultivated in Holstein, and during the past few years the government has been purchasing large areas of heath-lands in Schleswig and Hanover for conversion into forests.

The great importance of state forests, in a financial view, is clearly shown, for instance, by Prussia's budget for the year 1863, wherein the net income of the state forests amounts to 6,100,000 thalers (\$4,500,000).



Although these few quotations from the copious work of A. Bernhardt may not be of practical value for the object in view, they may still be of some interest to a country where the science of forestry is as yet almost unknown—a *terra incognita*.

The advanced state of the science of forestry in Europe, is best illustrated by the fact, that there are at present 19 High Schools of Forestry, *viz.* :

In GERMANY	9, in the following cities: Aschaffenburg-Tharandt, Eisenach, Neustadt-Eberswalde, Münden, Hohenheim, Brunswick, Karlsruhe and Giessen. The four last-named are connected with other High Schools.
In AUSTRIA	2, one in Mariabrun near Vienna, and one in Schemnitz in Hungary, the latter being connected with a Mining Academy.
In SWITZERLAND	1, in Zurich, connected with a Polytechnic.
In FRANCE	1, in Nancy.
In ITALY	1, in Volombrosa.
In RUSSIA	2, in St. Petersburg and Moscow. The latter is in connection with an Agricultural School.
In SWEDEN	1, in Stockholm.
In SPAIN	1, in Escorial, near Madrid.
In DENMARK	1, in Copenhagen, connected with a Veterinary and Agricultural School.
Total	19

Besides these 19 High Schools there are, in some countries, institutes called "Forester Schools," which have similar final attainments in view, but which can hardly be classed as belonging to the High Schools.

In Germany, a Forest School ought to have, in accordance with the requirements of the present day, at least 10 Chairs, viz. :

- 3 Chairs for Forest Science.
- 1 Chair for Jurisprudence.
- 1 Chair for Public Economy and Finance.
- 1 Chair for Mathematics and Geodesy.
- 1 Chair for Mineralogy and Geognosy.
- 1 Chair for Forest Botany, and
- 1 Chair for Forest Zoology.
- 1 Chair for Physics and Chemistry.

Herewith I close my letter, hoping that it may be of some use to those who take an interest in the preservation of forests, and that it may assist in promoting the science of forestry in this great republic.

Very respectfully,

S. v. DORRIEN.

To

VERPLANCK COLVIN, Esq.,

SUPT. ADIRONDACK SURVEYS,

ALBANY, N. Y.

## ***EXPLANATIONS***

### TO THE ANNEXED MAP AND TABLES.

The wood district "*Buchholz*" is supposed to have been formerly managed in connection with other forests in several "*classes of management*," but shall now be administered by itself.

The soil of the divisions I, II, IV, VII, VIII, IX, X, and III sub-division 2, V sub-division 1, and VI sub-division 1, consists of clay, more or less mixed with sand, and is well suited for the cultivation of beech trees.

A large extent of this land being already stocked with this kind of trees, and there being a good market for it, it was determined to combine these divisions into one "*class of management*" of beech trees. Experience showing that it was profitable to fell the beech tree in this locality at an age of 120 years, a rotation of 120 years was decided upon, it being divided into six periods of 20 years each. The remaining sub-divisions having a sandy soil, partially mixed with clay in small proportions, and well suited for the growth of pine wood, it was concluded to form these parts into one "*class of management*" of pine trees, deeming it advisable to fix the rotation at 80 years, divided into four periods of 20 years each.

The map of the "*sets of trees*" shows the condition of the forest in 1878. The map of the "*felling plan*" shows: how the forester has to operate in accordance with the newly-made working plan.

On the last named map, for instance, the sub-divisions I 1, and X 1 and 2, are colored of the darkest shade of green, which indicates that in this part of the forest the timber has to be felled within the next 20 years and has to be managed so, that within this period it is to be re-stocked with a fresh growth of beech trees.

Sub-divisions I 2, and II 2, are marked with the next lighter shade of green, by which is indicated that the operations have to be carried on therein for the next following 20 years and so on. Thus the various shades of the same color show the successive order in which the respective divisions and sub-divisions have to be managed.

The sub-division 5 in division VI shows the darkest shade in the pine wood color, which indicates that the timber on this area has to be felled within the next 20 years, counting from 1878, and that at the expiration of this period in 1898 the whole area has to be stocked with a fresh growth of pine trees and so on.

Here it may be appropriate to add, that for a more concise description of the quality of the soil, the standing and growth of the trees, it is often customary to indicate by numbers the various degrees of perfection. No. 1, for instance, representing the highest, and 4, 5, 6, etc., respectively the lowest class of perfection.

The foregoing remarks, annexed maps and summary are not complete in themselves, but are only intended to serve as an illustration to chapter II.



## SUMMARY OF DESCRIPTIONS OF THE "SETS OF TREES"

Division.		Sub-Division.		Brief Description of the "Sets of Trees."	Designed for	
No.	Extent Tons a 260 □ R	No.	Extent Tons a 260 □ R		I Period	II Period
					1-20 Years. Tons.	21-40 Years. Tons.
I.	57.0	1	27.0	<b>Beeches</b> , over 100 years. <b>Growth</b> : good. <b>Standing</b> : close. <b>Soil</b> : clayish sand, covered with vegetable earth (Humus).		
		2	30.0	<b>do.</b> 70 to 90 years. <b>Growth</b> : good. <b>Standing</b> : pretty close. <b>Soil</b> : clayish sand, covered with a thin layer of Humus.		
II.	90.7	1	75.7	<b>do.</b> 80 to 100 years. <b>Growth</b> } very good; often <b>Standing</b> } intermixed with oaks from 100 to 200 years. <b>Soil</b> : a sandy clay, with a thick layer of Humus.		
		2	15.0	<b>do.</b> 60 to 80 years. <b>Growth</b> : tolerably good. <b>Standing</b> : rather thin, especially at the border of the forest. <b>Soil</b> : sandy clay, slightly covered with Humus. Ground sloped towards East.		
III.	84.8	1	5.4	<b>Pines</b> , 6 years old. <b>Soil</b> : sand; pretty well stocked; sloped towards East.		
		2	79.4	<b>Beeches</b> , 40 to 60 years; intermixed with Spruce, single and in groups, from 30 to 40 years. <b>Growth</b> } good. <b>Standing</b> } <b>Soil</b> : sandy clay, except at the border of the forest where it is pure sand.		
Forw'd	232.5		232.5			

## AND DIRECTIONS FOR THE FUTURE MANAGEMENT.

the "class of management" of  
BEECH Trees.

Designed for the "class of  
management" of PINE Trees.

III Period 41-60 Years. Tons.	IV Period 61-80 Years. Tons.	V Period 81-100 Years. Tons.	VI Period 101-120 Years. Tons.	Yield to be expected at the felling time. Cubic feet.	I Period 1-20 Years. Tons.	II Period 21-40 Years. Tons.	III Period 41-60 Years. Tons.	IV Period 61-80 Years. Tons.	Yield to be expect- ed at the felling time. Cubic ft.
			27.0	270,000					
		25.0	5.0	35,000 175,000					
		75.7		B. 636,300 O. 52,000					
		15.0		100,500					
					5.4				13,500
	79.4			B. 611,800 S. 60,000					
	79.4	115.7	32.0	1,940,600	5.4				13,500

## SUMMARY OF DESCRIPTIONS OF THE "SETS OF TREES"

Division.		Sub-Division.		Brief Description of the "Sets of Trees."	Designed for	
No.	Extent Tons a 260 □ R	No.	Extent Tons a 260 □ R		I Period	II Period
					1-20 Years. Tons.	21-40 Years. Tons.
Bro'ght IV.	232.5	1	232.5	<b>Spruce</b> , 5 to 10 years old. <b>Standing:</b> close. <b>Soil:</b> sandy clay. To be felled in the III. Period, and to be replant- ed with beech trees for the cultivation of which the locality is very well suited.		
	80.8		41.4			
		2	39.4	<b>Hard and Soft Wood</b> , 30 to 40 years old. <b>Growth:</b> good. <b>Standing:</b> very close. <b>Soil:</b> a stiff clay, partly sandy. There are besides the predominating Maple and Beech trees, Birches and Alder, the latter growing on the swampy parts of the forest which has to be drained by ditches. The timber has to be felled in the IV. Period and the area is to be re- stocked with Beech trees.		
V.	66.9	1	37.0	<b>Oaks</b> , 50 to 60 years old. <b>Growth:</b> middling. <b>Standing:</b> rather thin. Birches, Hazel and other kinds of soft wood as undergrowth. <b>Soil:</b> clayish sand. To be felled in the II. Period and the area to be restocked with Beech trees. Single oaks which may show a prosperous growth at the time of fell- ing are to be reserved for the next rotation.		37.0
Forw'd	380.2		350.3			37.0



## AND DIRECTIONS FOR THE FUTURE MANAGEMENT.

the "class of management" of BEECH Trees.					Designed for the "class of management" of PINE Trees.				
III Period	IV Period	V Period	VI Period	Yield to be expected at the felling time. Cubic feet.	I Period	II Period	III Period	IV Period	Yield to be expect- ed at the felling time. Cubic ft.
41-60 Years. Tons.	61-80 Years. Tons.	81-100 Years. Tons.	101-120 Years. Tons.		1-20 Years. Tons.	21-40 Years. Tons.	41-60 Years. Tons.	61-80 Years. Tons.	
41.4	79.4	115.7	32.0	1,940,600 S.124,200	5.4				13,500
	39.4			295,500					
				259,000					
41.4	118.8	115.7	32.0	2,619,300	5.4				13,500

## SUMMARY OF DESCRIPTIONS OF THE "SETS OF TREES"

Division.		Sub-Division.		Brief Description of the "Sets of Trees."	Designed for	
No.	Extent Tons a 260 [] R	No.	Extent Tons a 260 [] R		I Period	II Period
					1-20 Years. Tons.	21-40 Years. Tons.
Bro'ght	380.2	2	350.3 20.9	<b>Spruce</b> , 15 to 20 years old. <b>Growth</b> : middling. <b>Standing</b> : pretty close. <b>Soil</b> : sandy, slightly mixed with clay, well suited for the cultivation of Pine trees. After felling to be planted with pinewood. Ground sloping towards East and South.		37 0
		3	9.0	<b>Uncovered Place</b> . Hill sloping towards South. <b>Soil</b> is sand, covered with grass. To be stocked immediately with pinewood by seeds.		
		1	4.0	<b>Beech Trees</b> , 40 to 60 years old. <b>Growth</b> : thriving. <b>Standing</b> : close. <b>Soil</b> : fine clay. Valley extending into division VII. to which it is to be assigned with reference to its " <i>class of management</i> ."		
VI.	139.9	2	12.0	<b>Birches</b> , 20 to 40 years, mixed with Pine trees of same age. <b>Growth</b> } pretty good. <b>Standing</b> } <b>Soil</b> : sandy. This sub-division is according to its location assigned respectively to the I., II., III. and IV. Period of the pine " <i>class of management</i> ." To be restocked with Pine trees.		
Forw'd	520.1		396.2			37.0

## AND DIRECTIONS FOR THE FUTURE MANAGEMENT.

the "class of management" of BEECH Trees.					Designed for the "class of management" of PINE Trees.				
III Period	IV Period	V Period	VI Period	Yield to be expected at the felling time. Cubic feet.	I Period	II Period	III Period	IV Period	Yield to be expect- ed at the felling time. Cubic ft.
41-60 Years. Tons.	61-80 Years. Tons.	81-100 Years. Tons.	101-120 Years. Tons.		1-20 Years. Tons.	21-40 Years. Tons.	41-60 Years. Tons.	61-80 Years. Tons.	
41.4	118.8	115.7	32.0	2,619,300	5.4 20.9				13,500 52,250
					9.0				18,000
4.0				43,200					
					1.0	5.0	3.0	3.0	1,800 9,000 5,400 4,800
45.4	118.8	115.7	32.0	2,662,500	36.3	5.0	3.0	3.0	104,750

## SUMMARY OF DESCRIPTIONS OF THE "SETS OF TREES"

Division.		Sub-Division.		Brief Description of the "Sets of Trees."	Designed for	
No.	Extent Tons a 260 □ R	No.	Extent Tons a 260 □ R		I Period	II Period
					1-20 Years. Tons.	21-40 Years. Tons.
Bro'ght	520.1	3	396.2 52.9	<b>Pine Trees</b> , mixed with Spruce, 20 to 40 years. <b>Growth:</b> flourishing. <b>Standing:</b> close, especially at the western border of this sub-division.		37.0
		4	56.5	<b>Pine Trees</b> , 60 to 80 years. <b>Growth</b> } good. <b>Standing</b> } <b>Soil:</b> sand, with a good layer of Humus. 38.5 tons of this sub-di- vision is to be cut off from the westerly border and assigned to the IV. Period, and the remainder to III. Period.		
		5	14.5	<b>Oak Trees</b> , 20 to 40 years old. <b>Growth:</b> mostly stunted. <b>Soil:</b> clayish sand. Some good specimens are to be reserved for the second rotation, the bulk is to be felled in III. Period of the " <i>pine class of man- agement</i> " and the area is to be restocked with pine trees.		
VII.	73.7	1	73.7	<b>Beech Trees</b> , 40 to 60 years old. <b>Growth:</b> prosperous. <b>Standing:</b> close. <b>Soil:</b> sandy clay, with a good layer of Humus. In the lower portions very moist; drainage necessary.		
Forw'd	593.8		593.8			37.0

## AND DIRECTIONS FOR THE FUTURE MANAGEMENT.

the "class of management" of BEECH Trees.					Designed for the "class of management" of PINE Trees.				
III Period	IV Period	V Period	VI Period	Yield to be expected at the felling time. Cubic feet.	I Period	II Period	III Period	IV Period	Yield to be expect- ed at the felling time. Cubic ft.
41-60 Years. Tons.	61-80 Years. Tons.	81-100 Years. Tons.	101-120 Years. Tons.		1-20 Years. Tons.	21-40 Years. Tons.	41-60 Years. Tons.	61-80 Years. Tons.	
45.4	118.8	115.7	32.0	2,662,500	36.3 6.7	5.0 38.5	3.0 7.7	3.0	104,750 20,100 96,250 15,400
							18.0	38.5	44,000 115,500
							14.5		29,000
73.7				795,960					
119.1	118.8	115.7	32.0	3,458,460	43.0	43.5	43.2	41.5	425,000

## SUMMARY OF DESCRIPTIONS OF THE "SETS OF TREES"

Division.		Sub-Division.		Brief Description of the "Sets of Trees."	Designed for	
No.	Extent Tons	No.	Extent Tons		I Period	II Period
	a 260 □ R		a 260 □ R		1-20 Years. Tons.	21-40 Years. Tons.
Bro'ght VIII.	593.8 78.4	1	593.8 8.0	<b>Oak Trees, 60 to 80 years.</b> Growth: flourishing. Standing: pretty close. Soil: clay. Assigned to the II. Pe- riod of the "class of man- agement" for Beech trees; but, according to circum- stances at the end of the II. Period, either to be thinned and reserved as an oak "set of trees" or to be replanted with beech trees keeping only the best specimens of oaks.	37.0 8.0	
		2	36.0	<b>Beech Trees, 20 to 40 years.</b> Growth } good. Standing } Soil: sandy clay. At the easterly part of this sub-division mixed with spruce, which, when impeding the growth of the beeches have to be felled at the thinnings.		36.0
		3	34.4	<b>Oaks, 40 to 60 years.</b> Growth } tolerably well. Standing } Soil: a sandy clay, well suited for the growth of beech trees. Un- dergrowth of birches and hazel. To be felled in the II. Period of the Beech "class of management." Oaks which show a prosperous thriving are to be reserved. The area is to be replanted with Beeches.		34.4
Forw'd	672.2		672.2			115.4

## AND DIRECTIONS FOR THE FUTURE MANAGEMENT.

the "class of management" of BEECH Trees.					Designed for the "class of management" of PINE Trees.				
III Period	IV Period	V Period	VI Period	Yield to be expected at the felling time. Cubic feet.	I Period	II Period	III Period	IV Period	Yield to be expect- ed at the felling time. Cubic ft.
41-60 Years. Tons.	61-80 Years. Tons.	81-100 Years. Tons.	101-120 Years. Tons.		1-20 Years. Tons.	21-40 Years. Tons.	41-60 Years. Tons.	61-80 Years. Tons.	
119 1	118.8	115.7	32.0	3,458,460 48,000	43 0	43.5	43.2	41.5	425,000
				360,000					
				292,400					
119.1	118.8	115.7	32.0	4,158,860	43.0	43.5	43.2	41.5	425,000

## SUMMARY OF DESCRIPTIONS OF THE "SETS OF TREES"

Division.		Sub-Division		Brief Description of the "Sets of Trees."	Designed for	
No.	Extent Tons	No.	Extent Tons		I Period	II Period
	a 260 □ R		a 260 □ R		1-20 Years. Tons.	21-40 Years. Tons.
Bro'ght IX.	672.2	1	672.2	<b>Beech Trees</b> , 1 to 20 years old. Growth } good. Standing } Soil: strong clay, often mixed with sand.	18.0	115.4
	115.5		18.0			
X.	96 6	2	97.5	<b>Oaks</b> , 40 to 60 years old. Growth } same as in VIII. Standing } 3, with excep- Soil } tion of the west- ern part near the bor- der where the standing is not as good.	97.5	
		1	87.2	<b>Oak and Beech</b> , shoots from stumps, 20 to 25 years old; thickly mixed with oak and beech trees from 80 to 180 years old. Soil: a strong clay. To be felled in the VI. Period, and to be restocked by planting beeches, as far as there is no natural fresh growth of this class of timber or of oaks. Any oaks showing a prosperous thriving are to be reserved.		
		2	9.4	<b>Pine Trees</b> , 70 to 80 years old, mixed with single oaks and beech trees at the border of sub-division 1. Growth } good. Standing } Soil: a sandy clay. This sub-division forms a hill sloping gradually into sub division 1, and is assigned to the Beech "class of management" VI. Period. It is therefore to be replanted with beech trees after the clearing.		
Total,			884.3		115.5	115 4



## AND DIRECTIONS FOR THE FUTURE MANAGEMENT.

the "class of management" of BEECH Trees.					Designed for the "class of management" of PINE Trees.				
III Period 41-60 Years. Tons.	IV Period 61-80 Years. Tons.	V Period 81-100 Years. Tons.	VI Period 101-120 Years. Tons.	Yield to be expected at the felling time. Cubic feet.	I Period 1-20 Years. Tons.	II Period 21-40 Years. Tons.	III Period 41-60 Years. Tons.	IV Period 61-80 Years. Tons.	Yield to be expected at the felling time. Cubic ft.
119.1	118.8	115.7	32.0	4,158,860 180,000	43.0	43.5	43.2	41.5	425,000
				780,000					
			87.2	B.280,000 O.300,200					
			9.4	37,600					
119.1	118.8	115.7	128.6	5,736,660	43.0	43.5	43.2	41.5	425,000

# RECAPITULATION.

Beech Class of Management.				Pine Class of Management.				Totals.				Area.	
Period	Tons.	Cubic Feet.	Totals during Period.		Period	Tons	Cubic Ft.	During the Years.	Tons	Cubic Ft.	Class.	Tons.	
			Tons.	Cubic Ft.									Tons.
VI.	27.0	270,000			IV.	5.0	4,800	1878 to 1898	172.1	1,043,100	For Beech Trees,	713.1	
	5.0	35,000				38.5	115,500						
	87.2	B. 280,000 O. 300,200											
			9.4	S. 37,600		128.6	922,800						43.5
V.	25.0	175,000			III.	3.0	5,400	1898 to 1918	158.9	1,057,600	{ Main roads, Division, Lines & Enclosures,	22.0	
	75.7	B. 636,300 O. 52,000				7.7	15,400						
	15.0	100,500					18.0						44,000
			14.5	29,000		43.2	93,800						
IV.	79.4	671,800			II.	5.0	9,000	1918 to 1938	102.3	1,072,550	Total Tons,	908.3	
	39.4	295,500	118.8	967,300		38.5	96,250						
	41.4	124,200 43,200					5.4						13,500
			78.7	795,960		119.1	963,360						20.9
III.	4.0	43,200			I.	9.0	18,000	1938 to 1958	162.1	1,069,010			
	34.4	292,400					1.0						1,800
			34.4	292,400		115.4	959,400						6.7
	87.0	259,000											
8.0	48,000												
86.0	360,000												
97.5	780,000	115.5	960,000										
Average for each Period,			713.1	5,786,660	Average for each Period,			173.2	425,000				
Average for each Period,			118.8	956,110	Average for each Period,			43.3	106,250				

Handwritten text, possibly a signature or date, located at the bottom of the page. The text is faint and difficult to decipher, but appears to include a date and a name.











# Wood-district "BUCHHOLZ"

Total Area: 908.3 tons (a 260 Urods)


















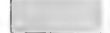


## MAP of sets of trees. (Bestands Karte)



1878.

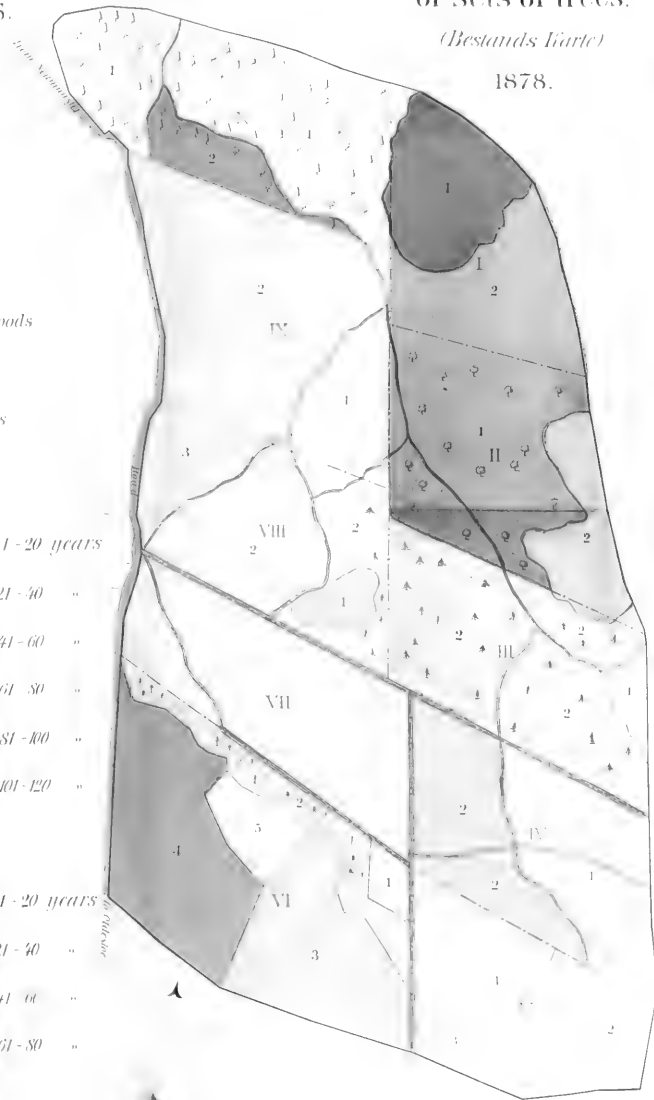
### EXPLANATION OF COLORS.

-  *Quercus*
-  *Fagus sylvatica*
-  *Betula alba*
-  *Abies*
-  *Pinus*
-  Hard and Soft woods
-  Coppice
-  Uncovered places

### Periods of Age.

- |  |   |            |
|--|---|------------|
|  |  | 1-20 years |
|  |  | 21-30 "    |
|  |  | 41-60 "    |
|  |  | 61-80 "    |
|  |  | 81-100 "   |
|  |  | 101-120 "  |
- 
- |  |   |            |
|--|---|------------|
|  |  | 1-20 years |
|  |  | 21-30 "    |
|  |  | 41-60 "    |
|  |  | 61-80 "    |

-  Division Lines
-  Main roads with ditches on either side
-  Byroads



# Wood-district "BUCHHOLZ"

## MAP of felling plan (Mantungsplan Karte)

Divisions are marked by red roman,  
Sub divisions by black arabian figures.

Signs for different kind of trees appearing single  
or in groups in complexes of other wood.

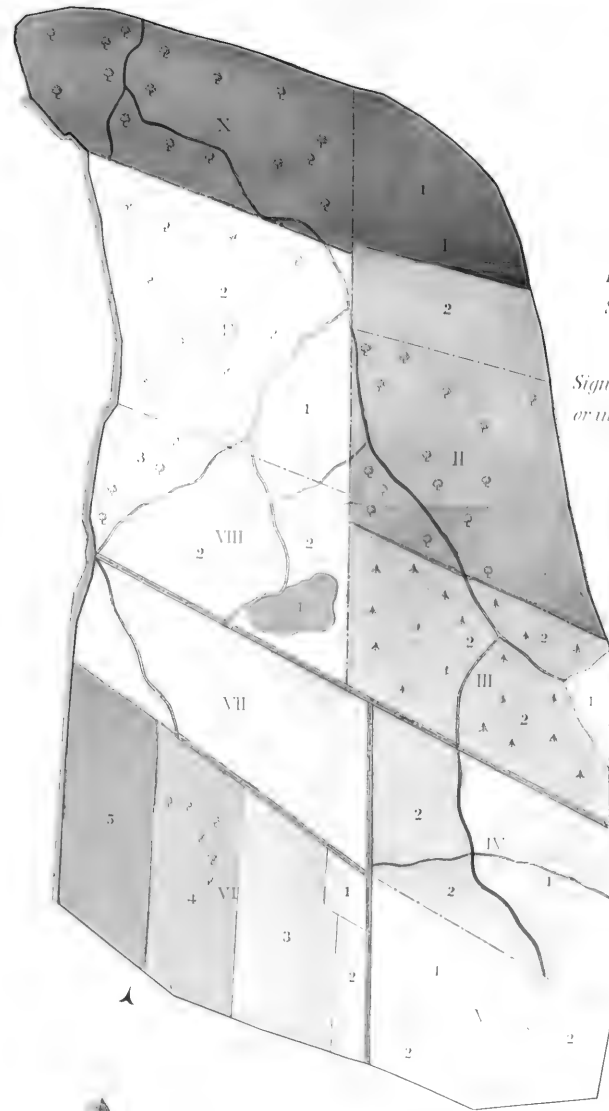
*Quercus*      *Fagus sylvatica*



*Abies*      and      *Pinus*



Soft wood



Scale bar: 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300

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Fifth line of handwritten text.

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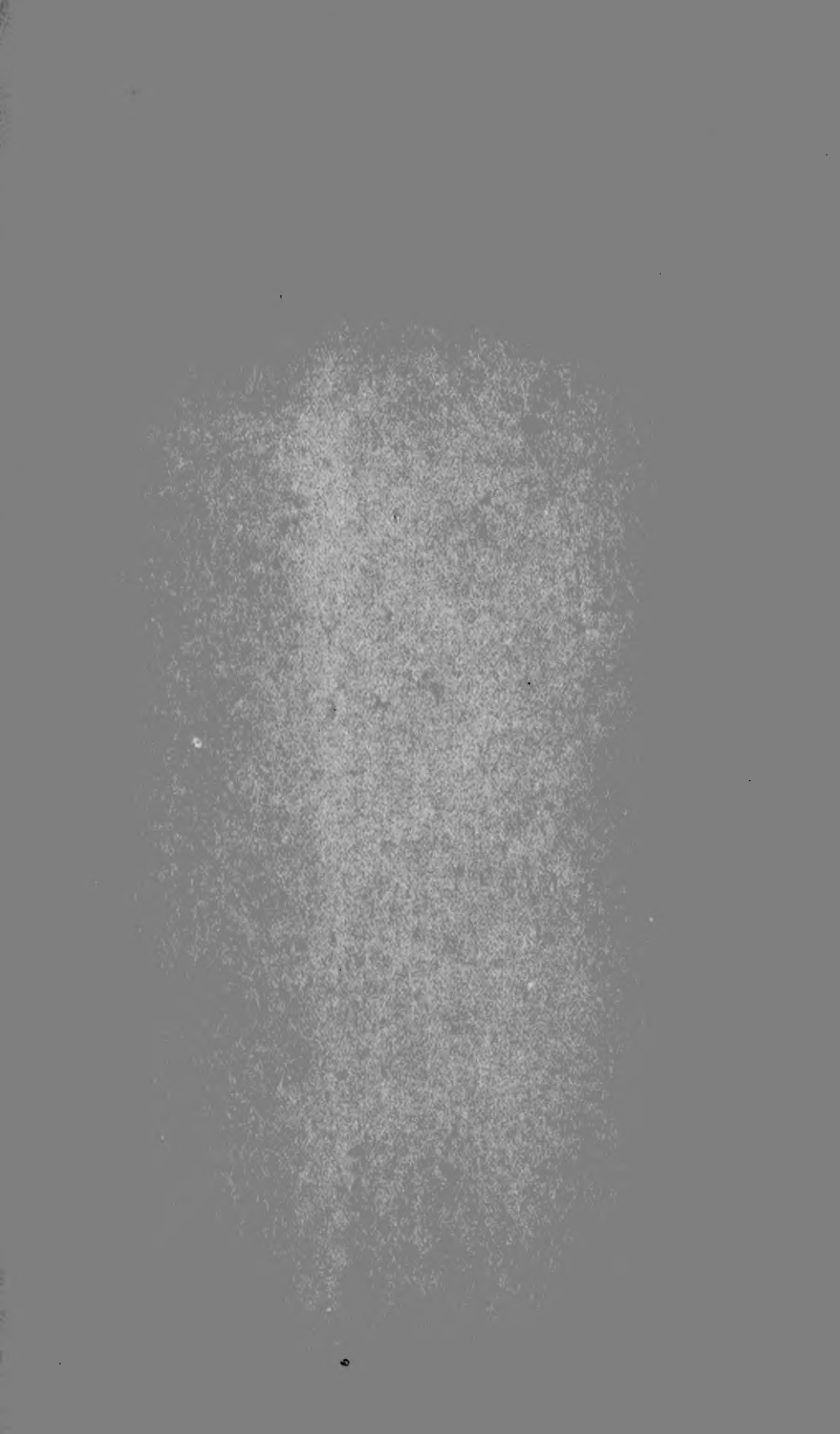
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