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DR. C.O. WILLITS
DEDICATION
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COVER PICTURE

Our cover picture for this issue came from the late W.W. Simonds of Penn State University, via Fred E. Winch, Jr. of Cornell University. Where it was taken is unknown, but we assume it was somewhere in Pennsylvania. It was undoubtedly taken a good many years ago, and at the time, considered a fairly presentable set-up. And I thought masonry arches were modern!

NOTICE

BACK ISSUES AVAILABLE

The following issues of the Digest have been printed to date:

Vol. 1, No. 1, 2, 3, 4
Vol. 2, No. 1, 2, 3
Vol. 3, No. 1, 2, 3, 4
Vol. 4, No. 1, 2, 3, 4
Vol. 5, No. 1, 2, 3, 4
Vol. 6, No. 1, 2, 3, 4
Vol. 7, No. 1, 2, 3, 4

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CORRECTION: In my article "A Completely Automatic Sirup Draw-Off" appearing in the Maple Syrup Digest, Volume 7, No. 1, page 12, 1968 I stated that the Connelly automatic sirup "draw-off" controller was the only instrument that was fully automatic, compensating for different boiling temperatures of standard density sirup caused by changes in barometric pressures.

Since that time Dr. A. Cholette, the inventor of the Cholette controller has informed me, by private communication, that his sirup draw-off controller also automatically compensates for the differences in the boiling temperatures of standard density sirup caused by changes in the barometric pressure. The Connelly controller, however, has as an integral part a continuously indicating thermometer which shows the temperatures of boiling sirup as it is concentrated, in 0.1° F, above the temperature of boiling water under the same barometric pressure.

Signed: C.O. Willits

Editorial

Everyone says we're going to have a bumper crop of syrup this year. I usually make my prediction about the first of May - it's safer. If we don't make more than we have the last two years, I'm going to get a ditch digging job, which will undoubtedly raise my standard of living considerably.

If we do have a bumper crop, we could end up with a bumper problem, too. What will we do with all the bulk syrup? There's a three part article in this issue entitled "The Bulk Syrup Problem" that gives the views of three individuals or organizations.

Sherb Doubleday, of American Maple Products, says we should develop new markets or make use of existing ones for table grade dark syrup. I agree. I never could see the sense of ramming fancy syrup down the customer's throat when he would rather pay the same price for a darker grade.

Bill Clark, and the Vermont Sugar Makers Association, thinks we should tap early, make all we can until it turns dark and quit early. That's a good idea, too. The buyers haven't had any use for buddy, or off flavored syrup since the tobacco industry stopped buying it 25 years ago. Anyone who makes it now could very well end up feeding it to his cows.

Dick Howard of the R.C. &D. office in Norwich thinks we should make a larger percentage of the table grades and less commercial. Here again I agree, and while you may think it's a difficult thing to do, it's not at all impossible. After all, most producers have been upgrading their products for several years now.

How? Well, if you want to give credit where credit is due, we'll have to acknowledge the work Dr. Willits and his associates have done the past few years in the maple laboratory in Philadelphia. The tap hole pellet, chlorine solutions instead of detergents for cleaning equipment, and the use of ultraviolet light, just for a starter, all came from the Philadelphia laboratory either directly or indirectly, and all help to keep down the bacteria and yeast counts in sap. And it's a proven fact that about 95% of the color in dark syrup is caused by excessive microbial populations.

I suppose a lot of leaves and bark in the sap will cause considerable coloring too, but personally, I can't honestly see where filtering the sap improves the grade any more than straining it through a piece of screen wire. The filter won't take out the bacteria and they're the little devils that's causing all the damage. A filter won't take out yellow rain water, either, so maybe you ought to make use of the run-off shields described in this issue's "How To Do It" column.

While I'm on the quality subject, there's another point I should mention. Inspection of sugarhouses is increasing by both State and Federal inspectors. A sugar house is a food processing plant and these boys sort of frown on dirt, gravel, or rough and broken concrete floors. They want a good steam removal system that eliminates the condensate from dripping off the rafters back into the pans, and a few other things of possibly lesser importance. After all, their demands aren't unreasonable – just good common sense for the production of as fine a pure food as maple syrup is supposed to be. I suggest you take a good look at your own operation and get the jump on them before they get the jump on you and bounce you right out of business.

The industry, as a whole, has done a pretty good job over the years. 15 years ago, 75% of the crop produced was of the two lowest grades. Now, about 75% is of the two top grades, but with one major buyer pulling out of the states, and the blending companies cutting the percentage of maple they use, we better increase the top grades to about 90% or someone may find themselves with a lot of blackstrap on their hands that nobody wants. While this change doesn't appear to amount to much, it actually means that over half of the commercial syrup would be removed from the market and this alone would relieve the situation considerably.

Producers really don't have to worry much about the good quality bulk syrup because good syrup always seems to find a home eventually. After two bad years, the shelves are bare and it will take more than one good crop to accumulate any surplus of the top grades. Dark, or commercial syrup is a different story. The days are past when you can sell anything you can get out of a maple tree. There just isn't any future in the dark syrup market.

How-To-Do-It

INSERTING PELLETS

From what I hear around the country, people still have a problem inserting tap hole pellets. In the Feb. 1967 issue we published a system for doing it. Before the ink was dry, someone, and for the life of me I can't remember who, told me of a better way. Here it is:

The man who bores the tap hole, carries pellets in his pocket. As soon as the hole is bored, he lays a pellet just inside the hole and goes on to the next tree. The next man, who drives spiles, can locate the hole very easily because of the white pellet. He simply inserts the spile and drives it tight. The pellet ends up in the back end of the tap hole. If you don't believe it, try it by hitting the spile just once and then pulling it out. The first crack will pop the pellet back in place.

Editor

RUN-OFF SHIELDS

Covers on sap buckets only do half the job of keeping out rainwater. Quite often water running down the tree follows the spile out into the bucket and this is the worst kind of water because it is loaded with yellow tannin.

The rain guards pictures here will practically eliminate the possibility of yellow sap during a heavy rain. Simply cut a 2 inch square from an old innertube, punch a 3/8 inch hole in the center with a hollow leather punch and insert on the back end of the spile. These guards can be made and put on the spiles in the winter, before tapping, left on during washing and storing for many years and cost you nothing but a little time.

From Agriculture Handbook 134
By C.O. Willits

from the president

Ture L. Johnson
P.O. Box 373
Burton, Ohio 44021

My Dear Friends of Maple,

As I sit and gaze out of the office window, today (January 3, 1969), my thoughts are on the maple tree, and what is going to happen, come syruping time.

All of the old tales are bouncing around in my mind, such as the total amount of moisture or precipitation one must have in the ground for a good season; then the one on the relative coldness one has to have during the winter, the saying goes, the colder the better. There are others to quote, however, we will stop here, because if the above holds true, I would say this is a banner year we are in, for we have all enjoyed an exceptional fall and winter as far as moisture is concerned. Then too, the trees in most areas must be frozen clean to the heart.

Everyone in attendance at the Council meeting has been sent the brochures and literature relative to reservations at Punderson State Park for the Council meeting this October. I trust you all will make your reservations as soon as possible, as the nearest motel of any class is a good distance away, and we would like to have everyone in our immediate area as much as possible. If anyone has not received this material, please send us a card.

Many things need doing before spring arrives, so now is a good time to get going on some of these problems and not wait until it is time to tap.

Be careful of accidents. One of our friends, here in Geauga County, lost his eye in a buzz saw accident on New Year's Day.

I wish you all a Happy and Prosperous New Year, and a successful syruping season this Spring.

Sincerely,
Ture L. Johnson,
President

The Bulk Syrup Problem

from American Maple Products
Newport, Vermont
by Edward S. Doubleday, President

The marketing of commercial grades of maple syrup has been accomplished for many years by several United States and Canadian companies who buy maple syrup in bulk from producers and resell the product in syrup form or manufacture it into maple sugar.

Prior to World War II, the tobacco industry was the principal outlet for commercial grades of maple syrup that had first been converted to maple sugar. Since World War II, the principal outlet for these grades of maple syrup has been to other food manufacturers primarily as a flavoring ingredient for nationally advertised maple-flavored table syrups packaged for the consumer market.

In the past, this type of use has provided a market for an estimated 20,000,000 pounds of maple syrup annually and has more or less absorbed most of the production of commercial grades. However, recent changes in maple-flavored table syrup formulations have resulted in substantial reductions in the quantities of maple syrup used. This in turn has considerably reduced the market for maple syrup so that processors are quite likely to carry surplus 1968 inventories into 1969 resulting in future reduced demand for commercial grades of maple syrup now and in the future.

Most Fancy and Grade A maple syrup is packaged in retail containers for the consumer market and no doubt some Grade B maple syrup is marketed in the same way. Because of the diverse regional taste preferences for syrups, perhaps the industry can turn this into an asset and market more of the Grade B product in this manner to consumers now being overlooked.

If this idea has merit, then the industry should agree upon a designation other than Grade B for this product since, to most consumers, it denotes inferior quality, yet it may be just the flavor many people are looking for.

The solution to the current marketing problem is not simple, but new markets need to be developed if producers are to receive a fair price for their product because, in spite of improved production techniques, there is still a considerable quantity of commercial grades of maple syrup produced.

This matter could be a project for those agencies engaged in maple research problems since an adequate market is vital if the industry, as we know it today, is to survive.

The industry has gone through similar crises in the past and survived and we are hopeful that the industry will put its collective heads together and come up with a satisfactory solution.

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from THE VERMONT MAPLE SUGAR MAKERS ASSOCIATION
by Wilson S. Clark, Director

At the December 3, 1968 meeting of the Vermont Maple Sugar Makers Ass'n, Robert Coombs urged that the following information concerning the dark (commercial grade) syrup market be sent to the National Maple Syrup Digest for publication. It concerns nearly every maple producer in the United States.

1. The two largest blending companies have cut percentages of maple used to about 2/3 of what they were using.

2. One of the largest buyers of bulk syrup in the U.S., located in northeast Vermont, is picking up his drums and indicates no further purchases in the States.

3. After two poor maple years, , with much dark syrup produced, bulk buyers, both in U.S. and Canada,

Cont'd on page 7

Cont'd from page 6

have large carry over stocks.

4. The drop in duty on Canadian syrup coming into the U.S. is now virtually no barrier against import.

From the above information it would appear that the dark syrup market would be very poor in 1969 with much lower prices. My personal thoughts are: Winter has started very early and hard. Could be a year with February sugaring. We should be tapped in January, process all early sap, and quit early on the last end.

---

by Richard F. Howard, Woodland Conservationist Resource Conservation & Development, Norwich, N.Y.

Of great concern to us is the decision by one of the nation's largest bulk syrup buyers to confine his syrup purchases to Canada where quality is protected by governmental grading laws. This will seriously curtail our bulk syrup market, and may result in surplus syrup in 1969. The better producer has tried to retail his table grade syrups and used the bulk market to dispose of his low-grade product. Other producers have "drummed" their entire crop to this bulk market. The amount of syrup this one company has purchased in New York through their buyers scattered over the State can only be guessed at, but the figure is substantial. The action of this one company should, I believe, force each maple producer to take a fresh look at his own operation for 1969.

One fact stands out – at least those producers who sold to this one company may have no market for their low-grade syrup. I have heard of no plans by other buyers of bulk syrup to increase their purchases this year – especially for low-quality syrup. The market for low-quality syrup has been shrinking over the years, and this action by this company will seriously curtail what remains.

We should take every opportunity to inform maple producers that the market for syrup below the table-grade quality will be limited. They must be encouraged to upgrade the quality of syrup that they produce. This can be accomplished by following the approved sanitary practices which have long been advocated by the Extension Service. For many, this means a thorough scrubbing of their equipment before they start and periodically cleaning up their equipment during the season. While there was a market in the past for syrups below the table quality grades and there was some reason to produce this low-grade syrup, this no longer applies. As the quality of the syrup lowers toward the end of the producing season, producers may wish to cease operation rather than produce syrup which will not meet table-grade standards.

In my consultations with maple industrial leaders, there seems to be optimism regarding the markets for table-grade syrup. The lack of a "carry-over" inventory is part of this optimism. The feeling was expressed that successful producers who have markets will be able to handle surplus table-grade syrup produced by their neighbors. The efforts made in this latter direction by the Farm Bureau Marketing Co-operative should also be encouraged.

Syrup can, of course, be readily stored. There will be a lack of storage drums in New York State this spring. Producers should be urged to purchase drums for this purpose through their maple association. There is no reason why syrup cannot be successfully stored in open tanks. A sanitary tank to start with, ultra-violet light, and a tight cover to keep out insects will store syrup for long periods of time.

It is the objective of the South Central New York RC&D Project to expand the maple syrup industry. This curtailment in the bulk market is a handicap to this effort. It is suggested that individual producers who may be considering an expansion in their business may, for 1969, consider purchasing syrup for their expanding market rather than expand their plant facility.

Although this reduction in the bulk market is serious, it may be a blessing in disguise. Those producers who customarily produce low-grade syrup will be forced to upgrade their product. The buying of table grade syrup by those individuals with markets from their neighbors without markets will be a healthy and desirable trend.

It would appear that New York may be in the position of having surplus syrup in 1969. The larger maple producers consider that the table-grade syrups will probably be absorbed within the industry. Markets for low-quality syrups will be limited and producers must be warned to limit the production of syrup that does not meet table grade standards.

The Search for Sweet Sugar Maples

by William J. Gabriel
Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture, Burlington, Vermont.

Table 1. Summary of statistics for tree selection

State	Sugarbushes participating	Trees tested	Field selections	Final selections	Replacement pool
Maine	8	598	4	0	2
Mass.	35	2,537	18	0	6
New Hamp.	18	1,952	38	5	0
New York	72	4,896	64	8	6
Penna.	44	3,671	28	5	2
Vermont	102	7,426	85	9	11
Total	279	21,080	237	27	27

Five years ago a plea went out in the NATIONAL MAPLE SYRUP DIGEST for help in selecting sweet sugar maples (Sweet Sugar Maples Wanted, W.J. Gabriel, Nat. Maple Syrup Dig. 2(2): 10, 1963. These trees were to be used as foundation stock in developing strains of genetically superior sugar-producing maples. The search was planned and supervised by the genetics staff of the U.S. Forest Service sugar maple sap production project at Burlington, Vt.; but the success of the initial field phase was mainly due to the whole-hearted cooperation of more than 70 fieldmen and their supervisors from forestry and extension organizations in Maine, Massachusetts, New Hampshire, New York, Pennsylvania, and Vermont. This phase of the program is completed, and I would now like to acquaint the many interested sugarmakers with the results.

There were 21,080 trees examined for sugar content in 279 different sugarbushes distributed throughout six states. Among these trees, the fieldmen found 237 individuals that met our minimum requirements of being a sweet tree - - one that produces at least 30 percent more sugar than the average of four similar trees surrounding it and has an absolute sap sugar content 0.5 percent higher than the sweetest surrounding trees.

Each field-selected tree was given a careful screening by a geneticist to determine which of the trees showed the best possibilities of being born sweet. Trees that acquired their sweetness because of outside influences were rejected because acquired superior sweetness would not be inherited by future progenies.

After many measurements and much study, 27 trees were finally selected as the best of the lot. We picked a second group of 27 trees that, for one reason or another, were not quite good enough to make the final selection list but could be used to replace any of the latter, should the need arise.

The sweetest tree we encountered that was running sap steadily measured in at 10.8 percent sap sugar. For comparison, sap sugar content of sugar maples in Vermont and New York are often assumed to average around 2.5 percent. Other important statistics relating to our selection program are summarized in table 1.

The next step in developing superior strains of sugar maple is to breed the selected trees, that is, to cross them with each other, and evaluate the sugar content of the offspring. The parent trees that consistently produce the best offspring will then be used to produce seeds and seedlings for establishment of new sugarbushes.

Breeding must be done during the relatively few days when the maple flowers are at the proper stage of development. Because the trees are scattered throughout six states, it is difficult to get from one selected tree to another at the proper time. The fact that sugar maple trees do not produce large quantities of flowers every year also complicates the breeding process.

Orchards established by vegetative propagation (both grafts and cuttings) from the 27 selected trees will help to overcome this problem. Because the genetic characteristics of the vegetatively-produced offspring are identical with those of the parent, these orchards will permit all crossings of the selected trees to be done in one place, and will greatly speed the breeding process. The orchards also will provide for perpetuation of the superior trees should any of the original trees be lost to disease or insect attacks, storms, cutting, or other destructive forces.

Both the breeding and the orchard establishment have begun, and we expect to make steady progress toward our goal of developing sweet sugar maples.

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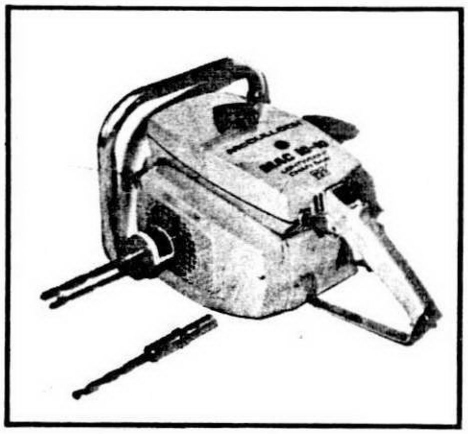

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TRANSPARENT – (ULTRA-VIOLET COLOR)
Contents can be seen from a distance — saving unnecessary trips to trees already gathered. Allows ultraviolet rays to penetrate sap and insures sterile sap.
Allows detection of any unusual condition of sap.

FLEXIBLE –
Not damaged by freezing or other weather conditions.

SIZE –
Holds about 15 quarts. Equal to most buckets.

SUSPENSION –
Hangs directly on spout – most any conventional type spout without a hook.

EMPTYING –
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HANDLE –
Has sturdy handle for convenient carrying.

TREE ATTACHMENT –
Does not blow off tree in high winds or storm.

QUICK ASSEMBLY –
About 30 seconds.

NO WASHING –
Disassemble and discard the bag. Use new clean bag next season. (Note: Bag can be washed and reused if desired.)

BAGS ONLY – 7¢ - 10¢ each.

SAMPLE UNIT Complete and Postpaid $1.25.

Marketing Maple Syrup In a Tourist Area

by R.R. Morrow
Department of Conservation
Cornell University

Improved marketing of maple syrup products can help to offset continuing increases in wages and equipment costs for maple producers. Determining effective marketing techniques has been one of the objectives of the Uihlein-Cornell Maple Project conducted at Heaven Hill Farm, Lake Placid, New York.

Lake Placid (population 3,000) is best known as a resort area in the scenic Adirondack Mountains. July and August are the principal summer tourist months, but despite the number of visitors the maple-product-marketing situation there has been far from ideal. Local stores were well stocked with syrup, some purchased from farmers at prices substantially below average New York retail levels when the project was started in 1965.

The marketing objective included an annual sales goal of 500 gallons of high-quality maple syrup. To facilitate this, an attractive sugarhouse retail outlet was constructed, complete with rest rooms, paved parking lot, and ample interior space for walking between evaporators. To compete with other area tourist attractions, an illustrated educational exhibit of sugar-making equipment and production steps was created. The result was an attractive, readily accessible, and convenient sales location to justify the decision to sell only high quality syrup at the highest retail price levels of local producers.

The sugarhouse was first opened to visitors in July 1966; surveys were conducted that August and in July and August 1967 to learn about potential customers. The survey results are not necessarily applicable to other consumers of maple products, since most visitors were tourists on vacation. However, the findings may be of use to other producers desiring to improve their marketing situation.

During the three months, more than 2,500 persons in about 750 different groups visited the sugarhouse. Survey results were obtained from nearly 500 parties.

Maple syrup was available for sale throughout the survey period in gallon, half-gallon, quart, and pint containers. Part of the time half-pints also were available.

The 1967 price varied from $6.90 per gallon to $1.35 per pint; 1966 prices were slightly less.

Relationships between syrup purchases and the home address areas of visiting parties is shown in table 1 (New York City area, including Long Island, north to Poughkeepsie; out-of-state; and upstate New York).

That a new market has developed was shown by the fact that three-fourths of the visitors, who purchased 83 percent of the syrup, were from the greater New York City area or from outside the state. Quarts and pints were the most popular sizes, making the average selling price above $8.00 per gallon. Out-of-state visitors purchased in both larger quantities and larger containers, and made nearly half the purchases.

There are several possible reasons for the average purchase per party of less than 0.4 gallon of syrup: Many people normally use little or no maple syrup; tourists often have other plans that restrict budget and space; and maple syrup was available elsewhere earlier in the year, often at lower prices.

Half of the visitors purchased over 90 percent of the syrup. A quarter of the parties purchased nothing and another 25 percent made minimum purchases of one pint or less. Quite possibly, there is a minimum-size container, below which sales may be reduced; most people who bought half-pints might have purchased pints if the smaller package had not been available.

More visitors made larger purchases in August. That month's sales were nearly double those of July, even though the number of visitors increased less than 50 percent.

The sugarhouse at Lake Placid is on a paved dead-end road more than a mile from the main highway. By enlarging its functions to include product display and sales, less capital was required, but increased sales and profit may well have been gained (at greater capital outlay) by constructing a sales room on the main highway.

The most effective of several promotional devices were road signs and brochures, which accounted for about 80 percent of the visitors and sales (table 2). A simple but attractive, six-page, fold-out brochure was printed and distributed from hotels and motels in the area. The contents were educational and oriented to this particular sugarhouse and its modern methods of maple sap and syrup production. Also, four road signs were placed at strategic intersections to guide the area visitor from the main road to the sugarhouse.

Less than 10 percent of the 1967 parties were repeat visitors from 1966, suggesting the need to attract new groups of customers in succeeding years for tourist sales. The implication for producers who rely on tourists to leave the main highway to visit their salesrooms, as at Lake Placid, is to anticipate continued high advertising costs and relatively little annual growth in repeat sales.

During the 1967 season, the sugarhouse was open to visitors from 1:00–5:00 p.m. Tuesday through Saturday. In 1966 it was open Saturday mornings rather than afternoons, with distinctly poor results. The survey revealed no significant difference between weekdays; Saturday often was the poorest, as were the Independence Day and Labor Day holidays. Rainy days seemed to stimulate the number of visitors.

Additional information gained in the 1967 study concerned customer knowledge of and uses for maple syrup, preferred package sizes, and quantities used. Questionaire results showed that consumers sometimes confused the pure product with blends, therefore less maple syrup may actually be used than is claimed. Among the survey findings: About 75 percent of the parties used less than one gallon annually; more than 80 percent used blends. Two-thirds of the parties made no use of maple syrup for sundae toppings, baking, or more specialized uses. Regional consumption level differences were evident. New York City area visitors reported lower maple syrup use. People who use larger amounts of maple syrup were generally the heavier buyers; they also indicated that they were not buying their entire annual supply then.

Metal, glass, and plastic containers were used. The season-long favorite was metal cans, probably based on fear of glass breakage.

Table 1. Maple syrup purchases by region during 1966-67 survey period at sugarhouse.

	No. of parties	Gallons per party	Dollars per party	Dollars per gallon	Percent of total dollars
New York City .	164	.40	3.40	8.45	37
Out-of-state . . .	192	.45	3.65	8.15	46
Upstate	120	.25	2.15	8.60	17
	476	.38	3.20	8.40	100

Table 2. Comparison of promotional means of attracting visitors to sugarhouse during 1966-67 seasons.

	No. of parties	Total dollars	Percent of parties	Percent of dollars
Signs	201	463	45	35
Brochures	159	588	36	45
Radio, news story and . . guidebook ad	54	154		
Word-of-mouth	30	108		

Plastic containers outsold metal during the short period they were available.

Each visitor was offered a free one-ounce sample of maple syrup, then asked to compare its taste with the syrup they ordinarily use. The samples were light amber color and thicker than normal (about 67° Brix). While not a scientific taste test, the results showed enthusiastic approval, even among blend users; 92 percent of the parties rated the sample "better" than their usual syrup and 64 percent said "much better."

One of the major findings in this project centers on the market development opportunity available to enterprising maple producers and their trade associations. *People like maple syrup,* yet most make little or no use of the product, a situation probably fostered by the convenience of supermarket shopping that keeps maple producers from reaching their best potential customers.

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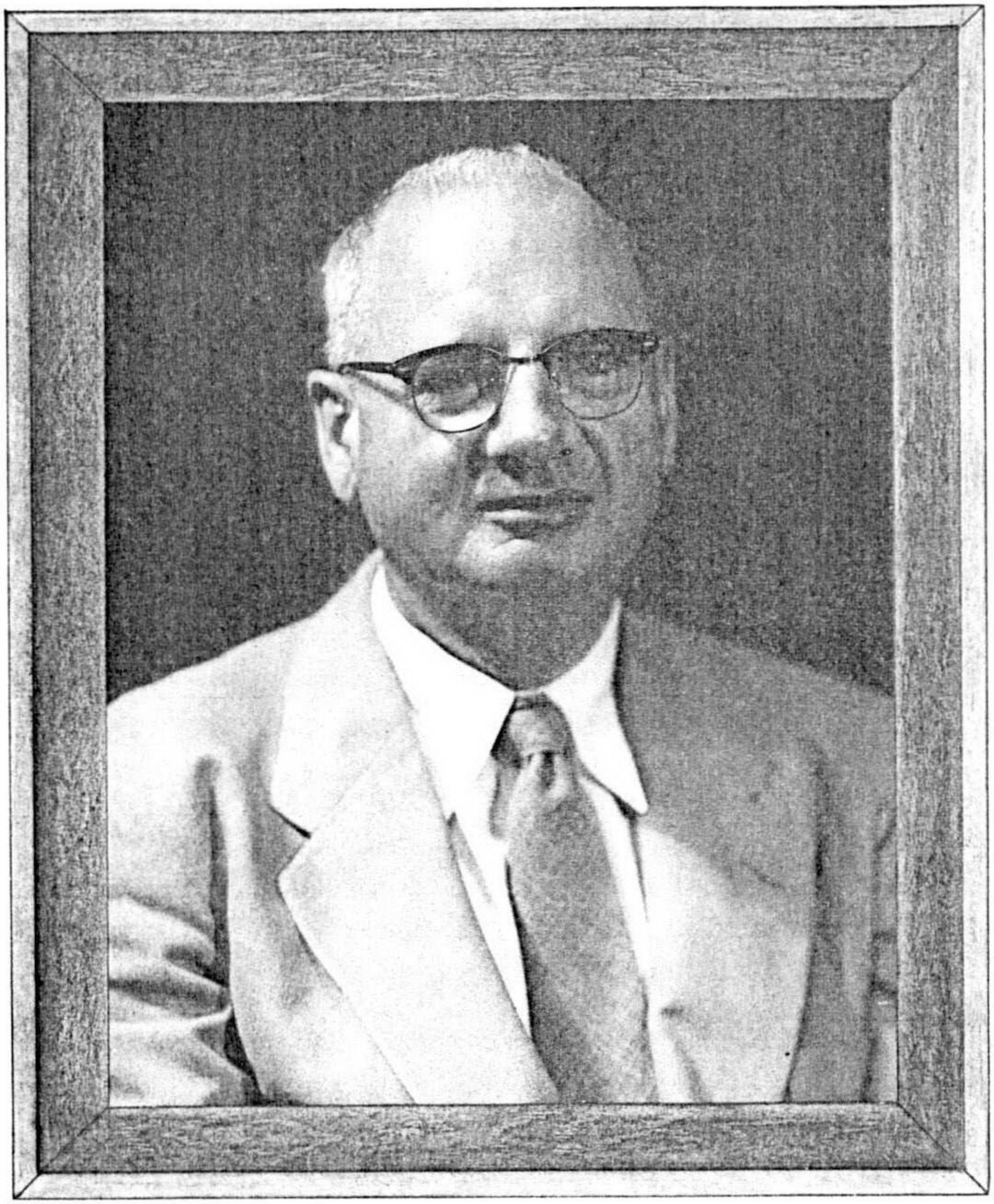
Dr. C. O. Willets - "Mr. Maple Research"



U.S.D.A. Photos by M.C. Audsley

by Norman E. Roberts

In the late 1930's, a bright young chemist at the New York State Agricultural Experiment Station in Geneva set to work on a pressing analytical problem. Large quantities of maple syrup were being rejected for lead contamination. Where did the lead come from? How could the contamination be prevented?

Thus began for Dr. C.O. Willits, who is retiring this month, an association with the maple-syrup industry that was to last for over 30 years and make him unquestionably the world's leading authority on maple sap and syrup.

Of course, he solved the lead contamination problem. He discovered that maple farmers had taken to using lead paint to protect their wooden and metal sap collection buckets, and that if any microbial fermentation developed, the sap would absorb lead from the paint.

In those days the maple-syrup industry seemed to be dying. In the twenty years since World War I syrup production had been cut in half, and fewer and fewer trees were being tapped each year.

And "Will" Willits had other interests. Since his graduation from Huron College in his native South Dakota, he had been trained as an analytical chemist, he had received his M.S. and Ph. D. degrees in this field from Cornell University and had taught the subject at Westminister College, Salt Lake City, for three years. During the seven years he was at Geneva, the young scientist was laying the foundation for a brilliant career in analytical chemistry.

When the U.S. Department of Agriculture established its program in utilization research and constructed the four Regional Research Laboratories, Willits was attracted to the Eastern Laboratory in Philadelphia. He was one of the first chemists to occupy the new building in 1940, when he started work in the laboratory's analytical section.

During his first few years there, Willits pursued his analytical research, taking a particular interest in microchemical methods. He became active on a number of committees of the Association of Official Agricultural Chemists, an organization he later served as president (1960-61).

After World War II, people in the Agricultural Experiment Stations of several of the northeastern states became concerned about the declining maple-syrup industry. They were not in a position to do a great deal of the research that was needed, and they approached the U.S. Department of Agriculture with a proposal that it include maple in its utilization research program. The Eastern Regional Research Laboratory was the logical place to carry out such a program, and Willits, with his previous experience at Geneva, was the logical man to head it.

"It was not an easy decision for me to make," Willits recalls. "I was intensely interested in a wide range of analytical work, and to concentrate on one commodity like this was to turn my back on many professional associations I had made and to start all over again in what was essentially a new field, in spite of the work I had done at Geneva."

Willits tackled his new work with characteristic enthusiasm. He began the travels throughout the maple country from Maine to Kentucky and as far west as Minnesota that were to earn him a reputation as one of the most peripatetic of

Dr. Charles O. Willits examining a module of a semipermeable membrane used to concentrate maple sap by reverse osmosis.

utilization research scientists.

He thoroughly immersed himself in the maple producer's problems, and there was not a single detail of the complex process of collecting sap and making syrup and sugar that escaped his attention.

Sometimes in his effort to improve the maple industry, Willits had to be more like a county agent, with the whole northeastern part of the United States as his "county," than a laboratory scientist. He exhorted and counseled and cajoled maple farmers everywhere to initiate the sanitary practices that he knew were vital to syrup quality, and to try the innovations that were constantly occurring to his imaginative mind.

Willits recognized early that if farmers were to realize the great profit potential of their maple trees, they would have to boost the quality of their product, and they would have to improve the efficiency of their operations. When he started his maple research, less than half the crop was top quality. And collecting sap and making syrup was a back-breaking, time-consuming toil that was still being done about as the Indians had taught the white man a couple of centuries before. The industry had simply not made it into the twentieth century, and there were prophecies of its imminent extinction.

Since he saw strict sanitation as the key to maple quality, Willits did much to abolish the open sap bucket, and he labored tirelessly to secure the now widespread acceptance of plastic tubing as a way of protecting the sap from microbial growth on its way to the sugar house. He was quick to see, too, the labor-saving potentialities of the complex networks of tubing that now criss-cross virtually every modern sugar bush.

Not only was Willits concerned about the small percentage of maple trees being tapped, but about the limited production of many of those that were tapped. It didn't make sense to him that a tap-hole would simply "dry up" before the end of the season. Research that he was responsible for proved that the tapholes did not dry up at all, but that the flow was stopped by the growth of micro-organisms in the hole. This discovery led to the development of a disinfecting pellet that could be placed in the taphole when it was bored and would keep the sap flowing throughout the entire season. The pellets were developed by Michigan State University under a USDA contract for which Willits was responsible. The combination of plastic pipelines and pellets allows the farmer to tap his trees at a leisurely pace at almost any time he wants during the winter and ensures the sanitary collection of virtually every drop of sap that flows from his trees from the beginning of the season to the end.

Operations in the sugar house have been affected no less profoundly by Willits' work than those in the sugar bush. The little smoke-filled structure in which the art of making maple syrup is practiced as it has been handed down from generation to generation is fast becoming a thing of the past. Thanks largely to Willits' inventions and innovations, the evaporation of sap to syrup has become a rather sophisticated technological operation, and the building where it is done is essentially a modern food-processing plant. The dial thermometer, the Brix scale hydrometer, the automatic syrup "draw-off," the automatic density controller, the improved burner arches, the multiple evaporators, the finishing pans, the covered evaporator that keeps the building free of annoying and unsanitary steam - - all these and many other improvements that can be seen in virtually any sugar house today are either the inventions or developments of Dr. Willits' or the results of his exhaustive research.

When Willits started his work on maple, syrupmaking was one of

Chairman Ture Johnson presents the National Maple Syrup Council Distinguished Service Award to Dr. Willits at the Seventh Tri-ennial Maple Conference in Philadelphia on Oct. 8, 1968. It reads: "This Award is presented to Charles O. Willits in recognition of his outstanding service to the Maple Industry of the United States." It was signed by all of the Council Directors and Associate Members that attended the meeting.

the few agricultural enterprises that were still being carried out completely on the farm. From tapping their trees to selling their syrup and candies, the maple farmer and his family did everything themselves. It was picturesque and nostalgic. But it was not profitable.

Today, again largely as a result of Willits' work, all this is changing. The concept of centralized evaporation is taking hold. The individual farmer is giving up his dual role as producer and processor. He is concentrating on the collection of sap, a work he can now do with far more efficiency than ever before. Instead of trying to make the syrup himself, he is selling his sap to central evaporators who are in a position to take advantage of all the advanced instrumentation and gadgetry that the work of Willits and others has made available to them.

When it arrives at the central plant, the sap is stored in huge vats, protected from microbial spoilage with ultraviolet light until it is ready to be processed. Discovery of the effectiveness of ultraviolet light in preventing sap spoilage for as long as a week has been a great boon to central plant operators by permitting the temporary storage of sap.

Willits' last significant development was the partial concentration of sap by reverse osmosis. During the last couple of years, he has demonstrated the applicability to syrupmaking of this technique which was originally brought to a high state of refinement as a means of making sea water potable and is now being used for a number of food processes.

It is too soon to predict how important reverse osmosis may become in syrup processing. It is a far less expensive way of removing water from sap than conventional boiling because it requires no heat. For this very reason it cannot be used to produce finished syrup because, of course, heat is required for the development of flavor and color. But its simplicity and economy suggest that it may find an important use in removing, say, 75% of the water. Perhaps sap producers could accomplish such a concentration themselves, thus saving the cost of transporting so much water and speeding the task of syrupmaking at the processing plant.

Powered by the sheer force of his personality and enthusiasm, Willits has made the maple program one of the most productive and exciting of the entire utilization research effort. What might have been, under the guidance of a less energetic and imaginative man, a modest effort to make a small improvement in an industry that might appear to have little significance in the overall picture, has instead become a glowing example of the strides that can be made through intelligent and well-directed research.

Honored on many occasions by his Department, receiving two USDA Superior Service Awards, and by producers on both sides of the Canadian border, Willits has become "Mr. Maple Research." Even after retirement, his work will live on in the 150 publications and 7 patents he contributed to the literature. The handbook he wrote and revised a couple of years ago will long remain a "bible" of maple syrup production. When he takes up residence, with his good wife, in the cottage, he has built on Long Beach Island in New Jersey, he can rest in the satisfaction of having revitalized an important little industry and having brought new hope and encouragement -- and profit -- to the Nation's hundreds of maple farmers.

We hereby declare FEBRUARY as DIGEST APPRECIATION MONTH

This past year the DIGEST has come to you by controlled circulation instead of third class bulk mail. This means a saving in postage.

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P.S. Sorry we can't send you a self-addressed envelope this year. Controlled circulation doesn't allow any inserts. Wouldn't it be nice if all publications did the same?

Improving Your Sugarbush?
Use Fall Sap Sugar Percentages

by Carter B. Gibbs
Northeastern Forest
Experiment Station, Burlington, Vt.

In forest-grown maple stands, sap sweetness may vary from 1 to 5 percent or more. So maple producers should locate and favor their sweeter trees in stand improvement operations. But when maple producers use sweetness to determine the trees to favor in a thinning operation, they must test the sap during the busy sugaring season. Because of this producers are often unable to test all the trees in a sugarbush that needs thinning. But, if the trees could be tested and marked in the fall, the use of sap sweetness as a guide in sugarbush management could be increased.

Fall sap is generally less sweet than spring sap. But because trees that are high in sweetness tend to remain high from year to year, there is the possibility that trees that are sweetest in the fall might be sweetest in the spring also.

To find out if fall sap sweetness could be used as a guide in sugarbush management, we tapped 34 trees in November 1966 and retapped them again in exactly the same manner in February 1967. The 34 trees were divided between two sugarbushes. In both operations each taphole was fitted with a galvanized metal spout and a paraformaldehyde pellet.

Using a standard sap refractometer, we determined the sugar percentages for each taphole on three occasions during the fall. We determined the sugar percentages in the spring for each of the new tapholes in the same way. Then we compared the average fall and average spring sugar percentages for each tree.

Our comparisons showed that trees high in sugar content in the fall were high in the spring. This means that fall sugar percentages may be used to locate high sugar trees just as spring percentages have been used in the past. However, remember that fall sugar readings will run generally lower, and, therefore, trees must be rated on the basis of their sweetness in relation to other trees in the bush tested at the same time, rather than on their exact sugar percentage.

Fall sugar percentages can give a sugarbush owner much more flexibility in using sugar determinations to develop and manage his trees. For example, if he plans to use sugar percentages as a guide for selecting the best trees to leave when thinning his sugarbush, he can test for sugar content in the fall or in the spring.

Having more time to test for sugar content has other advantages too. For instance, sweet trees can be selected in stands that are not being tapped, but have good potential for sap production. Also, sugarbush owners can select sweet trees and mark for thinning in one operation; and they can do their thinning in late fall or early winter when logging conditions are most favorable. During the spring sugaring season there is seldom enough extra time to test young stands or mark undesirable trees.

For those intending to use sap sugar percentage as a guide for thinning a sugarbush, a word of caution is in order. Sugar percentage is only one of several factors that should influence the final decision on which trees to leave. Size, vigor, and tree spacing must also be considered. When healthy, well-spaced, and high-sugar trees have been selected, any other trees that may hinder their development should be removed.

Wildlife Damage to Plastic Tubing and Pipe

R.R. Morrow and J.W. Caslick
Department of Conservation
Cornell University

Because of reports of extensive rodent damage to plastic tubing and pipe during the 1968 sap season, a survey of producers was made during the New York Maple Tour in August, 1968. Two questionnaires, one each for plastic tubing and plastic pipe, were provided. Of approximately 100 producers present, 48 filled out one or both questionnaires. The sampling was not perfect; some producers who filled out one questionnaire apparently were not aware of the other. The replies were from all sections of New York State and three were from outside the state. They indicated that wildlife damage was widespread over the state and in neighboring states.

Plastic Tubing

For 34 replies, 30 producers used plastic tubing and 26 of these had wildlife damage. An average of 1,800 taps with Naturalflow tubing were reported by 27 producers; 7 reported an average of 300 taps with Mapleflo tubing. Both appeared readily susceptible to rodents, a fact reported as early as 1959 (1). Damage to spiles, tees, and caps were reported 13, 18, and 15 times respectively.

Of the 26 producers who suffered wildlife damage, 21 of 22 reported damage to tubing on the ground and 10 of 12 reported damage to suspended tubing. Two producers said they had less damage after suspending their tubing however. Damage was reported in early season, late season, all season, and after the season 6, 11, 10, and 7 times respectively. The worst years were 1967 and especially 1968. One man had 100 times as much loss in 1968 as in all the previous 10 years combined.

The following animals were observed or believed to be the culprits (number of reports in parentheses): red squirrel (11), grey squirrel (5), chipmunk (8), flying squirrel (1), unknown squirrel (8), porcupine (3), rabbit (3), mouse (2), woodchuck (1), raccoon (1), and deer (1). Seven producers tried damage control methods; 16 did not. Poisoning and trapping usually helped, but did not eliminate the problem.

Repair of damaged tubing was done mainly by inserting connectors (24 reports) and replacing tubing (12 reports). One producer reported 100 percent replacement. Most producers failed to make quantitative estimates of the cost of damage. Checking and repair time were generally more costly than loss of material. Two producers lost 10 percent of their sap. Altogether, seven producers suffered extensive damage while 18 (60% of tubing users) expressed much concern over the wildlife damage problem.

Plastic Pipe

For 31 replies, 24 producers used plastic pipe and 13 of these had wildlife damage. One-half inch pipe was used by 23 producers, three-quarter inch pipe by 17 producers, one inch pipe by 6 producers and larger pipe sizes by 5 producers. The two smaller sizes were usually used in amounts varying from 1,000 to 5,000 feet by each user; larger pipe was usually used in amounts of 1,000 feet or less. Seven producers leave pipe out all year; 17 do not. Fifteen producers used Naturalflow pipe, 13 used black pipe, 6 used white pipe; and 4 used Mapleflo pipe. Damage was reported for all kinds of pipe and fittings; none appeared to be more resistant than any other.

Damage was reported equally for all the sap season, and some after season damage was found. Some occurred as early as 1960, but most has been noted since 1965. It has been found on both ground and suspended pipe lines. The accused culprits are: red squirrel (5), grey squirrel (3), chipmunk (5), unknown squirrel (6), porcupine (4), raccoon (1), and woodchuck (1). Eight producers have tried control measures; 5 have not. Poisoning, trapping, shooting, and grading lines so sap drains are reported to be helpful.

Damage repair was done by inserting connectors (10 reports), replacing pipe (9 reports), and taping holes (4 reports). The latter method apparently is a temporary measure. Up to 400 feet of pipe have been replaced at one time, and 6 producers reported damage losses exceeding $100 in some years. Nearly half of the plastic pipe users were concerned about the wildlife damage problem and the lack of an effective control technique.

Citation

1. Morrow, R.R. 1959. Maple sap flow through plastic tubing. Proc. Fourth Conf. on Maple Prod. pp. 24-29.

Our Sugar Maple Resource

Summary of a talk given at the Triennial Maple Products Conference in Philadelphia, Pa., October 1968.
by
Albert G. Snow, Jr.
Principal Physiologist, Northeastern Forest Experiment Station, Forest Service, U.S. Dept. of Agriculture, Burlington, Vermont

Few of us concerned with the production of sap from sugar maple trees, and with the many other products that come from this valuable resource, can appreciate the great abundance of trees that are available. To use this resource to its full potential will require a new look at how to handle this species - - and a willingness to accept change in the way we do things.

The Sugar Maple Conference at Houghton, Mich., where 50 specialists told the more than 250 participants what is known - - and not known - - about the sugar maple resource that is so important to the maple sugaring industry, covered a wide range of topics. The reports went into detail on such subjects as: tree characteristics; physiology of sap production; soil-site relations; tree improvement; insect enemies; diseases; wildlife pressures; artificial regeneration; production economics; and wood uses. The consensus of these reports was that there is a good potential for sugar maple sap production - - and for timber production.

But coupled with this optimism was the oft-repeated caution: we need to apply what is now known, and we need to fill in the many gaps in our knowledge about things that we do not know. This implies that the service branches of Federal and state organizations must not only bring to sugar maple sap producers the facts that are now accepted, but must also bring to researchers information about those important areas where help is needed.

The conference papers emphasized that we do have a reservoir of facts upon which to build. These include ways of doing things in the production of sugar maple sap, and more basically, methods of how to handle our trees as a resource in sugarbush management for the maximum production of all products.

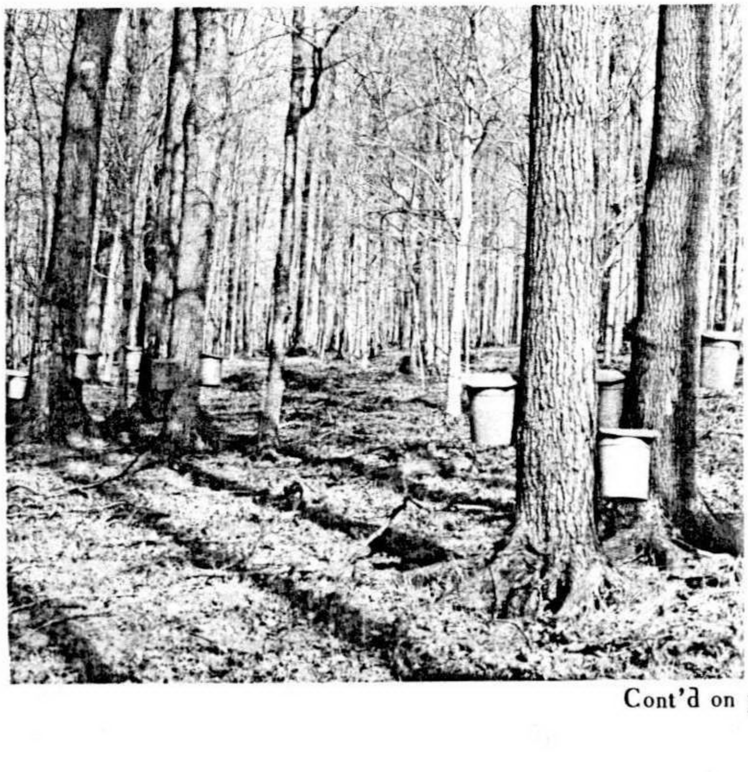
The Resource

What about our sugar maple resource? First, may I point out the statement in that important Maple Syrup Manual by Dr. C.O. Willits: that only 3 percent of the available trees are being used for the production of sugar maple sap. Recent information indicates that even a smaller portion is now being used for this purpose.

The maple sugaring industry depends on a tree resource spread over 33 million acres of land. Recent survey reports indicate that the total supply of sugar maple timber is increasing three times as fast as it is being cut; but 60 percent of the volume is in trees less than 17 inches in diameter. There are enough sound and accessible trees to support sap-production operations greatly in excess of present operations.

According to conference reports, 13 maple species are native to the United States. Of these only 5 are important timber trees. Sugar maple (Acer saccharum) is the most important. Black maple (Acer nigrum) has been recognized as a distinct species, but it differs so slightly from sugar maple that most foresters have treated it as a variety of sugar maple.

Sugar maple is found throughout the eastern half of the United States north of the Gulf States. It is one of the most important hardwoods, ranking in volume just below the oaks, hickory, and sweet gum. The largest volumes of sugar maple are found in New York, Michigan, Maine, Wisconsin, West Virginia, and Vermont. However, we must recognize that not all parts of the East have climatic conditions right for optimum sap production.



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Sugar maple seldom grows in pure stands. Most of it is found mixed in with the maple-beech-birch forest type. New York, Michigan, and Maine each have about one-third of their forest area, or over 5 million acres, in this forest type. And Pennsylvania, Wisconsin, West Virginia, Vermont, New Hampshire, and Minnesota each have over 1 million acres in this type.

The smaller sugar maple growing stock – 5 to 11 inches – is distributed throughout its range in about the same manner as is the sawtimber-size growing stock. Approximately 40 percent of this volume is in the Mid-Atlantic States and 31 percent is in the Lake States.

In addition to the growing-stock volume, there is a large volume in rough and defective sugar maple trees that do not meet the standards for growing-stock trees. Approximately one-fifth of all the hardwood timber volume in the East is of this kind. And there is an additional 2 billion cubic feet of volume in rough and defective sugar maple trees that, under current market conditions, can be harvested only for such low-grade products as fuel wood or charcoal. But many of these trees can be used for sap production.

Although the sugar maple growing stock is increasing, cutting of the older sugar bushes is resulting in fewer trees over 19 inches. This means fewer trees, on a national basis, for use in future sugar maple sap production and timber production. This deficit in high-quality trees will be met as the young material grows up.

Species Improvement

The potential for genetic improvement of sugar maple is good. Initial work to select trees for high sugar-sap has been successful, through the helpof many men throughout six of the more than a dozen states that produce significant amounts of sap and maple products. Breeding of these trees has been started, as well as vegetative propagation of the final selections to preserve them as clones in the event the original trees are lost. We are learning more about other critical adaptive responses, showing up in provenance tests, such as time for flushing, onset of dormancy, and potential degree of forking.

Leonard Carpenter (right), maple syrup producer of Petosky, Michigan, showing John Hodge, Extension Specialist, buried collection barrels used to keep his tubing cool. He told Al Snow, (photographer) and John that sap collected this way often makes a higher grade of syrup than sap from his bucket operation (background).

Insects and Diseases

Sugar maple has many insect enemies. Though they lower the quality of timber products, they generally have little direct effects on sap production. However, some insects, such as those that cause repeated defoliation, are potentially serious because they may contribute to the little-understood problem of maple decline, which in turn may be associated with reduction in sap yields. Also, poor form may often be the result of insect injury. The resultant small and misshapen crown are not generally considered to be best for maximum sap and sugar production.

Killing diseases of sugar maple are rare, but many diseases may be crippling. Fungi that enter through scars, old branch stubs, and frost cracks contribute to 40 percent cull in logs cut for timber products. Also, these fungi - along with insect defoliators and nutritional problems - are believed to contribute to maple decline.

Sugarbush Management

Our present information could be effectively used in managing sugar maple stands for better sap production. But there are wide gaps in our knowledge for most efficient use of this resource, whether it be for sap production, timber products, wildlife habitat, or recreation.

Generally, large-crowned and vigorous trees are considered best for sap production, though these factors seem to account for only about 25 percent of the variation in sap and sugar yield. There are no doubt other factors that influence yields, such as genetic make-up. Future sugarbush management will gain through the present trend toward tree improvement and planting.

Artificial Regeneration

Present information indicates that most high-quality timber products of sugar maple will come from natural stands for a long time to come. Yet the time is not too distant when planting of sugar maple will become much more common. The trees in these plantations will be of

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genetic quality improved in characteristics such as high growth rate, less forking, and sweeter sap.

Most past efforts to establish sugar maple plantations by seeding and planting have failed. But we have made a start in solving some of the problems. Although much seed research still needs to be done, sufficient information about seed storage now exists to insure an annual supply of high-quality seed for nursery production. The production of seedlings that have the morphological and physiological attributes best suited for field planting requires careful consideration of such factors as time of sowing, seedling density, shade, root-pruning, and soil moisture and nutrients. For the most part we lack positive information about the best nursery culture of sugar maple.

The main reasons for past failures in planting were: planting on poor sites, weed competition, frost damage, and animal damage. Current research emphasizes work on the problems of vegetative propagation of genetically superior trees, and protection of planted stock from animal damage.

The problem of animal damage invoked considerable discussion at the conference. Some people advocated measures that would insure an adequate supply of seedlings for both animal use and to meet management requirements. But protection of high-quality seedlings for the sugarbushes of the future will be a must, as we see things now.

In Conclusion

This summary falls far short of doing justice to the wealth of information given at the conference at Houghton, Michigan, in August.

Copies of "Proceedings of the Sugar Maple Conference, Houghton, Michigan, August 1968" may be obtained from the Northeastern Area, State and Private Forestry Service, Forest Service, U.S. Department of Agriculture, 6816 Market Street, Upper Darby, Pa. 19082.

The final remarks by the keynote speaker at the Houghton conference, Edward P. Cliff, Chief of the U.S. Forest Service, are as appropriate here as when he gave them in August. He concluded with this:

"When this conference ends, our work here will have really just begun. Some of you will go back to forests and mills to put latest knowledge about maple to immediate use, and others will return to experimental plots and laboratories determined to find the answers to the questions posed here.

The result, he said, will be "more and better maple trees; more and better maple products and jobs; and better living."

Thus the Conference predicted a bright future for sugar maple. All products of our valuable sugar maple resource will be available to future generations in increasing amounts and quality - provided present and future knowledge is put to use.

CLEAR-EYED VIEW OF SAVINGS FROM LONG LIFE PRODUCTS
SMILE OF PROFIT FROM MORE SAP PER SEASON THANKS TO LAMB PRODUCTS
FLOMOR PELLETS FOR LONG RUN, BACTERIA FREE TAPS
NATURALFLOW TUBING THE MODERN WAY TO GATHER SAP FROM INACCESSIBLE BUSH
LAMB ELECTRIC TAPPER LIGHT WEIGHT DRILLING FOR SEASON AFTER SEASON
PLASTIC TEES AND FITTINGS MAKES A RUN TAP ALL TREES IN ITS PATH
DOLLARS IN WALLET FROM SAVINGS ON ECONOMICAL TROUBLE FREE LAMB PRODUCTS
FIRM BUSINESS FOOTING BUILT ON LAMB DEPEND-ABILITY