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MINNESOTA FOREST SCHOOL ANNUAL.

Nineteen Hundred Twenty.

Editor in Chief .................................................. S. C. Brayton
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Business Manager ............................................... W. W. Schmid

CONTENTS.

<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest School Picture</td>
<td>2</td>
</tr>
<tr>
<td>Foreword</td>
<td>4</td>
</tr>
<tr>
<td>Insurance of Standing Timber, Prof. E. G. Cheyney</td>
<td>5</td>
</tr>
<tr>
<td>Minnesota Foresters in the &quot;Service&quot;</td>
<td>7</td>
</tr>
<tr>
<td>A Lookout on the Kootenai</td>
<td>10</td>
</tr>
<tr>
<td>Leyden N. Erickson</td>
<td></td>
</tr>
<tr>
<td>Chasing Smoke</td>
<td>Lloyd O. Grapp</td>
</tr>
<tr>
<td>The Last Fire</td>
<td>Hubert Person</td>
</tr>
<tr>
<td>Plans for Proposed Economic Survey of Forest Resources</td>
<td>12</td>
</tr>
<tr>
<td>of Minnesota, T. Schantz Hansen, '15</td>
<td></td>
</tr>
<tr>
<td>Itasca Field Work, 1919, Clyde F. Peick</td>
<td>21</td>
</tr>
<tr>
<td>The Place of Entomology in Forest Working Plans, S. A. Graham, '14</td>
<td>27</td>
</tr>
<tr>
<td>The Splinter Cat, W. T. Cox, '06</td>
<td>32</td>
</tr>
<tr>
<td>Xi Sigma Pi, W. W. Schmid</td>
<td>34</td>
</tr>
<tr>
<td>Fourth Annual Convention I. A. F. C., J. H. Allison</td>
<td>35</td>
</tr>
<tr>
<td>The Forestry Club, S. C. Brayton</td>
<td>39</td>
</tr>
<tr>
<td>Student Roster</td>
<td>40</td>
</tr>
<tr>
<td>Alumni Roster</td>
<td>41</td>
</tr>
</tbody>
</table>

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FORWORD

Our purpose in publishing this book is to provide a medium of contact between our school, our alumni and the outside world. We believe we have embodied the spirit of Minnesota in this book, and we hope through it to become known as a progressive, live force for the advancement of forestry in this country.

The publication of this annual is made possible by the support of the firms whose advertisements appear in this book. They are all reliable firms, and the products they advertise are the ones you will eventually buy. You will confer a favor on us if in buying of these firms you mention that you saw their ad in this book.

We also wish to acknowledge the willing assistance that members of the school and faculty have given us in getting out the annual. We especially wish to thank Mr. Paul Palmer and Mr. Walter Wilson for the time and effort they spent in helping us at different times. We also wish to give the Minnesota Forest Service credit for the cuts they so kindly loaned us.
INSURANCE OF STANDING TIMBER.

Prof. E. G. Cheyney.

Two great obstacles block the view of timber owner in the United States when he attempts to contemplate any future forest policy which looks toward a permanent timber supply; taxes and fire risk. There may be others even more important, but these two are apparently and overshadow all others in the mind of the lumberman. No constructive moves in the direction of forest management can be expected from private owners till these obstacles have been removed.

Up to the present time only a half a dozen states in the Union have adopted laws which provide for anything like a just system of forest taxation. It is only natural—but nevertheless unfortunate—that these should be states with a comparatively small amount of timber. Even less has been done to reduce the fire risk. It is true that many states have established agencies for preventing, detecting and fighting forest fires, but the many destructive fires of the past two years show that they are all more or less inadequate. Both the states and the federal government have failed to understand the true importance of the work and to properly provide for it. It is not enough to reduce the chances of big fires by an uncertain amount, which is the most we can expect from even the best of our present patrol systems; it must be reduced to a certain definite charge, and that is possible only through some system of insurance.

There are at present only a very few insurance companies in the country which will write a policy on standing timber and they restrict their operations to a very small area in the most densely populated portion of the country where the timber is mostly in small patches and the conditions are most favorable. None of the companies will cover any of the large timbered areas except at prohibitive prices.

During the great world war, the federal government set the precedent of insuring its soldiers because the risk was greater than any of the private companies cared to take. Why shouldn’t the government follow this precedent in insuring forests against fire? Continuous forest production is necessary to the prosperity of the country. Three-fourths of the timbered area of the country is in the hands of private owners, and it is the policy of the government to encourage these owners to practice forestry on their lands. It is almost certain that very few of them will ever seriously consider the matter without some form of insurance.

The government alone is in a position to offer this insurance at a reasonable rate. Furthermore the issuance of such
policies will be made to exercise a powerful influence for better protective measures all over the country. The conditions under which they would be issued could be very strictly defined. They could confine the privilege of this insurance to such states and such owners as complied with these conditions: to such states as maintained an adequate patrol system and to such companies as complied with the regulations in regard to slash disposal and other specified conditions. Or there should be a differential rate based on the efficiency of the fire laws and protective systems of the different sections.

There is no question but what many of the timber owners would gladly insure their forests if they could do so at reasonable rates. Suppose, for instance, that some such system were put in operation and that the state of Oregon was barred on account of inadequate protective service. It is most likely that the timber owners would be able to force the state to improve its service to meet the insurance provisions. It would be the same in every state where there was much timber land. The strength of the fire departments in the cities is very largely determined by the local men to whom their power to raise firemen to perpetuate tax reforms and others go a long way to encourage government for the first few years. If it did not prove at and could not be improved, then the insurance owners improve the condition would be very greatly more factor in educating fire protection. The government could be considered too severe in a way that our forests' expenditure of a large sum out. If such an insurance enterprise to undertake an economical plan in the carried out at a heavy

MINNESOTA FOREST

A Look Afield

Supervisor Vinal and Henry Lookout on the chaser and I as lookout on the road point, at noon, the ranger at Sylvan buying a month's supplies we could lay our ranger station, suppose the four miles on the way down a few grades settled in at the station on that long, rocky road, bacon came then. The next day we tried to help Alec tally, we received much goat so as to have isolation were getting the

Page Six
It is necessary, powerful influence for better country. The conditions would be very strictly defined of this insurance to applied with these conditions adequate patrol system with the regulations in related conditions. Or there the efficiency of the fire different sections. Many of the timber owners they could do so at reasonableness such system were if Oregon was barred on. It is most likely that the state to improve visions. It would be the much timber land. The cities are very largely

determined by the large fire insurance companies through their power to raise their rates. There is no reason why it should not have the same tendency in the forest.

It is doubtful if this measure alone would induce the lumbermen to perpetuate their forests, but linked with the proper tax reforms and other measures now contemplated it might go a long way to encourage private management.

Such government insurance might not be self-supporting for the first few years, but it could not be a very heavy loss. If it did not prove attractive very few men would go into it and it could not be very expensive, if it did prove attractive and many owners became interested it would so greatly improve the conditions in the country concerned that the risk would be very greatly reduced. It would in any event be one more factor in educating public opinion to the importance of fire protection. The probability of a possible loss should not be considered too serious a drawback. There is no possible way that our forests can be perpetuated now without the expenditure of a large sum of money. There is no cheap way out. If such an insurance plan as this would induce private enterprise to undertake some of the work it might be the most economical plan in the end even though it appeared to be carried out at a heavy loss.

MINNESOTA FORESTERS IN THE "SERVICE."

A Lookout on the Kootenai.

Leyden N. Erickson, '21.

Supervisor Vinal at Libby, Mont., assigned us to the Mt. Henry Lookout on the Kootenai forest, Grapp to act as smoke-chaser and I as lookout. We arrived at Troy, the nearest railroad point, at noon, July first, and there met Jack Baldwin, the ranger at Sylvanite, and Alec Berg, the packer. After buying a month's supply of grub, trout flies, and all the magazines we could lay our hands on, we started for the Sylvanite ranger station, supposedly twenty-five miles up the Yaak river. The four miles on the wagon were rather wild, but after climbing a few grades settled down to a steady gait, and we finally pulled in at the station at eleven P.M., having been nine hours on that long, rocky road, in a wagon with no springs. The best part of that ride was the end, for the fried brook trout and bacon came then.

The next day we stalled around getting our outfit together and trying to help Alec get the pack train in shape. Incidentally, we received much information as to how to tame a mountain goat so as to have fresh milk every day, and instructions to notify the ranger as soon as we felt that the solitude and isolation were getting the better of us.

Page Seven
On July third we left the station and packed as far as the Olsen ranger station, about twenty-five miles from the Sylvanite. "Wild Joe," one of the few picturesque Westerners left, was stationed there as smoke-chaser, and to see him standing over the cook stove wearing his "Luger" and belt full of shells made us realize the seriousness of the work and the dangers to be encountered. The country through which we travelled that day had been burned in the big fire of 1910 and there were many tall, charred trunks still standing, with a good stand of young stock over much of the area.

We spent a grand and glorious Fourth clearing the trail and repairing the telephone line on the trail from the Yaak up Vinal creek. This country had not been burned over and gave us our first taste of a real trail, following the stream for a while, then climbing sharply to the top of a lodgepole flat and down again, crossing the creek through magnificent red cedars and along the base of sheer cliffs, several hundred feet in height. Fifteen miles of this sort of country brought us to the fish lakes, a chain of three beautiful little lakes placed in a deep, narrow valley. These lakes are full of brook trout, and as there is good grass here, the pack train always stops for the night. Deer being very plentiful, often come down for water, and it is quite a novelty to sit and watch a doe and her fawns walk down to the shore and wade around with their heads completely under water, feeding on plants growing beneath the surface.

The next morning we started for the top—four miles of steady climbing. It was a rather windy, cloudy day, but fairly warm down in the valley. Lodgepole pine is practically the only tree on these upper slopes and makes up stands about like our jack pine. The higher we climbed the more country we could see until finally we were above the surrounding country, but still we kept on climbing. The last mile was a real workout, and so steep that it consisted wholly of switch-backs, working zig-zag fashion up the side of the mountain. The lodgepole type gradually disappeared and gave way to white-bark pine and firs, and finally, as we reached the top, these in turn thinned out until, on the very top, there was nothing but rock and here and there a small bunch of stunted pine, with all their branches turned toward the East because of the force of the constantly blowing West wind. Here we pitched our tents and were ready to spend the remainder of the summer, spotting fires and chasing any smoke which might occur.

CHASING SMOKE.
Lloyd O. Grapp, '21.

I was awakened by the ringing of the telephone one frosty morning during my stay in the Upper Ford Ranger Station. It was hard to get to sleep on the other bunk, so I sleep through an empty ring. The phone was being answered from the other end, and I was getting peevish.

"Hello! Upper Ford Ranger Station. What are you doing there?"

"Hello," came back the night operator. "Grapp," he said, "this is Keller creek, and 'Mount Hickey' can't locate it in the 'Summit.'"

I had been in that country before, and those were all the instructions I needed. We got breakfast from the assistant ranger's stomach plasters. After a more for comfort than anything else, but still had lots of minnows for the assistant ranger's horse. We started for the top of Keller creek, a mile or so, and the assistant ranger's horse.

I reached the "Summit" early. I saw the great clouds of smoke rising up and estimating its location by a homesteader who was already there, continued on to the fire. Before dark and picking through the worst tangle of dead brush I reached the divide between Sullivan creek, and all the land beyond as though hell had broken loose on the top of the ridge. I decided that I'd had enough and made a hasty retreat. After dark I reached the make-shift barn and finally found my horse and sniffed at the smoke. He seemed to agree with him.

After supper I went for a stroll. We could do nothing but sit and watch the make-shift barn and the smoke, and the breeze did not blow for two miles, pleading...
I and packed as far as forty-five miles from the picturesque Westerners haur, and to see him r his “Luger” and belt wieadness of the work and country through which l in the big fire of 1910 hks still standing, with h of the area.

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Station. It was hardly light yet, and I looked over at Pete on the other bunk. Pete had the reputation of being able to sleep through an earthquake, so I knew it was up to me to answer the phone. I listened again for the short-long-short ring of the station. It came again and sounded like the ranger was getting peeved.

“Hello! Upper Ford Station,” I said in as wide-awake voice as I could assume.

“Hello,” came the ranger’s voice, slightly peeved. “Grapp,” he said, “the supervisor has reported a fire on Dodge creek, and ‘Mount Henry’ says he can see it also, but they can’t locate it in the other district, so see what you can find at the head of the creek and a little on the other side of the ‘Summit.’”

I had been in the service just long enough to know that those were all the instructions I was to get. I woke up Pete and we got breakfast as soon as possible. I saddled old “Nag,” the assistant ranger’s horse, while Pete baked the sour-dough stomach plasters. At eight A. M. I started. Nig was built more for comfort than for speed. He had seen his best days, but still had lots of nerve, as I found out later. I passed the Keller creek fire about noon but did not stop to say hello to the assistant ranger, for I thought he might want to use his horse.

I reached the “Summit” about six P. M. and was able to see the great clouds of smoke arising from the fire. After estimating its location I continued to a cabin which I was told by a homesteader was five miles down the trail. On reaching this roadhouse I unpacked all my blankets and grub and con-

tinued on to the fire. I reached the head of Dodge creek just before dark and picketed old Nig. After climbing through the worst tangle of dead and down timber I have ever seen, I reached the divide between Dodge creek and Sullivan creek. There against the rose-colored sky I saw a sight that made my hair stand on end. The fire was coming up the slope from Sullivan creek, and as I looked down into it it surely looked as though hell had broken loose. It was getting dark, even on the top of the ridge, and the ashes were falling pretty thick. I decided that I needed Nig’s moral support and beat a hasty retreat. After wandering around in semi-darkness I finally found my horse. He was covered with flakes of ashes and sniffed at the smoke as if he knew he ought to be going. I agreed with him.

After supper I went out to where I had left the horse in the make-shift barn and found that he had gone out for a stroll. He was not far down the trail when I first saw him, but he kept just so far ahead of me, and all the pleading I could do would not shorten the distance. After following him for two miles, pleading, and cussing him at every step, I finally
gave up the chase and turned back to the cabin. But there was no sleep even then. The pack rats were overjoyed at having company, and they insisted on keeping me awake. First one would run across my face, and then another would push the frying pan off the stove, and so on. After having thrown all available articles at them, I pulled my head under the blankets and thought of all the new cuss words I had learned since being in the service.

The next morning I tied the saddle and blankets to the ceiling and started out on my twenty-five mile hike for the station. That was a weary day. In the evening I reached the station and found old Nig eating contentedly in the yard. Pete came out with an ear-to-ear grin on his face and said that Nig had trotted in about noon. Well, anyhow I had found out one thing—I knew that the old hypocrite could make good time if he wanted to.

The next day Nig and I started out to bring back the equipment I had left at the Summit cabin, having first reported to the ranger the condition of the fire. Old Nig learned that day what fast travelling was, and at the end of the fourth day, with a load of two saddles, the blankets, rifle, grub, and me, he pulled into the station on his last legs. We had covered over a hundred miles of mountain trail, and the only difference between Nig and me for the next week was that Nig laid down all the time, while I either stood up and ate off the mantel or sat on a pillow.
Near the end of the fire season, "Dad" Tripp, the ranger, left me at the station to help with a few "left-overs" from the season, while he took a trip to inspect the recently finished Big creek trail. While he was gone a bad fire broke out on Bristol creek in spite of the fact that the fire season was "officially" over.

With the help of a former ranger who lived a short distance from the station I managed to get a crew started to work on the fire. Steenersen, an old fireguard, was supposed to be in charge, but a half-breed, on whose land the fire was burning, was of a more assertive nature and took charge of his own accord. He decided that he would have the men board and bunk at his ranch instead of starting a camp near the fire. As he was to receive a good price for keeping the men he showed keen business judgment.

After two days Tripp returned, and as he had little confidence in the half-breed he told a smoke-chaser and myself to go to the fire and find out just what was going on. The fire was up the Kootenai about five miles, just across the river from the Great Northern tracks; so we got out the forest service motor speeder and were soon opposite the half-breed's ranch.

We ditched the speeder just in time to miss an extra freight that came rushing past with a load of Western fir for the East, and went down to the river. After much hollering and gesticulating we succeeded in arousing someone at the ranch and soon saw the half-breed's squaw set out from the opposite bank in a home-made skiff. The Kootenai river was especially swift and treacherous at that place and I was surely surprised to see how that squaw, well past middle age, managed the boat. As I had done a great deal of rowing back and forth between Warland and the ranger station, I volunteered to row back. Before I got to the other shore I more fully appreciated the skill and strength of the squaw, for by the time I reached the other side I was exhausted and had barely strength enough to land the boat quite a distance below the landing.

After eating a light lunch we set out to locate the boundaries of the fire and see what was being done on it. After walking for nearly an hour we were apparently as far from the fire as ever, and when we finally reached the fire after two hours of hard climbing in the burning sun we had already decided that the half-breed's ranch was no place for a camp. To get to the main fire it was necessary to go across the fresh burn or go a much longer distance around. As we had walked...
enough already we cut across. Aside from the fact that our feet got awfully hot from stepping on stones which were still hot, and that we barely missed being hit by a big yellow pine that had burned at the base until it fell with a crash, we managed very well and were able to get a good idea of where the fire could be most successfully fought.

Going back we decided to take a short cut by following a road which ran through one corner of the fire that was still burning in some places. It got hotter and hotter as we neared the edge until we finally got to a place where the flames nearly reached across the road. We held a consultation and decided that it wouldn't pay to go way back, so we covered our faces with our bandanas, pulled down our hats and ran for it. I may have to go through a hotter place some time, but it won't be until after I have "shuffled off this mortal coil."

We went on to the half-breed's ranch, ate supper and returned to the Warland ranger station. The next day Tripp sent camp equipment and started a camp near the fire and so saved the men four hours of hard hiking a day. The men were placed on the dangerous points and in a few days had the fire under control.

PLANS FOR PROPOSED ECONOMIC SURVEY OF THE FOREST RESOURCES OF MINNESOTA.

By T. Schantz Hansen, Division of Forestry University of Minnesota, Cloquet Forest Experiment Station.

INTRODUCTION.

Good business demands that stock of assets and liabilities be taken periodically. It is on the basis of these inventories that the financial status of the business is figured. From these, the gain or loss is calculated and the business man knows whether his venture is a paying one from a financial standpoint. If forestry is ever to be practiced in this state, and it certainly will be, we must put it on a business basis. It must show a gain from a financial point of view or become a philanthropic venture to be indulged in only by state and federal agencies, and then not extensively.

That forestry principles will be applied to our forest lands cannot be disputed. Every economic factor is working that way. There has recently been considerable agitation throughout the country to force the private individual to practice forestry on his forest lands. The war and the experience of France brought home to the thinking man of this country the fact that some definite step must be taken to perpetuate our forests. Foresters as a whole must try to take a step forward by active work rather than waiting for development. A policy of aggression rather than action. It is not the purpose but merely to cite it as an example to show how great the demand for properly formulated any forestry project will be. After thoroughly the business aspects of mining and industries.

This can only be a small amount of reliable figures on the amount of state and federal agencies, and then not extensively.

The peak of production was in 1906. Since then the production of lumber has been on the wane within the state probably the most valuable.
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short cut by following a of the fire that was still r and hotter as we neared e where the flames nearly and decided , so we covered our faces r hats and ran for it. I e some time, but it won't s mortal coil."

The men were n a few days had the fire

MIC SURVEY OF THE MINNESOTA.
Forestry University of experiment Station.

ock of assets and liabilities basis of these inventories usiness is figured. From ed and the business man ying one from a financial e practiced in this state, it on a business basis. It int of view or become a in only by state and fed­bly, applied to our forest lands ic factor is working that terable agitation through­individual to practice for­ar and the experience of r of this country the e taken to perpetuate our ry to take a step forward or development. A policy of aggression rather than watchful waiting must be adopted. It is not the purpose of this paper to discuss the movement, but merely to cite it as a cause for the economic survey and to show how great the need is for such a study. In order to formulate any forestry principles, we must first know thor­oughly the business status of our complete forest resources and industries.

This can only be arrived at through a comprehensive sur­vey of the forested area of the state. There is a surprisingly small amount of reliable data available concerning the forest resources and industries of the state. Let anyone try to find figures on the amount of standing timber and the amount cut. True such figures exist, but they are based on guesswork rather than actual investigation. In order that a real step for­ward be made, it is absolutely essential that we have a com­plete stock taking of our forest resources. This forms what might be called a cornerstone of our building or the keystone of the arch. Without such information, we have no founda­tion on which to build.

History.
In September, 1848, the first sawmill in Minnesota started operating at St. Anthony Falls. The rapid growth and de­velopment of the lumber industry in the state is nothing short of miraculous. In a space of less than half a century, the in­dustry developed from one involving an investment of $5,000 to one involving an investment of over $52,000,000. The fol­lowing table of lumber production gives an indication as to the development of the lumber industry of the state:

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<tr>
<td>1848-1850</td>
<td>12,000,000</td>
</tr>
<tr>
<td>1851-1860</td>
<td>315,375,000</td>
</tr>
<tr>
<td>1880-</td>
<td>663,974,000</td>
</tr>
<tr>
<td>1890-</td>
<td>1,078,408,000</td>
</tr>
<tr>
<td>1900-</td>
<td>2,341,619,000</td>
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<tr>
<td>1906-</td>
<td>1,942,248,000</td>
</tr>
<tr>
<td>1911-</td>
<td>1,485,015,000</td>
</tr>
<tr>
<td>1913-</td>
<td>1,148,704,000</td>
</tr>
<tr>
<td>1917-</td>
<td>901,941,000</td>
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The peak of production was reached between 1900 and 1906. Since then there has been a gradual decrease in pro­duction. This means, of course, that the lumber industry is on the wane within the state, but it does not mean that it is not a large factor in the economic life of the state, or even of the nation.

In 1917, Minnesota ranked twelfth among all the states in the production of lumber. In the production of white pine, probably the most valuable of all native softwoods, she was
first. About 40 per cent of all of the white pine manufactured in the country was produced by Minnesota. As an indication of our future standing in the production of white pine, it is worth while noting that the state of Maine ranked second in the production of this material in 1917. Maine, a state where cutting has been in progress for years, surpassed even a state like Idaho, which is well stocked with virgin stands of white pine. It speaks well for the future of our second growth and it is a most reliable indication that lumbering and lumber manufacturing will always be of importance within the state.

It is difficult to get any accurate figures on the amount of timber originally standing in the state. The early practice was to estimate only white pine and disregard the other species as having no commercial value. As the industry developed, the other species became more valuable and were included in the estimates. Hence we find the original estimates rather low, when we consider the present day utilization where all species are merchantable. It was estimated that there was originally 70 billion feet of white pine in the state. Estimates made in 1895 gave the amount of standing timber as 31 billion feet. Estimates in 1910 gave the total stand as 75 billion feet. This apparent increase in timber, in spite of the period of rapid production is due to closer utilization and a better knowledge of the state's resources. All of the foregoing estimates are based on the judgment of men who have been acquainted with the timber area of the state. They are not based on any systematic survey of the resources of the state. One of our first aims should be to secure accurate information as to the amount of timber within the state.

Any information concerning the ownership of lands within the state is more difficult to secure. Originally the lumbermen purchased their timber from the Indians, usually at so much per acre. Gradually the white men came into possession of the Indian's territory and the government took control of the public domain. With the organization of the state of Minnesota in 1858, a considerable portion of the federal lands became state lands. From this point on, began the acquisition of timber lands by lumber operators. Large holdings were acquired through purchase, homesteading and under the timber and stone act. The rapid development of the industry and the opening up of the country made it possible financially to carry these large holdings. There was no long period of waiting before realizing on the investment.

It was at first common practice to remove the timber from the land and then abandon the land to avoid paying taxes. In 1897, it was estimated that about two million acres of cut-over land had been abandoned up to that time to avoid paying taxes. Since then the land has increased in value so that it is no longer abandoned, but is held and its development at-
white pine manufactured in the state. As an indication of the value of white pine, it is pointed out that Maine ranked second in the nation in the production of white pine, surpassed even a state like Michigan where the remaining virgin stands of white pine are to be found. Our second growth and second growth and lumbering and lumbering and lumbering within the state.

To get a better idea of the amount of timber within the state, the early practice of disregarding the other species of trees as being less valuable and were in reality the original estimates of the amount of timber which was estimated that there was one billion cubic feet. It is estimated that there was 31 billion cubic feet of standing timber as 31 billion cubic feet of timber within the state. Estimates have been made from time to time where the period of utilization where the forests of the state have been and are yet such a factor in the economic development of the community that to let them become a thing of the past would be the height of folly.

The history just briefly stated gives an indication as to how much they have contributed to the wealth of the state, both financially and otherwise. It must be remembered, too, that in addition to the production of lumber we have a host of other forest products which have not been mentioned, the value of which makes no small total. There are such products as pulpwood, fence posts, poles, ties, boxboards, shingles, matches, toothpicks, cooperage, woodenware, etc., that are a considerable factor in the industrial life of the state.

The perpetuation of the forest depends on the utilization of the cut-over land. All of the land originally forested is by no means forest land. There are millions of acres of cut-over land which were originally covered by forests that should be put into farms. Every forester will admit that this is the case, and forestry could receive no greater aid than the complete utilization of all lands that are true farm lands.

All Cut-over Lands—Are Not Potential Farms.

The cut-over lands of the state constitute one of the biggest problems and it is in their proper use that the solution of many of the difficulties of forestry practice in the state lies. The forests of the state have been and are yet such a factor in the economic development of the community that to let them become a thing of the past would be the height of folly. The history just briefly stated gives an indication as to how much they have contributed to the wealth of the state, both financially and otherwise. It must be remembered, too, that in addition to the production of lumber we have a host of other forest products which have not been mentioned, the value of which makes no small total. There are such products as pulpwood, fence posts, poles, ties, boxboards, shingles, matches, toothpicks, cooperage, woodenware, etc., that are a considerable factor in the industrial life of the state.

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overlooked and avoided by nearly all of the large owners and agriculturists is the fact that all cut-over lands within the state are not potential farms. The common idea is that it is a detriment to any given region to admit that all the land it contains is not agricultural and that it injures the sale of land to prospective settlers. This is an attitude that must be corrected. It is just as profitable, and in some cases more so, to produce timber on many areas as to produce agricultural crops. In fact we will get no real, solid growth in any community until all land is put to its proper use. When this is done, all industries will be on a stable basis.

The forests play an important part in the agricultural development of the cut-over lands in the North. This was strikingly brought out in Bulletin No. 180 of the University of Minnesota, "Experiences of Northern Minnesota Settlers," by F. W. Peck of the Farm Management Division of the Agricultural College. The receipts for the average Northern farm studied were derived 24 per cent from agricultural crops, 42 per cent from livestock, 23 per cent from forest products and 11 per cent from outside labor. The outside labor was largely done in connection with logging. Hence the forests contribute 34 per cent of the man's income while he is developing his farm. Remember, too, that this figure represents an average of the better developed and of the newer sections. In St. Louis county, for example, the sale of forest products contributes about 60 per cent to the income of the average settler.

The purpose of the foregoing discussion has been to bring out the important part played by the forests in the economic development of the state. The peak of the production in the lumber industry has been passed and it is on the decline. Its complete passing would be a serious blow to the welfare of the state, because of the close relationship the forests and their use have had in the development of all the industries of the state and the immense areas which would remain idle.

Every broad-minded man will admit that the perpetuation of the forests and the existence of forest industries is of paramount importance to the economic balance of the state. Realizing this, it is our duty to formulate some definite plan or principle that this may be accomplished. We have been content to drift with the current too long and must try a little upstream work.

The following plan has been suggested for gathering data on the basis of which to formulate these principles for the perpetuation of our forests.

Proposed Survey.

It is planned to cover as large a percentage of the Northern portion of the state as possible, using the county as a unit of study. The unit of study within the county will be the township. As much of the data as possible will be gathered on the basis of the county survey, classifying the percentage of the township which every forest division contains. The diversity of conditions in the state is recorded, but the county records census return is used in classifying the case of cut-over lands.

There are five main land divisions which every forest division contains: Cut-over land, marketable timber, social, cut-over land, and non-agricultural land. The areas having second growth are cut-over land, and non-agricultural land. The areas having second growth are cut-over land, and non-agricultural land.

Burned land includes all areas which every forest division contains. It is doubtful. The areas having second growth are cut-over land, and non-agricultural land.
of the large owners and the cut-over lands within the county as possible will be covered by a strip survey, classifying the land as the survey progresses. The percentage of the township to be covered and the number of townships in each county to be covered will vary according to the diversity of conditions found. Much of the desired information is recorded, but it must be made available from the county records, census reports and other sources. It must all be gathered together and made applicable to our study.

There are five main divisions into which the data desired can be classified. They are land, agriculture, property, merchantable timber, social and economic conditions. The following discussion takes up in detail the points to be covered under each division, with a short statement as to the use or purpose of such data. Many changes will have to be made as the fieldwork progresses and the plan is put into practice.

The lands will be studied from the standpoint of ownership and character. Four main divisions suggest themselves in which to classify the character of the land. They are as follows: Cut-over land, burned-over land, land with merchantable timber and prairie land. The classification is on rather a mixed basis, but the desired information will be secured on this basis and it is not planned to use this as a soil survey.

Cut-over land is a rather self-explanatory classification and includes all degrees of cutting, regardless of time, on which the slash may or may not have been burned. This large subdivision is further classified in three divisions on the basis of the use of the land. Class I includes all land unfit for farming, Class II includes all land tillable but not farmed, while Class III takes in all land farmed. This goes on the supposition that all lands already farmed are agricultural, a concession which every forester will gladly grant, even though at times it is doubtful. Classes I and II are further divided into areas having second growth of commercially valuable species, areas of brush land and areas of swamp.

Burned land includes all lands that have been burned over severely before the timber was removed. In this class would fall the large areas having stands of less valuable species such as were burned in the large fire of 1918. These areas, with almost valueless burned timber on it, constitute a distinct problem and their development will be entirely different from the development of cut-over lands. The same subdivisions are used in classifying the burned-over land as was used in the case of cut-over lands.

The areas of merchantable timber need only be divided into two main classes; that on agricultural land and that on non-agricultural land. Further classification than this is not necessary at present. Prairie land, which is land that never was forested, is divided into that in farms or under cultivation.
and that not in farms. This division will be used primarily in the southeastern part of the state.

We must know, too, just how much of each class of land is owned by the state, by corporations, by private individuals, by the federal government, and by other organizations.

The next step is to learn something about what the land actually produces under present conditions. The agricultural development, as it exists today and as it was in the past, will give some indication as to the future. We must know something as to the character of the crops produced. We must learn, if possible, the number of farms, the acres farmed, the value of the agricultural crops and the value of the forest products ten years ago, twenty years ago and at present.

Property values are a very real indication of the economic development of the community. From the records at the county court house can be secured figures on the total property valuation for a period of years back. The personal property and real property values can be secured also. Real property is further subdivided into improvements, farm land and forest land. All of the above information can be obtained from county records, although some difficulty may be experienced in assembling it to fit our purpose.

In any survey of forest resources, it goes without saying that we must include an estimate of the stand of merchantable timber. The estimate should be secured from the fieldwork, from records in state forester's office, and if possible, through co-operation with the various lumber companies. The estimates should be made either in board feet or cords, depending upon the character of utilization of the species.

Under social and economic studies, it is planned to cover the growth in population and its distribution, the industries other than forest and agriculture, and the forest industries. The most detailed information will, of course, be secured concerning the forest industries. Both the active and discontinued industries will be covered in the study. It is planned to study the nature of the plant, products made, kind of wood used, amount used annually, number of men employed, the source of raw material, value of annual output, and in the case of discontinued firms whether they moved or dissolved and the cause.

If possible, it would be of value to know the number of logging camps and the number of men employed therein for a period of years back. This will probably be difficult to ascertain, but the information is worth the effort.

Logging railroads are an important factor in the development of the community. Therefore it is planned to work out the miles of logging railroad existing, the number of miles abandoned, and the number of miles developed to a common carrier.

Page Eighteen

Now as to the application of land as outlined with the utilization of the land, there is an area of second growth or areas needing planting. The agricultural development of much of the different classes of land will enable us to be taken to make the already have of it.

The study of the community will give an idea of what is being properly used or not. The community is developing, the area however, the area farms are decreasing, then value to its proper use.

The rise or fall of the area will give an idea of the status of business. Limited value to know just the continuance of forest industries of the community. It is of the money loss due to provision for their continuation.

The purpose of securing the value of timber is almost too limited to know just the status of business. The industries leave us our stock on hand at life of the various branches an idea of the reserve supply.

The social and economic studies of the community. The community and the presence of the industries leave us an idea of the status of business. The logging railroads have development of all cut-over to a common carrier another idea of the status of business. Much land would never have been developed to a common carrier, these transportation facilities served as a source for the industries and are of unlimited value.

With the foregoing it is possible to intelligently recommend the perpetuation of the systematic survey of statements. Until we have the exact value of statements, it is wise what is needed.
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Now as to the application of all of these data. The study
of land as outlined will give us the character and present
utilization of the land. We will know how much agricultural
land there is and how much forest land. We will know the
area of second growth on both forest and agricultural and the
areas needing planting. It will give us an idea of what the
agricultural development will be. We will know just how
much of the different classes of land is under different owner-
ship. This will enable us to see just what measures will have
to be taken to make the land productive and what control we
already have of it.

The study of the agricultural development of the com-
munity will give an indication as to whether the land is being
properly used or not. If the agricultural side of the com-
munity is developing, then everything is as it should be. If,
however, the area farmed is decreasing and the value of the
crops decreasing, then undoubtedly the land is not being put
to its proper use.

The rise or fall of property values is a sure indication of
the status of business within the community. It is of un-
limited value to know just what effect the perpetuation or dis-
continuance of forest industries have on the property values
of the community. It is by this that we can measure a part
of the money loss due to the removal of the forests without
provision for their continuance.

The purpose of securing a reliable estimate of the amount
of timber is almost too self-evident to mention. This gives
us our stock on hand and from it we can figure the probable
life of the various branches of the industry. It gives us also
an idea of the reserve supply we have to work with.

The social and economic study reveals the business status
of the community. The increase in population of the com-
munity and the presence of industries go hand in hand. When
the industries leave, usually the population goes with them.
The logging railroads have played an important part in the
development of all cut-over lands. Often they are developed
to a common carrier and as such serve to open up the land.
Much land would never have been opened had it not been for
these transportation facilities already being there. The aban-
doned grades serve as a start for a great deal of road build-
ning and are of unlimited value to the community.

With the foregoing information at hand, it will be pos-
sible to intelligently recommend what steps are necessary for
the perpetuation of the forests. We will be able to state defi-
nitely the exact value of our forests instead of making general
statements. Until we do get this information by means of
systematic survey, it is impossible for us to intelligently ad-
vise what is needed.
Three of the New England states have completed or are working on surveys of this nature. It is worth while to consider their methods and results.

The forestry department of the state of New Hampshire is at present conducting a survey of forest resources. The survey is carried on by towns, which are the unit of government in that state. The examiner visits the town and gets all of the information possible from the town assessors. Then he covers the town, looking over the timber, making a rough survey map and interviewing timber owners and manufacturers. On the basis of this information, he makes his report. No figures are available from this survey. In considering the application of this method to our conditions, we must remember that the towns of New Hampshire run from 10,000 acres to 60,000 acres in size and are often thickly settled, while some of our Northern counties cover as much as four million acres and are usually sparsely settled.

The forestry department of Connecticut has completed a forest survey covering the entire state. It consists principally of a classification of land and forest types. The method of obtaining the information was traversing all roads using a United States geological survey map as a base. An auto was used in traversing the road. The forest types were all mapped from the road and descriptions were written of each type.

It is of interest to note that in as thickly populated and old a state as Connecticut 46.4 per cent of the land is still forest land. Again we must remember that the entire state of Connecticut covers only 3,194,445 acres, which is a good deal less than the area of St. Louis county alone. Some idea of the magnitude of our task can be obtained from this comparison.

Massachusetts has completed a forest survey of the counties of Plymouth and Worcester. In the former county, 69 per cent of the area was found to be forest land, while in the latter 57 per cent was found to be forest land. They found the best method to use was a strip survey by towns. Each town was covered by a series of parallel strips one-half a mile apart. These strips were arranged so that they ran at right angles to the prevailing direction of the road. By doing this, they obtained a better average of conditions. United States geological survey maps were used as a base for all type mapping.

Conditions as they exist in Minnesota make it advisable to conduct this survey as a cooperative project between the State Forest Service and the Forest Experiment Station of the University of Minnesota. A combination of the methods used in the East seems advisable.

It is planned to start with a crew of two men and traverse as many roads as possible. A strip survey will be made of a certain percentage of the map will be constructed | geological survey maps a so it will be necessary to put out by the different

A great deal of the the records at the county this information and the given definitely in advan as the work progresses. It is well to remember Connecticut and Massachu the oldest states in the est land still constitutes These states have gone land for farms only to h in the development of o ence and develop only in the same time let us not state must be kept perpet we make provision for th are truly agricultural.

THE 1919 FIELD WORK

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The Great Northern its passengers at Park Ra Freshman Forestry Corp seota. This justly far formed by the Freshman manage its summer camp. We were a small class of men to go into camp since had organized and had o the corporation; Daniel I ski, treasurer.

As we stood gazing of the town which was months, one old devotee at a telephone pole with marked to another, "Tha Evidently we were en ous looks which we recei the hotel. "Your white the manager as we signe camp. After dinner we picked for hard wear in shirts, army hats and he
...have completed or are completing a rest survey of the counties for the state of New Hampshire to estimate the extent and characteristics of forest resources. The township is the unit of government in New Hampshire, the town and gets all its income from the town assessors. Then he makes his report. No county assessor would do so. In considering the apportionment, we must remember that the entire state of New Hampshire has about 10,000 acres to the township, while some states have as much as four million acres to the township. Connecticut has completed a rest survey of its forest resources. It consists principally of surveying all roads using a certain percentage of the townships of each county. A type map will be constructed by these two methods. United States geological survey maps are not available for use as base maps, so it will be necessary to use road maps and outline maps, as put out by the different publishing houses.

It is well to remember what the surveys conducted in Connecticut and Massachusetts teach us. Here we have two of the oldest states in the Union where the forested area or forest land still constitutes about 50 per cent of the total area. These states have gone through the process of using forest land for farms only to have it revert to forest again. Let us in the development of our own state profit by their experience and develop only farm lands for farming purposes. At the same time let us not forget that no small portion of the state must be kept perpetually in forests. It is necessary that we make provision for this if we are to develop the lands that are truly agricultural.

THE 1919 FIELD WORK—ITASCA STATE PARK.
Clyde F. Peick, '22.

The Great Northern train from St. Paul unloaded among its passengers at Park Rapids, Minn., June 26, 1919, the entire Freshman Forestry Corporation from the University of Minnesota. This justly famed organization was a corporation formed by the Freshman class of the College of Forestry to manage its summer camp at Itasca State Park, Minnesota. We were a small class of ten fellows and were the first Freshmen to go into camp since our entry into the Great War. We had organized and had elected Arthur Whiton, president of the corporation; Daniel Dwyer, steward; and Francis Ostrowski, treasurer.

As we stood gazing at the little station and Main street of the town which was to be our nearest neighbor for two months, one old devotee of "Spearhead," after taking a crack at a telephone pole with a stream of liquid refreshment, remarked to another, "That's them, I bet!"

Evidently we were expected, from this and from the curious looks which we received as we carried our luggage up to the hotel. "Your white cheeks will soon be tanned up," said the manager as we signed up for dinner before starting out to camp. After dinner we donned our clothes that had been picked for hard wear in the woods—khaki trousers, flannel shirts, army hats and heavy boots or shoes. Our equipments...
of compasses, hand-axes, notebooks and bedding were loaded into an old Ford truck and off we went on the twenty-five mile trip to the camp. After a soaking by a short drizzle we stopped at the big log bunkhouse and rushed in to get dried by the fire in the huge stone fireplace. After unloading our supplies which had to be brought with us we made our beds on the army cots and “turned in” immediately. Very soon the din of snores that arose gave me an inkling of the stertorous rumblings that would have to be endured all summer, and curiously it was the officers of the corporation that were the worst offenders.

Obeying the unwritten law of the foresters that each man take a plunge in the drink every morning, we rushed shivering in the crisp cold air to dive into historic Lake Itasca, the headwaters of the mighty Mississippi. That took all the sleep out of us and after dressing we took a look around the campus. It is on the east shore of Lake Itasca and consists of a long, level stretch of natural velvety lawn about three hundred yards long, in the center of which stands the two-story bunkhouse, forty by sixty feet, with screened porches both upstairs and downstairs. Near it is the log library and to the south of this are the half dozen log cabins of the faculty. As we were strolling around the campus a sudden clatter of an iron saw announced that breakfast awaited us in the log cook shack up on the hill. We had hired a lady who had cooked for a fraternity house at the university and that morning we gave her some idea of the appetites she would have to satisfy. The upstairs of the cook shack was fitted up into comfortable living quarters. The state had installed running water in all the buildings, and this and the cooking in the woods at the camp and we managed the camp up proudly of the fact, for the most independent bodies have complete control of the camp. It meant brain matter a Freshman ordered camp and in pre against us in the final in the chorus of “You tell ’em with this eloquent, if not

The next day we strolled around the campus the previous months with virgin timber. Prof. Wentling gave us into the mysteries of the instructions in pacing distances, and we locating markers some afternoons. Prof. Wentling took us to the park for instruction in grading.

This was our gene rained, and then we all swallowed and gobbled crappie. The invigorating work made our appetites that made us the most hungry and hardy foresters did not savor today, or, “I feel like soup.” These were stock expressions. The majority of us, and we couldn’t tell the name. The preceding siable mosquitoes feasted on the members. It seemed like every my neck and wrists when a sight ahead. We were mosquitoes and I believe
 bedding were loaded on the twenty-five mile by a short drizzle we rushed in to get dried. After unloading our us we made our beds on diately. Very soon the inkling of the stertorous for the corporation that were the foresters that each man ning, we rushed shiver historic Lake Itasca, the That took all the sleep in our porches both the log library and to the thins of the faculty. As a sudden clatter of an vailed us in the log cook lady who had cooked for d that morning we gave ald have to satisfy. The chop into comfortable liv running water in all the builds, and this and a well filled icehouse made the task of cooking in the woods an easier proposition than it usually is. Prof. Wentling gave the corporation the inventory sheets of the camp and we proceeded to take the responsibility of managing the camp upon ourselves. It made us feel a little proud of the fact, for the forestry corporation is one of the most independent bodies in the student world, and we were to have complete control of all the state buildings and grounds of the camp. It meant that we were bound to use what little brain matter a Freshman is supposed to have in running a well ordered camp and in preventing damage that would be checked against us in the final inventory.

By nightfall we all felt at home in the camp and a contented bunch of fellows it was that gathered around the fire-place and lighted their corncobs. “Some dump,” remarked Pendergast, through the blue fog of “Prince Albert,” and a chorus of “You tell ‘em” and “I hope to meet you,” agreed with this eloquent, if not very grammatical, description. The next day we started to round out our school work of the previous months with some actual woods experience in virgin timber. Prof. Cheyney took us out and initiated us into the mysteries of the timber cruiser’s craft with some instructions in pacing distances and running boundary lines with compasses. At first none of us could come within rods of finding corner stakes, but after a little practice we found that the surveys were not wrong and Freshmen not always right in locating markers some distance off from the true corners. Afternoons Prof. Wentling took us on hikes to distant parts of the park for instruction in the thirty-five tree species of that district.

This was our general routine of work except when it rained, and then we all sought the abiding places of the wary pike and gullible crappie which we “hauled in” in large masses. The invigorating work in the fragrant woods soon gave us an appetite that made us the despair, and I expect the nightmare, of our cook. The morning plunge put lots of the old “pep” into the bunch, and seldom a morning went by when some of the hardy foresters did not remark, “Guess I’ll run down a deer today,” or, “I feel like swimming down an otter this morning.” These were stock expressions of expressing physical fitness. The majority of us had never been in the woods before, and we couldn’t tell the difference between a pine and a spruce, but soon we could call every tree by its common or scientific name. The preceding spring had been very wet and innumerable mosquitoes feasted on the succulent portions of our anatomicies. It seemed like every sawbill in the Northwest settled on my neck and wrists when I tried to hold a compass steady for a sight ahead. We were told that it was a bad season for mosquitoes and I believe that even New Jersey was shaded
in the size and number of tortures. But after a few weeks of toughening, a few dozen mosquitoes trying to insert their barbed wire prongs into our hides gave us no trouble at all.

It was not all work by any means that took up the whole of our time, for we had our evenings free, besides Saturdays and Sundays. Four miles down the lake, Douglas Lodge served as a summer resort for hundreds of tourists. Members of the unfair sex were numerous there, and there were so many canoe and launch trips to the lodge that Prof. Cheyney said that if the girls did not leave soon there would be a groove worn in the lake. Some of us thought that two young femmes from Grand Forks had Pendergast and Ostrowski "going," and it must have been something of the sort that caused them to visit the lodge nearly every night. For a time it seemed certain that "Flossie" had "Hy" Dwyer's watch and chain, and it was some time after she left that he ceased to gaze over the lake with ox-eyes, singing, "I Love You."

Our diving platform and beach brought the fair one up to the camp, and our human cork, Julius Jasper Schmidt, amused them with his hippopotomic antics in the water. "Jack" Frost claimed that Schmidt's understanding was located around his pedal extremities because he always wore his shoes in swimming. "Red" Whiton used to purposely swim far out in the lake with one young lady so that he could save her in case she became exhausted. We all came in for our share of kidding and I hope some day to live down the reputation of having to back a canoe in from the lake until early dawn.

In spite of all the engagement bug, although we were not always right, but the dishonesty engendered by the exploits of our papa's would have missed the truth in that, for they certainly executed some crawling order on the long arm of the camp, and then standing on his ear. We usually cruised around the lake on the odd Saturday to check our records. Prof. Wentling's diurnal and statistical studies over the forty-two square miles of water were always right, but they were not always right, but they were always right, but they were not always right, but the truth in that, for they must have had a streak of mischief in the water.

Our lunches in the old black hod and the anecdotes of Prof. Cheyney were often punctuated by running straight into a butterfly Bill Thayer, he must have had a streak of mischief in the water.

One gets to know around the campfire, and part of the enjoyment comes from the bonds of friendship.
But after a few weeks trying to insert their ve us no trouble at all.
s that took up the whole free, besides Saturdays; lake, Douglas Lodge ds of tourists. Members here, and there were so ege that Prof. Cheyney soon there would be a thought that two young rast and Ostrowski "go­g of the sort that caused "I Love You." hrough the fair one up to ; Jasper Schmidt, amused the water. "Jack" Frost g was located around his wore his shoes in swim­relly swim far out in the could save her in case she for our share of kidding e reputation of having to back a canoe in from the lake after being down to the lodge until early dawn.

In spite of all the flirtations no one was bitten by the eng­gagement bug, although "Buck" barely saved his peavie em­blem. Shortly after the departure of the girl friend of "Butter­fly Bill" Thayer, he got lost in the woods one morning while cruising. We have thought ever since that there was some con­nection between the two events.

About the middle of July our real woodsman's work started when we were divided into crews of three men each and instructed in the art of cruising. Each of us took turns at being tally and caliper-men, measuring all conifers at diam­eter-breast-high in strips about four rods wide. The calipers showed a decided tendency for catching on brush with the measuring arms, and "Floesy" Tilden never could keep from getting tangled up in the dense undergrowth. "Doc" Grabow certainly executed some marvelous calisthenics by inserting the long arm of the caliper between his short legs, inadvertently standing on his ear.

We usually cruised "forties" and each area had to be checked over by the other crews. The varied results of re­corded board feet caused some lively arguments as to which crew was right. Personally I always thought that our crew was always right, but this view was challenged by the others. Schmidt was charged with the crime of dozing on the job in­stead of recording Norway and white pine, but he came back with his principal excuses, that "Hy" fought mosquitoes in­stead of running straight lines. There might have been some truth in that, for they were soon going around in circles one day, although that might have been some novel plan of "Red" Whiton's.

Our lunches in the woods were brightened immensely by the anecdotes of Prof. Cheyney, who proved to be a veritable mine of humorous stories and experiences when he pulled out the old black hod and the red sack of pain killer. We thought he must have had a steel inlaid throat, for it was too much for any of us.

Prof. Wentling's distance-eating stride failed to tire us after a few hikes behind him, though we carried out agri­cultural studies over the whole park, which consists of about forty-two square miles of timber. Nothing short of a thirty­mile hike would have daunted us at the least, and our esprit de corps was rated at 110 per cent, according to our own judg­ment, while our prof's were vouched for as being the best in the business.

One gets to know his fellow students in the woods and around the campfire as nowhere else, and I believe the greater part of the enjoyment of our stay in the camp was realized from the bonds of friendship formed between foresters by the
close association and la are met with on every c huge fireplace and sing “Colombo,” with a volur basses that must have heads in wonder.

However, the camp was spent in assembling tree keys and descriptive dendrology finished our outfits and turned the ca tendent, Harry Branigan.

We left early the r realization that we had s and I know we are all v can go to the forestry ca

THE PLACE OF ENT

By S

A forest working pl to foretell the future de purpose is to determine will bring the greatest s dent from its very chan to be perfect or final an ject to such modificatio same time the nearer it the nearer will the plan s be its aim, and the more of the forest in question point out one factor, w garded in past working omission. This factor oi be expressed in the phra

That insect injury l factor to be considered i working plans some of th tioned under the head of evident that these pests less and helpless, and th venting outbreaks usual an unattainable goal.

The entomologist is tion. The recognized a have without exception I discouraged the forester insect problems. As a r
close association and laying aside all conventionalities which are met with on every campus. We used to gather around the huge fireplace and sing everything from "Hail, Minnesota" to "Columbo," with a volume of husky tenors and broken-backed bassos that must have caused the hoot owls to shake their heads in wonder.

However, the camp had to break up, and the eighth week was spent in assembling our cruising tabulations, writing up tree keys and descriptions of final cruises. A final quiz in dendrology finished our work, and we reluctantly packed our outfits and turned the camp back to the efficient camp superintendent, I-IalTY Branigan.

We left early the morning of August fifteenth with the realization that we had spent one of the best times in our lives, and I know we are all waiting eagerly for the time when we can go to the forestry camp in our Junior year.

THE PLACE OF ENTOMOLOGY IN FOREST WORKING PLANS.

By S. A. Graham, '14.

A forest working plan, in the final analysis, is an attempt to foretell the future developmental processes of a forest. Its purpose is to determine methods of silvical procedure which will bring the greatest net return from the land. It is evident from its very character that such an effort cannot hope to be perfect or final and any working plan is, therefore, subject to such modification as circumstances require. At the same time the nearer it can prophesy the future of the forest the nearer will the plan approach that perfection which should be its aim, and the more valuable will it be in the management of the forest in question. It is the purpose of this article to point out one factor, which has usually been almost disregarded in past working plans, and the dangers attending its omission. This factor or, more correctly, factor complex may be expressed in the phrase danger from insect injury.

That insect injury has been recognized by foresters as a factor to be considered is indicated by the fact that in most working plans some of the insects affecting the trees are mentioned under the head of "protection." At the same time it is evident that these pests are mentioned in a spirit both hopeless and helpless, and that the possibility of control or of preventing outbreaks usually appears, under forest conditions, as an unattainable goal.

The entomologist is directly responsible for this condition. The recognized authorities on tree and forest insects have without exception been guilty of statements which have discouraged the forester from hoping for any solution of his insect problems. As a rule the recommendations for control
have either been obviously too expensive for general application, or the entomologist has resorted to such statements as that of Felt who says: "It is ordinarily impractical to attempt much in either a preventive or remedial way, in the forests of the United States." While natural control by parasites and birds is mentioned frequently in forest entomological literature, and the protection of these beneficial animals is recommended it is a rarity to find any practical suggestions which would lead to the encouragement of these desirable species. In short the forester has received very little help or encouragement from entomological works on forest insects.

A recognition of the importance of forest insects in the management of timber lands cannot be avoided when we consider the vast destruction of spruce in the Northeast by the spruce-destroying beetle,2 the ravages of the Southern pine beetle,3 and more recently, outbreaks of Dendroctonus beetles in the Black Hills and the Rocky Mountains,4 the devastation of the Eastern larch by the larch sawfly,5 and the destruction of balsam and spruce in Eastern Canada and Maine by the spruce bud worm. As a result of these outbreaks we have learned a great deal about the life and habits of the insects responsible for the destruction but we still know little or nothing of the causes leading up to these outbreaks or the causes of forest insect outbreaks in general.

In the past the science of forestry, comparatively young in this country, has looked to Europe for guidance in forestry methods, but it is evident that our problems in the United States are unique and that their solution cannot often be found in the European forests. The same is true of forest insects. The methods used in the German forests, such as trap trees, trap trenches and pits, tanglefoot, pruning, spraying, etc., cannot be applied under American conditions for obvious reasons. So we cannot hope for much help from foreign sources. Neither can we afford to sit down and let nature take her course as we have shown an inclination to do in the past. We must accept our problems as they are presented to us and find the answer under existing economic conditions and not await the arrival of the millennium when conditions will be more favorable,—perhaps.

Generally speaking there are two angles from which an insect problem may be attacked. (1) From the remedial standpoint, which waits for a pest to manifest itself and then applies measures of control. (2) From the standpoint of prevention, which aims at the reduction to the minimum of favorable conditions for the development of pests. The former is the easier from the entomologist's point of view and makes the biggest display for those involved in the control work, but remedial measures are always expensive and should be avoided wherever possible. The latter is much more difficult, requiring an intimate knowledge of these factors to use this knowledge in such a way as to prevent the pest from establishing itself. Such methods usually require the capital to be used primarily in the management of forest areas. Remedial measures should be applied promptly and at a time when they are effective and at the time they are needed.

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ing an intimate knowledge of all the factors involved, the re-
lation of these factors to one another, and the application of
this knowledge in such a way as to prevent insect epidemics.
Such methods usually require comparatively small out-
capital to be used primarily in investigation and in keeping
the management informed as to insect conditions so that if
remedial measures should become necessary they can be ap-
plied promptly and at a minimum of cost. Such methods are
not conspicuous and perhaps do not reflect so much glory upon
the men engaged in the work as the remedial methods but
they are effective and are cheaper in the long run.

At first glance prevention appears much more difficult than
is really the case. It is true that at the present time we know
little of this angle of insect work, because most of the ento-
mological effort has been directed into other lines, but the time
will doubtless come when preventive methods will be widely
used in the control of insect pests not only in forests but in
agriculture generally. One of the chief objections to such
methods is the impossibility of applying them to small areas.
This objection obviously does not hold in the forest since of
necessity large areas are brought under a single management.

While work along this line is in its infancy we will un-
doubtedly be forced to fall back upon remedial measures to a
greater or less extent, but with the increase of our knowl-
edge of the laws governing insect outbreaks the nearer we will
come to the ideal. A few rather general laws are now recog-
nized and fairly well established and these should be applied
immediately. Others will be brought out by future investiga-
tions. The time to apply these laws is not after the forest has
been established but when the trees are planted or other pro-
visions for reproduction are being carried out. Therefore,
they must be included in the working plan.

As an illustration of the possibilities along this line we
may cite the case of the black locust. The growing of this
tree, which was primarily used for posts, in the central states
has been practically abandoned due to the attacks of a beetle,
the locust borer, which was so universally abundant and inju-
rious that it seemed almost impossible to grow a tree to post
size. The locust borer has been the subject of investigations
at the hands of many entomologists with the result that nearly
every state experiment station in the central states and in
many of the Eastern states has its publication treating of this
insect. None of these workers were able to find any remedy
except in the case of shade trees on which a considerable
amount of labor could be profitably spent. Within the last
year Craighead 1 has published a bulletin showing how the
problem, which had been given up as hopeless, can be solved,
and there now appears to be no reason that the black locust
cannot be successfully grown even in districts where the borer

Page Twenty-nine
infestation is the worst. His recommendations are based upon the fact that the adult beetles are sun-loving insects and will not oviposit in shade. This being the case, close planting or planting under the shade of a nurse crop of some other species will prevent the deposition of eggs upon the trunk and thereby prevent injury by the borers. Such a measure of control must be considered in the working plan if it is to be considered at all.

The above method of control applies to a number of light-loving insects such as the bronze birch borer, the two-lined chestnut borer, which annually kills many oaks in and about the Twin Cities, and Cerambycid and Buprestid beetles in general. In the case of the white pine weevil it has been shown that close planting not only aids the tree in outgrowing the weevil injury but also reduces the percentage of weevil trees.

A general policy of slash burning, if consistently carried out, tends to reduce the danger from bark beetle injury. Insuring the good health of trees by planting species suited to the site on which they are to grow is an insurance against insects as healthy trees are most resistant to insect attack.

It is a well established fact that in virgin stands, with the exception of those species growing naturally in pure stands such as most of the hard pines, injurious insect outbreaks rarely occur. There appears to exist a status quo where the trees and other organisms which make up the environment are so nicely balanced that the pests are unable to become the dominant factor and thus become epidemic. This is the condition which gives the greatest security against insect injury, and, therefore, is the ideal condition from the entomological point of view. It may not be ideal as a timber producing forest, however, but the closer this condition can be simulated under practical conditions the safer will be forest investments. It may not be practical to plant trees in mixture, or to maintain a mixed forest, but we can certainly avoid planting the same species in pure stands over extensive areas by using a system of pure blocks separated from one another by blocks of other species not subject to the attack of the same insects. This would at least minimize the danger of pure planting.

The effect of pure planting is well illustrated by some of the common agricultural crops. In nature these plants did not grow in pure stands, but were scattered here and there and separated from one another by other species of plants. Under these conditions the insects feeding upon these plants were forced to search for their proper food plant and in the process exposed themselves to dangers of starving if their search were unsuccessful, or of being killed by their enemies.

These dangers tended to the other hand, these stands the danger of stable food no longer kept enemies increase, they factor of danger which was not for the watch increase to such an extent introduces controlling factors of culture, and so forth; factors which he removes the crop.

The same principle applies to a number of light-loving insects such as the bronze birch borer, the two-lined chestnut borer, which annually kills many oaks in and about the Twin Cities, and Cerambycid and Buprestid beetles in general. In the case of the white pine weevil it has been shown that close planting not only aids the tree in outgrowing the weevil injury but also reduces the percentage of weevil trees.

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1. It is evident that in two possible angles of:

(1) Remedial measures.

(2) Prevention.

2. The first involves the use of labor and capital, but necessary to the rapid increase of the

3. The second involves a loss of labor and capital, but necessary to the rapid increase of the

4. The second method of remedial measures must be

remedial measures which increase of our knowledge may eventually be replaced.
These dangers tended to hold down their numbers. When, on the other hand, these plants are planted in fields in pure stands the danger of starvation while on the search for suitable food no longer keeps the pests in check, and, while the enemies increase, they are seldom if ever able to equal the factor of danger which has been removed. As a result, if it were not for the watchfulness of man, the pests would increase to such an extent as to destroy the crop. Man then introduces controlling factors in the form of sprays, methods of culture, and so forth, to take the place of other inhibiting factors which he removed when he produced a pure stand of the crop.

The same principle without doubt applies to the forest. If we wish to obtain a harvest we cannot remove the factors which control the tree insects under natural conditions without substituting other factors to take their place. There is certainly a distinct danger in the planting of pure stands of white pine or spruce over immense areas as has so often been suggested, unless we can afford to adopt such expensive measures of protection as are used in the German forests.

The effect of the development of pure or nearly pure stands of a single species is beautifully illustrated in the devastation of the balsam in Eastern Canada and Maine. Here the balsam became the predominant tree as a result of logging methods. This abundance of its favorite food plant led to the rapid increase of the spruce bud worm which developed to such proportions that it swept over thousands of square miles of forest, destroying almost all of the dominant balsam in the areas attacked. Control in such a case is out of the question, and, therefore, the only remedy lies in prevention, which can only be accomplished by a consideration of the problems involved while the working plan is under consideration.

**SUMMARY.**

1. It is evident that in the control of forest insects we have two possible angles of attack:
   1. Remedial measures after the pest is in evidence.
   2. Prevention.
2. The first involves the expenditure of an immense amount of labor and capital, but is comparatively simple.
3. The second involves a comparatively small outlay of labor and capital, but necessitates a fairly complete knowledge of the trees, the insects, and the factors influencing their relations to one another.
4. The second method can at present only be used in a general way and must be supplemented by the application of remedial measures where economically possible. With the increase of our knowledge the remedial measures can eventually be replaced by preventive measures.
5. There are a few well established general methods of procedure which can be applied even with our present limited knowledge such as:

(1) Close planting for the control of certain insects.
(2) Slash burning for the control of bark beetle.
(3) Mixed planting.
(4) Pure plantations in isolated blocks.
(5) Simulating as far as possible natural stands.

6. Preventive measures have many advantages over remedial measures and should, therefore, be used as far as possible. **If preventive measures are to be used they must be considered in the working plan.**

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**THE SPLINTER CAT.**

*(Felynx Arbordiffusus.)*

By Wm. T. Cox, '06.

A widely distributed and frightfully destructive animal is the splinter cat. It is found from the Great Lakes to the Gulf, and eastward to the Atlantic ocean, but in the Rocky Mountains has been reported from only a few localities. Apparently the splinter cat inhabits that part of the country in which wild bees and raccoons abound. These are its natural food, and the animal puts in every dark and stormy night shattering trees in search of coons and honey. It doesn't use any judgment in selecting coon trees or bee trees, but just smashes one tree after another until a hollow one containing food is found. The method used by this animal in its destructive work is simple but effective. It climbs one tree, and from the uppermost branches bounds down and across toward the tree it wishes to destroy. Striking squarely with its hard face, the splinter cat passes right on, leaving the tree broken and shattered as though struck by lightning or snapped off by the wind. Appalling destruction has been wrought by this animal in the Gulf states, where its work in the shape of a wrecked forest is often ascribed to windstorms. **—From Fearsome Creatures of the Lumberwoods. Illustrated by Coert DuBois.**
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XI SIGMA PI

Walter W. Schmid

The Delta Chapter of Sigma Pi was installed at Minnesota on the evening of March 25, 1920, by Mr. I. V. Anderson of Michigan Agricultural College. Eighteen men were installed as the charter members. Walter Schmid was elected Chief Forester; Arthur Whiton, Secretary and Fiscal Agent; Leyden Ericksen, Assistant Forester; Huber Person, Aangerf; and George Hauser, National Representative. The Xi Sigma Pi is the oldest honor society in forestry in the United States. The valuable influence of such an organization in the live forestry schools of the country is now universally recognized. Five chapters are now established in forest schools located in as many different forest regions from Washington to Maine. Xi Sigma Pi has had an auspicious beginning at Minnesota, and from all appearances will fill a big place in future forestry activities at Minnesota. Since the installation three new members have been elected to membership.

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IMPRESSIONS GATHERED AT THE FOURTH ANNUAL
CONVENTION OF THE INTER-COLLEGIATE
ASSOCIATIONS OF FOREST CLUBS.

By J. H. Allison, Minnesota Delegate.

The Yale Forest School, at which this convention was
held, roosts on a hill at a distance of about a mile from the old
Yale campus (and the New Haven Green). Yale University
holds a large tract of land across the street and a little nearer
the old university buildings upon which the university has
located several new laboratories. The forest school grounds
cover the equivalent of a large city block, the old Marsh resi-
dence and grounds. The old residence is used as the home of
the forest school. It is just about as well suited to the needs
of the Yale school as our horticulture building is to our needs.
It is located just far enough away from the rest of the Yale
buildings so that one of the delegates, who finally arrived
about the middle of the first morning session, claimed that he
had spent the preceding hour with a “wild taxi driver” trying
to locate the forest school.

The first session (morning of February 27) was occupied
by an “Address of Welcome” by Dean Tourney, the president’s
address by President Claridge of the Yale Club (I arrived
after these addresses had been made) and the reading of the
reports of the various forest clubs making up the Association.
As I listened to the reports from the various clubs, the impres-
sion grew on me that Minnesota had one of the oldest and
most active clubs in the whole Association. I do not think that
any of the other clubs have undertaken acquiring a permanent
home. At least I did not hear a club house mentioned in the
reports of any of the other clubs, but some of the club reports
were read before my arrival. The clubs at Washington, Cali-
ifornia, Minnesota, Cornell, Syracuse and Yale Universities,
and at Pennsylvania State College were represented by dele-
gates. The University of Maine and the Pennsylvania State
Forest Academy may have been represented, too.

After the club reports had been read, Prof. Record took
the delegates for a tour of the more important university
buildings, winding up at the university dining hall for lunch.
I chose to talk with some acquaintances and by so doing got to
the dining hall and nearly through eating before the rest of
the crowd arrived—and I am a slow eater! Not only did I
almost get through eating before they appeared but I nearly
acquired chilblains standing before the dining hall doors await-
ing the rest of the crowd before we (there were four of us)
got up courage enough to butt in alone. You may decide for
yourself whether it was the scanty menu or the length of the
tour that Prof. Record took the rest on.

The afternoon was occupied by a brief business meeting
at which committees on “Resolutions,” “Auditing” and “Publi-
cations" were appointed. The business part of the meeting was immediately followed by talks on:

- "How Can the Forester Help the Lumberman," by Mr. T. L. Bristol of Ansonia, Conn. (Mr. Bristol is manager of the Ansonia Water Co. and, as such, operates one or more portable sawmills on the water company's land besides on outside tracts).
- "The Work of the Consulting Forester," by J. T. Rothery of New York City (a Yale forest school graduate who has butted successfully into the consulting forester game).

These three talks will be reported in detail in the Association annual and I will not even try to review them. It will be worth your while to look them up and read them.

In the evening the Yale Club invited the visiting delegates and other guests and visitors, totaling some 50 or 60 in number, to a banquet in the president's room at the dining hall. The menu was as follows:

- "Blue point oysters (I prefer them fried but these were raw); cream of tomato, olives, celery, roast turkey with dressing, green peas, mashed potatoes, cranberry sauce, grapefruit salad (mostly made out of apples), assorted fancy cake, Neapolitan ice cream, coffee and cigars." The banquet was served at 7 P. M. By that time I was very hungry. The eats sat very well. I could even have eaten a little more of the roast turkey and mashed potatoes.

T. S. Woolsey was the principal speaker of the evening. He dwelt upon the necessity of practicing real forestry, looking toward sustained yield on the national forests. He even suggested that "mandatory forestry," that is, the legal requirements, that not more than a certain volume of timber should be removed annually from each of the national forests, might be desirable, possibly necessary. That is a revolutionary suggestion. Mr. Woolsey was preceded by Dean Toumey, who made a very short and distinctly humorous address, while he was followed by Roy Marston, who at one time handled the lumbering work at Yale. Mr. Marston is something of a character to the old Yale men—but I think some of the delegates did not "get" him at all. Marston never had to work for a living, hopes it will never be necessary to do so (that's just my guess), likes to have good things to eat and drink, really likes liquor exceedingly well and does not intend to take life too seriously. Being of such a disposition, his talk following directly after Woolsey's serious one perhaps did not sound entirely apropos to all, but to those who knew him, it sounded characteristic and really humorous. I enjoyed it very much.

Most of Friday morning. The principal topic of the question of the Publications Committee (Mr. Record reported in favor of a move as the North Woods, to start the discussion by Association was biting off a quarterly would be a good idea in the present. (Here I may say how this club felt each delegate had something, except the members of the publicist asked Prof. Record and gave the experience in News," which is a quart Chapman gave them the original motion, calling it put to a vote, the committee and substituted one calling numbers per annum to be March 1 and May 1. Thus the publication discussion was a matter of a satisfactory for consideration. Seven pins. Thereafter it was time for the adoption of an Association.

Having settled these couple of amendments to the ready or will soon receive were postponed until the next meeting.

The morning's speech Prof. Briscoe of the University, "The Undergraduate Student of Forestry and the United States Forest Service," called upon State Forester and the Student of Forestry and the United States Forest Service. The Student of Forestry's addresses will be reported and recommend Mr. Hirst's preferences as State Forester as clearly worth while reading.

Prof. Hawley took the walking excursion to the times since 1902, on that by the New Haven Water could not be used for this
Most of Friday morning was devoted to a business meeting. The principal topic before the delegates was the settlement of the question of an Association publication. The Publications Committee (Mr. Smith of Washington, chairman) reported in favor of a monthly publication, about twice as big as the North Woods, to be gotten out eight times a year. I started the discussion by stating that my opinion that the Association was biting off more than it could swallow and that a quarterly would be a more reasonable thing to attempt for the present. (Here I must thank Isaac for giving me a real tip on how this club felt concerning this question.) I believe each delegate had something to say on the question and everyone, except the members of the committee, objected to the frequency of the publication. The president of the Yale Club asked Prof. Record and Chapman, who were present, to describe their experience in getting out the "Yale Forest School News," which is a quarterly publication. Prof. Record and Chapman gave them the information requested. Before the original motion, calling for eight publications a year, could be put to a vote, the committee withdrew their original motion and substituted one calling for a publication to consist of four numbers per annum to be put out on November 1, January 1, March 1 and May 1. The substitute motion was approved.

The publication discussion took up most of the morning. The matter of a standard Association pin then came up for consideration. Several clubs have already adopted club pins. Therefore it was the opinion of the delegates that the adoption of an Association pin was inadvisable.

Having settled these two matters, and having adopted a couple of amendments to the constitution, which you have already or will soon receive a copy of, other business matters were postponed until the evening smoker.

The morning's speaking program was then taken up. Prof. Briscoe of the University of Maine, talked on the subject, "The Undergraduate Student of Forestry." He was followed by State Forester Hirst of New Hampshire on "The Student of Forestry and the State Service." Mr. Dana of the United States Forest Service, completed the program by covering "The Student of Forestry and Research." These addresses will be reported in full in the Association Annual. I recommend Mr. Hirst's paper, covering some of his experiences as State Forester of New Hampshire, as being particularly worth while reading.

Prof. Hawley took the visiting delegates for a street-car walking excursion to the plantations, established at various times since 1902, on that portion of the Maltby tract (owned by the New Haven Water Co.) near the Derby car line. Autos could not be used for this excursion on account of the condi-
tion of the roads. The snow was anywhere from one to three feet deep. I did not go on the excursion. Neither did I go to the smoker in the evening. I left verbal instructions with the Yale Club President to vote Minnesota for California as the president club for next year, and, if California did not land the presidency, to use his own discretion in voting on other aspirants.

I do not know how much the meeting cost the Yale Club. I believe the Yale Club paid the expenses of the delegates for the two days covered by the meeting. The delegates were put up at the Hotel Taft, which is in the same class as the Saint Paul or Radisson hotels here. Some of the meals were served at the Yale dining hall. They cost about 60 cents apiece (lunch and dinner). I do not know what breakfast cost. Then there was the banquet, served to the delegates and other guests, total number present about 50. It was served at the dining hall and cost between $1.50 and $2.00 per plate. That was "on" the Yale Club. Then there were seven out-of-town speakers. I think some of these men paid their own expenses, but I do not think all of them did. From this fragmentary information you can make your own estimate of the cost of the meeting to the Yale Club.

My impression of the meeting sums itself up as follows: The meeting itself was an instructive and interesting one. It was well worth while for the men attending it. Much of its value lies in the contact of the various delegates with each other—which gives them a chance to see what the other fellow, perhaps from a distant part of the country, is doing and to learn what he is thinking. I think the Yale program was rather overloaded with outside speakers. Two outsiders on the first afternoon and either none or not more than two outsiders on the second morning would have been sufficient. With three or more speakers, the program became too long. There was not time enough for business. I think the field trip, at least there, where there are available woodland stands that have been under management for twenty years, was a good feature, but snow conditions made it impossible to go far. I feel that Minnesota has one of the oldest clubs in the organization and that it should try to have a student representative at the future meetings. Also Minnesota should try to secure the meeting of the Association in February, 1923.
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THE FORESTRY CLUB.

In spite of the handicapped start last fall the Forestry Club at Minnesota has had one of its best years since the edi-
tor first became acquainted with it back in '14. Two-thirds of
the men were Freshmen and all but about nine men had been
at Minnesota less than a year. However enough of the old-
time pep which has always characterized the foresters
survived the war and things were soon humming. The second
week of school the old men staged the traditional bonfire
at the "Lagoon." The Freshmen gathered around in such
flocks that it almost made us older men feel among strangers,
but after Cheyney broke the ice with a few of his best, and
Sam Graham with a few of—(well you all know the kind Sam
can tell), it sure seemed like old times. Pep and enthusiasm
fairly began to sizzle and it's been growing hotter all year.

Our furniture, which had been stored during the martial
hiatus, was moved into the new club house which we pur-
chased on Langford avenue. Because of the high cost of
building materials it was not deemed wise to build, and the
advance of rents made it necessary for us to buy a place of
our own. In passing it might be well to note that so far as we
can find out Minnesota is the only Forestry Club having a
house of its own. Sixteen men are living at the club house
this year.

A program of talks by a few of the local men was ar-
ranged, but because of the preponderance of Freshmen in our
midst it was considered best to have this year's meetings of
a more social nature, or in the nature of informal discussions.
We are thus enabled to get better acquainted and get things
established on a firmer basis. Among the social events of the
past year was, the Freshmen banquet on the night of the club
initiation, the dance given in the ballroom of the men's union
in connection with the Alpha Gamma Rho agricultural fra-
ternity, a dancing party at the club house on the evening of
January 31, the annual banquet at the Dyekman hotel, and
many informal smokers and get-togethers. A minstrel show
was organized the first of the year to be given at the agricul-
tural auditorium on the evening of March 6. Harry Bartelt
acting as musical director, "Bill" DeFlon as business manager,
and "Mike" Frudden as publicity agent were chosen to put on
the show. The production was given with fewer-than-the-
usual hitches of an amateur performance, and outside of our
prima donna, Mr. Palmer nearly losing his velvet evening
gown in the last act, without accident. The house was packed
and some $250 profit was realized.
We were ably represented at the Yale convention of clubs by Prof. Allison who will tell of his experiences in this volume. We also were honored by a visit from Mr. Smith of the University of Washington on his trip to attend the Yale convention as the Washington delegate. Mr. I. V. Anderson of Michigan Agricultural College, also favored us with a visit when here to install the local chapter of Xi Sigma Pi. If Mr. Smith and Mr. Anderson are fair representatives of Washington and M. A. C. students we predict a bright future for those schools. Space does not permit of recording all of the activities of the year, but suffice to say, there has been something going on every minute. Our President Mr. Leo Isaac, is to be congratulated on the showing the club has made during his administration. As a whole the year has been very satisfactory and in closing let me say, that to us who are about to leave, it sure is gratifying to see things booming as they have been this winter.

FORESTRY STUDENTS AT MINNESOTA.

Graduate Students.

Shirley C. Brayton, B. S. (Minnesota), Manchester, Iowa.
Xi Sigma Pi, Forestry Club, Gobbler, 1918 Junior Corporation.
S. A. Graham, B. S. F. (Minnesota, 1914), M. S. F. (Cornell, 1916), Minneapolis, Minn.
Alpha Zeta, Gamma Alpha, Forestry Club, 1914 Junior Corporation.

Seniors.

Clyde M. Fradden, Charles City, Iowa.
Sigma Alpha Epsilon, Xi Sigma Pi, Alpha Zeta, Sigma Delta Chi, Forestry Club, Grey Friars, Tau Shonka, Wing and Bow, Gobblers, 1919 Junior Corporation.
Rudolph H. Grabow, Minneapolis, Minn.
Xi Sigma Pi, Alpha Zeta, Forestry Club, Gobbler, 1919 Junior Corporation.
Harlan C. Hanson, Cedar Rapids, Iowa.
Phi Kappa Sigma, Forestry Club, 1917 Junior Corporation, Varsity Football.
Leo A. Isaac, Fond du Lac, Wis.
Xi Sigma Pi, Forestry Club, Gobbler, Students' Catholic Association.
Paul R. Palmer, St. Paul, Minn.
Xi Sigma Pi, Forestry Club, Gobbler, University Glee Club, 1919 Junior Corporation.
Walter W. Schmidt, Minneapolis, Minn.
Phi Delta Theta, Xi Sigma Pi, Forestry Club, Gobbler, Wing and Bow, Tau Shonka.
Arthur L. Whiton, Rochester, Minn.
Phi Kappa Psi, Xi Sigma Pi, Alpha Zeta, Gobbler, Forestry Club, Wing and Bow, Tillikum Club.

Juniors.

Leyden N. Erickson, Minneapolis, Minn.
Xi Sigma Pi, Alpha Zeta, Forestry Club, Gobbler, 1919 Junior Corporation.

Page Forty

Walter Haertel, Minneapolis, Minn.
Phi Delta Theta, 1918.
Lloyd G. Grapp, Minneapolis.
Xi Sigma Pi, Forestry Club, Gobbler.
Francis V. Ostrowski, Chicago, Ill.
Xi Sigma Pi, Forestry Club.
Hubert L. Penson, Minneapolis.
Xi Sigma Pi, Alpha Zeta, Forestry Club, Gobbler.
Albert E. Wackerman, Minneapolis, Minn.
Alpha Zeta, Forestry Club.

Alvin A. Anderson, Minneapolis.
School of Business.
Forestry Club, Gobbler.

Otto W. Anderson, B. S., Forestry Club, Gobbler.
Rudolph H. Grabow, Minneapolis, Minn.

College of Engineering.
Forestry Club, Gobbler.

Daniel E. Dwyer, Jr., St. Paul, Minn.
Delta Kappa Epsilon, Xi Sigma Pi, Forestry Club, Gobbler.
Harley Fendel, Detroit, Mich.
Phi Kappa Delta, Xi Sigma Pi, Forestry Club, Gobbler.
Edward J. Schmidt, Monticello, Minn.
Forestry Club, Gobbler.

Stanley F. Staples, Minneapolis, Minn.
Kappa Sigma, Forestry Club, Gobbler.

Burton W. Thayer, Minneapolis.
Alpha Zeta, Forestry Club.

Perry E. Johnson, St. Paul, Minn.
Forestry Club, Gobbler.

John A. Sellehan, St. Peter, Minn.
Forestry Club, Gobbler.

Walter G. Wilson, Dodge City, Kansas.
Forestry Club, Gobbler.

Eugene G. Bjornstad, St. Paul, Minn.

Philip H. Bryan, St. Paul.
Phi Psi, Forestry Club, Gobbler.

Robert W. Butler, St. Paul, Minn.
Phi Kappa Psi, Forestry Club, Gobbler.

Robert Callan, St. Paul, Minn.
Phi Kappa Psi, Forestry Club, Gobbler.

David Allen Christianson, Eau Claire, Wis.
Delta Kappa Epsilon, Xi Sigma Pi, Forestry Club, Gobbler.

Clifford O. Christopherson, St. Paul, Minn.
Forestry Club, Gobbler.

Charles L. Dockstader, St. Paul, Minn.
Forestry Club, Gobbler.

Gunnar K. Fenger, Des Moines, Iowa.
Yale convention of clubs experiences in this volume. In Mr. Smith of the University of Illinois, I V. Anderson of Michigan, and Mr. Smith of Washington and future for those schools.

II of the activities of the Sigma Pi. If Mr. Smith is to be congratulated for his administration, the results have been very satisfactory and the future looks promising as they have been in the past.

MINNESOTA.

Freshmen.

Walter Haertel, Minneapolis, Minn. Phi Delta Theta, 1916 and 1919 'Varsity Football.

Lloyd LeGrapp, Minneapolis, Minn. Xi Sigma Pi, Forestry Club, Gobblers, 1919 Junior Corporation.

Francis V. Ostrowski, Chicago, Ill. Xi Sigma Pi, Forestry Club, Gobblers, Students' Catholic Association.

Hubert L. Person, Minneapolis, Minn. Xi Sigma Pi, Alpha Zeta, Forestry Club, Gobblers.

Albert E. Wackerman, Minneapolis, Minn. Alpha Zeta, Forestry Club, Gobblers.

Sophomores.

Alvin A. Anderson, Minneapolis, Minn. From University of Minnesota School of Business. Forestry Club, Gobblers.


Sidney S. Burton, Minneapolis, Minn. From University of Minnesota College of Engineering. Forestry Club, Gobblers.

Daniel R. Dwyer, Jr., St. Paul, Minn. Delta Kappa Epsilon, Forestry Club, Gobblers, Wing and Bow.

Ralph M. Nelson, Climax, Minn. Forestry Club, Gobblers.

Clayton Reich, McGregor, Iowa. Forestry Club, Gobblers.

Edward J. Schmidt, Manitowoc, Wis. Forestry Club, Gobblers.

Stanley F. Staples, Minneapolis, Minn. Kappa Sigma, Forestry Club, Gobblers, University Band and Saxophone Sextette.

Burton W. Thayer, Minneapolis, Minn. Alpha Zeta, Forestry Club, Gobblers.

Floyd Tilden, St. Paul, Minn. From Hamline University. Forestry Club, Gobblers.

John A. Sheehan, St. Peter, Minn. From Gustavus Adolphus College. Forestry Club, Gobblers, Students' Catholic Association.

Walter G. Wilson, Dodge Center, Minn. Forestry Club, Gobblers, Webster Literary Society.

Eugene G. Bjornstad, St. Paul, Minn. Forestry Club, Gobblers.

Philip H. Bryan, St. Paul, Minn. Forestry Club, Gobblers.

Walter Butler, St. Paul, Minn. Forestry Club, Gobblers.

Robert Calton, St. Paul, Minn. Forestry Club, Gobblers.

David Allen Christianson, Hinckley, Minn. Forestry Club, Gobblers.

Charles L. Deckert, St. Paul, Minn. Forestry Club, Gobblers.

Gunnar K. Fenger, Des Moines, Iowa.
Orcutt Frost, Minneapolis, Minn. Forestry Club, Gobblers.

Hubert D. Hamilton, Martinsville, Ind. Forestry Club, Gobblers.

Frank S. Hough, Jr., Sibley, Iowa. Forestry Club, Gobblers.

R. Frederic Kelley, Long Lake, Minn. Phi Sigma Kappa.

Robert H. Knight, Le Roy, Minn. Forestry Club, Gobblers.

James P. Kostol, Little Falls, Minn. Forestry Club, Gobblers.


Henry Mooney, Madison, Minn. Forestry Club, Gobblers.

Arthur L. Nelson, Minneapolis, Minn. Forestry Club, Gobblers.

Earl W. Olsen, Dassel, Minn. Sigma Alpha Epsilon, Forestry Club, Gobblers.

Maxon Y. Pillow, Duluth, Minn. Forestry Club, Gobblers.

Ed. E. Probstfield, Minneapolis, Minn. Forestry Club, Gobblers.

Homer O. Rathbun, Fort Worth, Tex. Sigma Alpha Epsilon, Forestry Club, Gobblers.

William A. Ritchie, Manitowoc, Wis. Forestry Club, Gobblers.

Raymond E. Stevans, Duluth, Minn. Forestry Club, Gobblers.

Augustine J. Streitz, Minneapolis, Minn. Forestry Club, Gobblers.

Nelson Upton, Rogers Park, Ill. Forestry Club, Gobblers.

Paul Youngers, Minneapolis, Minn. Forestry Club, Gobblers.

FORBISTRY ALUMNI.

1899. Herman Chapman, M. F., M. A., Harriman Professor of Forest Management, Yale Forest School, New Haven, Conn.

1902. Martin L. Erickson.

1905. Harold Cusser, Lamo Bataan, P. I.

1906. William T. Cox, State Forester, St. Paul, Minn.


1909. George deS. Canavarro, Washington, D. C.


Page Forty-two
1910.
Norman M. Baker, C. A. Smith Lumber Co., Bay Point, Cal.
Arnold O. Benson, U. S. F. S., Kailspel, Mont.
James Birt Berry, Dean Georgia State Forest School, Rome, Ga.
Donald R. Brewster, Forest Products Laboratory, Madison, Wis.
Charles L. Lewis, Jr., Beaver Brooks, Wis.
Clarence L. Underwood, North Yakima, Wash.

1911.
Frank W. Beard, Chicago, Ill.
Clarence W. Bowen, 1837 Diamond Ave., South Pasadena, Cal.
James H. Brownlee, Forest Products Laboratory, Madison, Wis.
Hugh B. Campbell.
Robert Deering, U. S. F. S., Albuquerque, N. M.
Walter Eisenach, Aitkin, Minn.
James R. Gillis, Los Ranchos, P. I.
Carl L. Hamilton, White Pine Bureau, St. Paul, Minn.
Adolph G. Hauge.
Julius V. Hoffman, Ph. D., Wind River Experiment Station, Carson, Wash.
William H. Kenoby, M. S. F., Forest Experiment Station, Cloquet, Minn.
Dean W. Martin, U. S. F. S., Washington, D. C.
Arthur F. Oppel, Minnesota Forest Service, St. Paul, Minn.
William Underwood, Pierre, S. D.
Henry Weber, Duluth, Minn.
Donald Williams.
J. Paul Young.

1912.
Walter F. Beyer, St. Paul, Minn.
Harvey P. Blodgett, Red River Lumber Co., Westwood, Cal.
William R. Clymer, St. Paul, Minn.
Grover M. Conset, M. S. F., Eufaula, Ala.
S. G. Harris, Jr., Page and Hill Co., Minneapolis, Minn.
Arthur W. Hugman, St. Paul, Minn.
Sigvald Norman, Page and Hill Co., Gemmell, Minn.
William R. Pearce.
Herman N. Pettibone.
F. E. Spieleschberg, Sioux Falls, S. D.
J. A. Stevenson.
Robert Wilson, U. S. Experiment Station, Mandan, N. D.
Lee Orcutt Miles.

1913.
J. J. Armstrong, ex-'13, St. Paul, Minn.
Ernest O. Bulter, McGrath, Minn.
Andrew Erstad, Boise-Fayette Lumber Co., Barber, Iowa.
Thomas Griffin, Minneapolis, Minn.
Edwin Hall, U. S. F. S., Ogdea, Utah.
Robert Howarth.
Norman Henshel, U. S. Experiment Station, Mandan, N. D.
John Moir, St. Paul, Minn.
Henry Nuffer.
*David Renshaw.
*Ernest Rogers.
Oliver Savre.
Charles Simpson.
Paul Tobin, Minneapolis, Minn.
Gilbert H. Wiggin, Forest Experiment Station, Cloquet, Minn.
1914.
Donald Aldworth, Shevlin-Carpenter Lumber Co., Minneapolis, Minn.
Kenneth J. Braden, Duluth, Minn.
Thomas Cummings, Fort Benton, Mont.
George Freeman.
S. A. Graham, M. S. F., University of Minnesota, St. Paul.
George C. Lindeberg.
Alfred T. Mueller, Markesan, Wis.
Stanley L. Ringold, St. Paul, Minn.
Percy Record, ex-'14, Minnesota Forest Service, St. Paul, Minn.
Logan Ross, Mankato, Minn.
Adrian A. A. St. Marie, Kimberly-Clark Pulp & Paper Co., Kimberly, Wis.
Donald Aldworth, Shevlin-Carpenter Lumber Co., Minneapolis, Minn.
Kenneth J. Braden, Duluth, Minn.
Thomas Cummings, Fort Benton, Mont.
George Freeman.
S. A. Graham, M. S. F., University of Minnesota, St. Paul.
George C. Lindeberg.
Alfred T. Mueller, Markesan, Wis.
Stanley L. Ringold, St. Paul, Minn.
Percy Record, ex-'14, Minnesota Forest Service, St. Paul, Minn.
Logan Ross, Mankato, Minn.
Adrian A. A. St. Marie, Kimberly-Clark Pulp & Paper Co., Kimberly, Wis.

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Published Monthly Subscription Price, $2.00 a Year

It is not a periodical for sportsmen only, but for every man or woman who loves life in the open, or who studies the wild life of stream, forest, or field. Forest And Stream prints no outdoor fiction, acknowledged or disguised, but offers the experiences (not the less interesting for being true) of men and women who do the things all outdoor people do or want to do. Its narratives of camp life, fishing, shooting, mountain climbing, travel, adventure, canoeing, breeding and care of the hunting dog, and a hundred other things are an unmixed delight to outdoor people.

Reading Forest And Stream helps a man live better and enjoy life better in the months to come and all the time, and when the shut-in days come it is a welcome reminder of the battle with fighting trout or bass, glorious days in the game covers, campfire comradeship, the spring of the paddle, the charm of untrdden ways, or quiet hours close to nature.

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