ROADSIDES
THE FRONT YARD OF THE NATION

By J. M. BENNETT
The object of this book is to explain how and why roadside development should be practiced. It is written in a strictly non-technical manner in order that the uninformed may thoroughly understand the significance and importance of the work. Those who are technically trained will find the information given in this style easy to read and understand and readily usable. The book is also intended to do more than this, to excite a permanent and convincing interest in trees, shrubs and other plants, to bring out the importance of natural surroundings, to explain how they can be used to the best advantage, to present and explain all the problems involved in roadside development and to show how everyone can effectively support such a public service. It should serve as an invaluable guide in directing the enthusiasm of those engaged in or sponsoring the work and it places the entire matter on a common sense basis.

Briefly, ROADSIDES, THE FRONT YARD OF THE NATION is designed to provide all the authentic information on the subject of roadside development which is available at the present time. It

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A desirable example of the nation's front yard
ROADSIDES
THE FRONT YARD
OF THE NATION

By

J. M. BENNETT
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BOARD OF COUNTY ROAD COMMISSIONERS
WAYNE COUNTY, MICHIGAN

THE STRATFORD COMPANY
PUBLISHERS, BOSTON, MASSACHUSETTS
This Book
is sincerely dedicated to the motoring public
whose worthy demands the road authorities
are earnestly striving to fulfill.
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PREFACE

THE development of roadsides, however completely carried out, is not absolutely necessary to the health, happiness and prosperity of a community, county, state or nation. It does not rank in importance with road construction, public parks, sanitary sewer systems, water supply and similar enterprises, but it does contribute its full proportional share toward the general welfare of everyone. It is a logical and desirable forward step in public improvement and one among many that should not be overlooked if the greatest benefits are to be realized by the general public. It occupies a place of relative importance and necessity in the complete scheme of public works, yet it applies only to roads and it has only recently been considered as embracing a number of betterments which logically fall under a single classification.

This is known as roadside development, which is the collective title for several closely related operations designed to improve the appearance and usefulness of roadsides. This designation has been employed in its present sense by various governmental highway departments since its inception in 1922 by the Board of County Road Commissioners of Wayne County, Michigan, although organized road-
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side tree planting was done to some extent in a few localities prior to that time.

The accepted term, roadside development, is now generally understood to include other work in addition to tree planting, or in short, everything except drainage, that has to do with the appearance and use of the roadsides between the travelled way or roadbed and the property lines. Some highway authorities prefer to place certain parts of this work under road maintenance and construction, while others believe that the responsibility of all the necessary operations involved should be confined to a single department or division of the highway organization. The latter method is the most economical and is to be preferred provided the work which other divisions are best suited to perform are allotted to them under the co-operative direction of a competent roadside development head. This is entirely an organization matter but an important one if the best results are to be achieved.

There is an increasing tendency on the part of road authorities to assume a more broadminded attitude toward roadside development and there is also a marked indication that landscape architects, public-spirited organizations and influential individuals are curtailing a too elaborate display of enthusiasm. This merging or leveling off of two extremes represents a most economical and serviceable situation. The realization has been reached that roadside development with its various activities is important,
that an organization for this work must be properly manned and equipped, that skilled and trained help is required and that reasonable budgets are necessary. The generally accepted opinion now is that the day is past when any man who is trained in the brush-cutting methods of his grandfather is fitted to participate in a responsible roadside development capacity. Proper training and experience is recognized as being as necessary to the successful planting and care of trees, shrubs and grass as to the successful construction and maintenance of a concrete road and if the work is to be done at all, it should be allowed to proceed in the best and yet most practical manner possible.

In contrast to this, there are still those who believe that every foot of the roadside must be completely and fittingly landscaped, that elaborate plans are necessary and that shrubs and herbaceous flowers must be included as well as trees. A completely landscaped highway is perhaps a desirable ideal, but the cost of proceeding on such a scale is prohibitive and it savor of the impractical because motorists in reality see a very small part of the detailed landscape as they pass. Furthermore, the intensive maintenance necessary for such a development is practically impossible. In practice, the average roadside through the open country cannot be maintained to the same degree as a private estate, home garden, or boulevard, without an excessive use of funds and it should therefore not be planted according to such
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a standard. To spend a lot of money for plans, grading and the planting of trees, shrubs, flowers and grass may be a perfect and desirable ideal, but even if this falls within the limits of practical expenditures, it could not be maintained in a manner befitting the outlay without a great many men constantly at work cultivating, mowing, watering and so on. Actually, the cutting of grass alone along country roads amounts, in reality, to a matter of making hay once or twice or at most three times during the season and this single operation taxes an average organization to the utmost for the necessary men, money and machinery.

The appearance of shrubs and flowers is secondary to the usefulness of trees and these, after all, are far from being unattractive and they will last for generations. The improvement of roads in all parts of the world since the earliest times has been followed, to a more or less extent, by the planting of roadside trees. Much practical and useful knowledge could be gained by a study of these conditions in various foreign countries and many exotic trees might be found desirable for roadside use in the United States, particularly in view of the tremendous losses now occurring because of numerous insects and diseases. Roadside trees are outstandingly important and if nothing else can be done in the way of roadside development, the planting of them alone will cost less and render the greatest service over the longest period of time. Country roadsides properly
planted with trees do not always need further landscape treatment.

Enthusiastic supporters of roadside beautification frequently advocate the use of inappropriate and impractical planting material or an improper arrangement or quantity of plants and they are often permitted by highway authorities to proceed with the work provided they can finance it or that their ideas are thought to be acceptable, either sincerely or as a matter of policy. Such permission should never be granted, for in addition to the resulting incorrect appearance and inefficient service rendered, the average public or those people who can determine the policies of government agencies by ballot form an adverse opinion concerning roadside development and it rapidly falls into public disfavor. The same results are likely to occur if the work is restricted or cheapened beyond the point of good practice.

These two extremes represent a natural condition caused by a growing interest on the part of the public and they indicate a normal stage in the development of an enterprise as its necessity gradually becomes evident to everyone. New roadside development programs are being adopted by highway departments each year and the improvement of roadsides is being advocated by an increasing number of outside organizations and influential individuals. In spite of the progress made to date, there is still a need for more complete information concern-
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ing the work as viewed from a standpoint midway between low standard practices and elaborate ideals.

This book is intended to serve such a purpose. It is not a text book or a manual of procedure, but a compilation of information covering all the present known ramifications of roadside development, something of its historic background and its application. It is designed to aid the over-enthusiastic, the neglectful and the uninformed to understand more clearly the proper course to follow in advocating or executing a program of roadside development and it may prove helpful in many ways to those who are engaged in the work as well as to those who are wondering just what can be done or what is being done to improve the roadsides in their respective communities.

An attempt is made to picture roadside development in its true light, stripped of its idealistic and fanciful showiness which so many have heaped upon it, yet retaining that deepness of purpose which is more than appearance and utility and which encourages a usable philosophy for human beings in all walks of life. An effort has been made to explain its purpose and necessity in full from the simplest and often questionable details to the most complicated operations involved with the thought that should this volume offer a clearer idea or better understanding of roadside development to everyone regardless of occupation, profession, or standing, its purpose will be fully accomplished.
PREFACE

All photographs are used with the kind permission of the Board of Wayne County Road Commissioners, Wayne County, Michigan, whose work they represent. This Commission is world famous for its accomplishments in road construction, road maintenance and roadside development. Appreciation is expressed for the helpful advice and criticisms given by J. K. Norton, Road Engineer, Board of Wayne County Road Commissioners, Wayne County, Michigan, and W. W. Lavers, former Construction Engineer of the Michigan State Highway Department. A complete bibliography is appended at the end. Full credit is due to Ralph J. Dennis for the typing of all the original notes and the manuscript together with valuable assistance rendered in reading the proof.

J. M. BENNETT.

Detroit, Michigan
September, 1936
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CHAPTER I

By the Wayside

FEW accomplishments can be termed worth while unless they are based upon sound facts. All efforts must have a definite and reasonable objective to be successful and with any public enterprise the question of necessity is most important. Roadside development is a public responsibility and while it embraces only one of innumerable and more important public duties, it has a most glaring aspect. It is thrust before the users of all highways at all times and it is a subject that should interest, to a more or less degree, every individual in the nation. Roadsides constitute the front yard of every community and because of this, if for no other reason, they should be developed and maintained in a manner befitting such a distinction. Everyone is benefited by an intelligent, economical and progressive public policy and the improvement of the roadsides is no exception.

Relatively few people are directly connected with highway work. Good roads are accepted as a welcome relief, but the majority of individuals are of
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necessity so engrossed in their own private affairs that little detailed thought is given to the types of roads constructed. This is left to trusted public officials who are or should be capable of functioning for the best interests of the people.

This, however, should cast no shadow of mystery over the work and in order that the individual may serve as an intelligent citizen, he should pause from time to time in the necessary business of earning a living and acquaint himself at least with the public enterprises which affect him most. To know why roadside development is necessary is vital to every normal citizen and no great amount of reflection on the subject is required to understand its advantage and benefits. A brief analysis of the more important reasons for this work should serve to place it on a sound basis in the minds of everyone.

The development of roadsides has not been a fanatic's dream that sprang into being overnight, but a gradual and logical growth following road construction, improved automobiles, and public demand. A realization of its necessity has become apparent over a long period of time and it is now generally accepted as being well beyond the experimental stage. The greatest urge for highway construction and roadside improvement is without doubt due largely to the development of automobiles and the effect of this upon industry and recreation.

Automobiles are no longer termed a luxury but are now looked upon as an actual necessity. Statistics
show that more than nineteen million passenger automobiles were registered and in operation in the United States during the year of 1933, or a gain of two and six-tenths per cent since 1927. The federal census of 1930 placed the population of this country at approximately one hundred and twenty-three million. These figures indicate a ratio of one passenger automobile for every six persons.

Busses have developed into permanent common carriers and those, with few exceptions, who do not possess automobiles, at least take advantage of many opportunities to ride in them. The reasonable assumption is, then, that practically everyone makes use of the highways and as the population increases, the users of the highways will likewise increase.

Public interest in highways from the standpoint of transportation is vital. Good roads are recognized as a necessity and the increasing volume of automobile traffic demands that roads be something more than relief from the mud stage. People desire to travel in comfort and automobiles are being constructed with this in mind. There has been a great improvement in automobiles from the first high-wheeled buggy type to the present pneumatic tired, upholstered cushion and streamlined style. Likewise, roads have been improved from wagon tracks to paved highways. That the maximum in comfort and attractiveness cannot be obtained for the traveling public without the mutual improvement of both
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roads and automobiles is obvious and in this respect roadside development plays a most important part.

Highway departments and road commissioners responsible for the adoption and execution of roadside development programs have found that a careful and a somewhat broad consideration of the subject is desirable before proceeding with any great amount of work. The improvement of roadsides has been approached rather cautiously from the first. States and counties were slow to use public funds for such a purpose until the question of necessity was proven and until the public demanded action. This gradual and unhurried progress reflects soundness and permanency of policy and it forms a solid foundation from which a worthwhile work may flourish without breaking the bounds of reason and invading the field of luxury, impracticability and wastefulness. There is danger that the too rapid development of any enterprise may suddenly, by the very inertia of its growth, thrust it beyond control. With the improvement of roadsides, this has been avoided.

Although in many communities certain phases of roadside development could be accomplished much more rapidly than they actually are without waste and without the misuse of public funds, the work cannot proceed with safety faster than the necessity for it increases in the minds of the individual taxpayers. Nothing is more harmful to a worthy public enterprise than severe public criticism and it may
result in the complete ruination of a project or its delay for many years.

Those who plan and build roads must be well trained, far-sighted and intelligent men. They cannot, however, proceed too far in advance of the public in the actual execution of the work. This is perhaps most true of roadside development because of its close association with æsthetic theories and because of its so-called beautiful aspect. Many well-meaning individuals and organizations have stressed the beautiful at the expense of the practical and necessary.

This criticism is not meant to discourage those who describe the roadsides as beautiful. In truth that is what is desired, but the word is inadequate. As applied here, it is limited and only partially descriptive. It creates the impression of eliminating necessity and upholding the æsthetic. The greatest stumbling block to the normal progress of roadside development is the impression created by those ardent supporters who persist in stressing the beautiful aspects of the roadsides without thinking that beauty alone seldom justifies the expenditure of public funds.

Beautiful is not a definite term. It is somewhat abstract and largely a matter of opinion. What appears so to some may seem entirely different to others. Of course, there may be established standards which confine the beauty of things within cer-
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tain limits but these are more or less flexible and in no way control personal opinion.

A road may be referred to as rough and in riding over such a road this becomes self evident to everyone. In the same manner it may be evident that a roadbed is smooth. To be rather technical, there are various degrees of roughness and smoothness and one may even be a degree of the other, but this is carrying the matter beyond acceptable standards and into the realm where beautiful has a limitless classification in which the terms are more or less abstract.

An admirer of trees may consider a road planted with them alone as exceptionally beautiful, while another might prefer shrubs. Many have advocated the planting of flowering shrubs, annuals and herbaceous perennials along the roadsides without a thought of trees because such plants hold more of an appeal to their sense of beauty.

What is really desired, however, is attractive and useful roadsides which can be obtained by preserving or creating a natural or an approach to a natural condition in keeping with the adjacent or surrounding country. And the significant thing about this is that to follow a natural development is outright economy in road maintenance. Such a procedure produces the most attractive and the most useful results.

Appearance is highly important and fortunately proper appearing and attractive roadsides result
BY THE WAYSIDE

largely from practical efforts to reduce maintenance costs. The idea is not to be conveyed, however, that the money spent for a program of roadside development would lessen that which would normally be spent for road maintenance, but in the aggregate the cost is less for the value received.

For example, sodding and seeding will eliminate much of the annual cost of filling washouts and cleaning drains, even considering the additional cost of mowing. The planting of trees and shrubs, however, seldom reduces maintenance costs but rather adds to them. After the initial expense of planting, the maintenance cost of trees and shrubs gradually diminishes, although it is never entirely eliminated. The use of trees and shrubs in improving the appearance of the roads, in producing shade and perhaps stabilizing the temperature and moisture content of the soil in the roadbed and ditches, is well worth the money spent for their planting and maintenance.

Also the matter of public convenience cannot be overlooked. Comfort stations should be incorporated in the plans for every main highway. From the standpoint of appearance the regulation of public utilities, advertising signs, hot-dog stands, filling stations and other encroachments is a matter of just as much importance to the public along highways as it is to individuals on private property.

The uses to which adjacent private property may be put is beyond the jurisdiction of the road authorities unless they are granted certain powers by zoning
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laws. Such laws are highly desirable in many instances, although their constitutionality may be questioned. However, the same results could undoubtedly be obtained, although over a longer period, by properly improving the roadsides, which would eventually result in equitably adjusting property values and taxes.

In giving consideration to the various needs for roadside development, those of the motorists demand first attention. Were it not for automobiles, improved highways would be less in demand and while routes of travel must be improved for the ever increasing army of cars, such improvement must not proceed beyond practical and needful limits. Roadside development means much to motorists. They are the ones who are most directly benefited and they determine its success or failure. They enjoy all the privileges of the highways at first hand and for them, primarily, roadside necessities, conveniences and pleasures are provided.

The highways of this country may be referred to as the arteries of the world's greatest nation. They throb with the blood stream of motoring millions every hour of the day, carrying freight and passengers from one city to another. Obliterate the highways and the nation would be paralyzed and the effect far reaching. Millions are spent each year for the construction of new roads and the maintenance of those already built, and the end is not yet in sight.
This must continue until adequate means of travel are provided to every community.

Considering this vast and ever increasing highway system and its prime reason for being, that of providing safe, smooth and rapid travel, nothing should be left undone to permit it to function perfectly. Anything which will further this end must be considered a necessity and in this, roadside development plays an important part. Smooth, safe and shaded pavements, attractive roadsides which do not detract from the business of driving, ample space for resting and making minor repairs and adequate comfort stations where relief may be found without trespass or without unsanitary conditions, aid all highways to function satisfactorily and economically.

There are few motorists who do not appreciate improved roadsides. Just how or why this is possible may be explained in a number of ways. Many are capable of recognizing the value and desirability of attractive plantings because they have either inherited or acquired a finer sense of consideration for such things. They derive a certain amount of mental pleasure from the landscape that may be denied those who are constituted differently.

Then there are those who motor without giving any thought to the appearance of the roadsides. True, each individual should not be expected to continuously revel in such surroundings every moment of the time that the car is in motion. Everyone has his own troubles, business or pleasure to think about,
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but it seems almost impossible that many miles of roads could be travelled without the attractive or unattractive outlook being noticed.

The truth of the matter is that few people really realize the mental effect of things which are apparently passed unnoticed. Billboard advertisers take advantage of this fact in using the same illustration or slogan on a number of signs. They are read and re-read without thought, but when the prospective purchaser has need for a similar article the continuously advertised slogan or illustration is the first one thought of. It has been stamped on the subconscious mind by repetition and has therefore favorably influenced the purchaser toward the advertised product.

A similar effect is created by the condition of the roadsides. A succession of barren or neglected areas exposed to the view of motorists may be passed with little or no thought of the outlook, yet by the time they arrive at their respective destinations their wits are likely to be somewhat dulled by the experience. Certainly there can be no uplifting effect of the subconscious or even conscious mind by the experience of gazing at a forlorn landscape.

This does not mean that the roadsides are completely or always even remotely responsible for the condition of an individual's disposition, but it is more or less true in a sufficient number of cases to warrant consideration. Further, if the true effect of properly developed roadsides is to be known, the
analysis must be complete. Good and sufficient reasons must be evident for improving the roadsides or such work is merely throwing money away.

The point may be taken that the function of road authorities is not to keep motorists in the proper state of mind, but there can be no dodging this responsibility. If there is anything that any public organization can do in connection with its particular work to uplift the mental attitude of individuals then it is a clear cut moral duty and should be executed without hesitation. The psychological effect of roadside development on the motoring public would not in itself constitute sufficient grounds for proceeding with such improvements, but coupled with other more practical reasons, it lends an important hand in justifying such a procedure.

Regardless of the theoretical effect on motorists, everyone who makes use of automobiles cannot help but appreciate wide and improved highways, shaded drives and pleasant and attractive roadsides. Narrow and congested roads where traffic barely creeps during the crowded periods of summer are not only extremely uncomfortable, but they are dangerous. Accidents are most likely to occur at congested points where the roads are narrow and where slow-moving vehicles and the heat of barren roadsides increase the impatience of drivers and goad them to take hazardous chances. Such conditions are a reflection on the services rendered by the highway authorities and if there is any public organization
that should provide the best of service it should be those having to do with roads.

As previously mentioned, automobiles are a necessity and people in all walks of life make use of them on the highways. Routes of automobile travel are necessary to every business and of late years to practically all forms of recreation. Every day of the year and especially during the summer, the pleasure drives and boulevards will be found carrying much more traffic than commercial highways. The reason for this is that people prefer attractive drives with properly developed roadsides to highways built with the sole objective of accommodating traffic.

This point cannot be overlooked. People cannot or will not live by bare necessities alone. The human element for seeking recreation cannot be destroyed, especially with the many opportunities that automobiles offer. Unless this is given consideration in communities with highways, there will be trespassing on private property, dissatisfaction and disappointment for those seeking recreational drives and a resultant general feeling of disregard for others.

The point is not taken that properly developed highways will eliminate immorality or that they will serve to convert the morals of the population, but the small share of such responsibility which does fall to the road authorities should be seriously considered. No nation can long survive the policy of dealing with things and offering no recognition to the element of human nature. And so in providing roads
for motorists something more is needed than just a first-class pavement.

The construction of highways is perhaps the most widespread of all public improvements. From the largest cities it reaches to the smallest towns and hamlets. It penetrates to prosperous farming communities and it crosses waste lands and forests. It offers first-hand evidence of accomplishments to more individuals than any other public enterprise. Abutting property owners are interested because they are taxpayers, because they make use of the highways and because their frontage is affected. Although these people are in the minority and although they may wrongly criticize the plans as followed, their rights, however small, should be observed.

The acquiring of private property for road purposes is made possible through condemnation laws. This is as it should be or else in a number of instances the rights of the majority would have to be sacrificed for the rights of a few. Ways and means are therefore made possible by law for the securing of highway right-of-way, and roads may be built in any manner necessary provided the abutting property is not unnecessarily damaged. Laws also provide, however, for the damaging of abutting property and the reimbursing of the owner, provided necessity can be shown.

If tree planting actually damages the abutting property, it should be handled in the same manner,
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yet the courts have been slow to recognize this part of road improvement as a necessity. Furthermore, to pay a property owner an annual amount because of damage to crops for a period covering the life of the trees would be impractical and a lump sum could hardly be intelligently fixed upon that would be equitable.

The abutting property owners in residential sections usually welcome any form of roadside improvement. It increases the value of their property and also provides a more pleasing outlook from their homes. In the rural districts, however, many land owners object to roadside tree planting because the shade damages the crops. Careful estimates of such situations where mature trees were concerned indicates that the losses are greater on the north side of east and west roads and almost negligible on the south side of the same roads. On both sides of north and south roads the loss falls approximately midway between the first two instances mentioned.

Trees are, or should be, most frequently planted near the property lines. Considering this as true and assuming that a continuous row of trees is planted, which is not always the case, an average belt of shade some fifty feet in width would exist. Such a strip of land would have to be nine thousand feet long to be the equivalent of an acre of ground and any damage to crops resulting from the shade of roadside trees would be almost negligible. Also the amount of frontage of farm property is not always an accurate
PLATE I

American elms are suited to formal as well as informal roadside planting.
indication of the total amount of land involved under single ownership and the depth is usually much greater than the width along the road. On this basis a conservative estimate would place the average crop loss because of shade at less than three-tenths of one per cent.

To be consistent, this loss must be rated against the benefits of tree planting which, of course, cannot always be measured in money. As an example, however, especially in the smaller and older farming districts many of the land owners have lined the roads with trees in front of their property. Rows of mature oaks, elms and maples are now found in many rural communities. The farmers of earlier days desired trees for their appearance and for the shade which they offered. After cultivating long rows in the open fields, relief was found in resting for a few moments under their cool and spreading branches. Human nature has not changed much and people still seek relief from the summer heat.

Then, too, trees really constitute an improvement to property. This fact is generally conceded with respect to city, town and suburban areas and it likewise should be so in regard to farm property. Those who have no appreciation for trees are few in number. We are a progressive people and our regard for trees grows with our progress. The truth is that the majority of those who object to tree planting along rural highways do so because they see an opportunity of securing compensation for claimed dam-
ages or because they do not wish others to proceed with anything which might affect their property either favorably or otherwise without securing their permission. Such action is considered as a trespass on their rights.

Considering all these objections, then, highway tree planting through most farming districts must be largely educational to be successful. Laws are enacted in many states to permit tree planting and the work may proceed in spite of the objection of individuals.

Some plan of public education, however, should be adopted in every case, although to secure the permission of each individual property owner may not be necessary. Newspaper and magazine articles are of great help. The value of trees can be taught to school children and their advantages made known by federal and state agricultural extension programs. The subject could also be presented at various farm meetings and in all cases it should not take the form of a plea but as a discussion which would bring out the value and desirability of trees. There is no limit to the various means which could be adopted to further the interest in trees and many outside organizations would be glad to co-operate with the road officials.

In addition to this, a very important point to remember concerns the personnel of every road organization. Each individual from the commission or board to the most unimportant laborer should be
taught to treat property owners with respect. The good will of these people, who do have rights, cannot fail to help a great deal in the support of any program. Personal contacts should always be well and honestly made. Everyone is entitled to a fair consideration and only in this manner can worthwhile public projects proceed on a sound basis.

In spite of this, however, practically every endeavor has its critics, those who stand on the sidelines and criticize the worthy efforts of the progressive without offering even constructive suggestions. Luckily, such people are in the minority and their influence, although sometimes aggravating, is seldom of serious consequence. Frequently they must be ignored, but this only after sound persuasion and educational effort has proven useless.

In the main, roadside development or the improvement of the Nation's waysides, will continue. Its desirability and necessity has been proven. The reasons supporting it are based on the soundest facts and it is bound to be carried along with the progress of road construction until the highways of the country completely and adequately serve all the people in every necessary respect.
CHAPTER II

Consider the Trees

Trees represent the zenith of perfection in plant life as human beings do in animal life. Side by side through the ages trees and humans have evolved from a common ancestry which dates back to the Pre-Cambrian era when all life is thought to have begun. Many millions of years have been required for those first microscopic bodies to reach their present high state of development, and although theoretically true the practical mind can hardly conceive of even a remote relation between man and trees. Nevertheless, everyone is endowed, at least to some small degree, with a considerate and kindly feeling toward all plants. Whether this feeling has been inherited from the beginning or acquired through centuries of association matters little, for it still remains a fact. The apparent disregard for trees by some can be attributed only to thoughtlessness or a lack of understanding, but this does not in any sense reflect a natural or normal attitude. A fuller appreciation for trees can be cultivated or developed by finding out more about them. Anything must be completely known or understood to be fully appreciated and with trees this is no exception. Their history is exceedingly interest-
CONSIDER THE TREES

ing and the part they have played in the development of civilization is almost beyond comprehension. The services they render man are legion and how they live and grow is one of Nature's greatest wonders. Ages have been required to perfect these natural masterpieces of the plant world, yet man may profit by them in the few short years of his existence. Also a knowledge of trees enables one to live a more enjoyable, wholesome, tolerant and peaceful life, for it reveals a most satisfying philosophy.

Geologists estimate the earth's crust to be about two thousand million years old. This assumption is based upon the present knowledge of radio-activity or the breaking up of the nuclei of atoms. There is a constant change taking place in the atoms of uranium which transforms them to atoms of helium and lead, releasing free radiation. The rate of change from uranium to lead is now known. By experiment or the measuring of the amount of uranium and associated lead in a sample of rock, the age of the rock can be determined. The age of plant life may be computed from this relation between uranium and lead found in fossil-bearing rocks.

How and when plants were first formed is a matter of sheer speculation based upon fragmentary evidence gleaned from fossil rocks of past geologic ages. Authorities generally suppose that protoplasm had its beginning in water and that water may have covered all or nearly all of the earth's surface at one
time. In the process of evolution ultra-microscopic particles acquired the ability to grow and became individual floating cells. If the theory is correct this vast step which probably took place gradually over a period of ages resulted in the actual beginning of plant and animal life.

Changes in the earth's crust brought the land above the water and the floating cells became attached to the rocks at the water line. Colonies of cells developed, multicellular plants were formed and as the water receded the plants gradually adapted themselves to land. During this time bare rock surfaces were eroded and surface soil was formed. Blue-green algae and certain types of bacteria which exist today are thought to represent the earliest forms of plant life.

At sometime between five hundred and fifty million and two thousand million years ago life on this earth is thought to have begun. This breadth of time is known geologically as the Pre-Cambrian era or as it is sometimes called, the Age of Algae. Not much tangible evidence is available concerning these earliest forms of life, but by the end of this era both primitive plants and animals had evolved.

Fossils resembling the blue-green algae have been found in Pre-Cambrian formations, but whether they are of organic or inorganic origin has not been positively determined. The presence of iron ore in similar rocks is supposed by some to be the result of bacteria since they are associated with the formation
of this metal. At any rate, as the blue-green algae and bacteria were leaving their permanent records in the rocks, very small and lowly types of sea shells were being preserved and annelid worms were forming trails which were to be read by geologists millions of years later.

The early periods of the Paleozoic era comprise the Age of Invertebrates and they date back to between four hundred million and five hundred and fifty million years. Practically all the lower marine animals such as sponges, corals, arthropods, worms, brachiopods, mollusks and the like as are known today existed at that time. Plants were largely represented by many types of highly developed algae, although the simplest forms of terrestrial plants may have existed.

The periods from three hundred million to four hundred million years ago in the Paleozoic era is known as the Age of Fishes. The first positive evidence of land plants, precursors of present-day trees, is found in the Silurian period or the early part of this age while during the latter part or Devonian period traces of mosses, liverworts, fungi, bulbous plants, the probable ancestors of ferns and horsetails, plants with creeping stems and primitive leaves and those having woody tissue have been brought to light. Toward the close of the Devonian period the ancestors of the shark and sturgeon ruled the seas, trees and shrubs appeared and finally extensive and luxuriant forests developed. Fossils of trees have
been found in rocks of this age which bear a marked resemblance to the maidenhair tree or *Ginkgo biloba*.

The Carboniferous period which is also known as the Age of Amphibians, the Coal Age and the Age of Insects dates from two hundred million to three hundred million years ago. During this time the first spiders and stinging scorpions appeared and cockroaches grew to a full foot in length. Amphibians belonging to the same class as frogs and salamanders were evident and reptiles began to appear. The land became inhabited with vertebrates and the swamps swarmed with insects.

Dense tropical jungles of giant club mosses, rushes, ferns, horsetails and ancestors of coniferous trees were developed. Trees which existed during this age were destined to serve the human race today by providing the present supply of coal. Thus man is not only dependent upon contemporary trees, but upon those of three hundred million years ago.

During the Mesozoic era or Age of Reptiles from sixty million to two hundred million years ago, great changes took place in the plant world and for the first time some of the present-day trees are recognized. At about the middle of this age or in the Jurassic period the ancestors of cypresses and the Norfolk Island pine became evident. When the petrified trees of Arizona formed thriving forests, the giant dinosaurs were becoming the rulers of the animal world and they arose to power at about the
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same time as coniferous trees became most highly developed.

The Ginkgo reached its greatest geographical distribution and most attractive growth during this time and it has changed little in the past one hundred and twenty million years. The last survivors of this tree probably existed in eastern Asia, since it has never been found in a wild state but was first discovered growing in the temple gardens of China and Japan, where it had been planted by man prior to recorded history. When the Ginkgo flourished, the first birds were learning to fly and the giant Sequoias now limited to California were found in every land.

As the dinosaurs, flying reptiles and marine monsters became extinct in the Cretaceous period more than sixty million years ago, the modern era in plant life began. Flowering plants were developed in the tropical Arctic from where they later migrated southward. Sycamores, poplars, willows and sassafras trees witnessed the passing of the dinosaurs.

At the close of the Mesozoic era flowering plants had become predominant and they overran the ferns, cycads and prehistoric conifers. The great reptiles were rapidly disappearing and the forests were becoming a mixture of hardwoods and conifers. Among the present-day trees which date back to this period are walnut, persimmon, beech, birch, maple, bald cypress, magnolia, tulip tree, sumac, oak, holly, dogwood, eucalyptus, palm, fig, cinnamon tree and breadfruit.
Plants reached their highest state of development before animals and during the Tertiary period of the Cenozoic era which dates back from one million to sixty million years, many new species of trees had developed and plant life became largely the same as it is today except the species were very differently distributed. Palms thrived in northern Europe and magnolia and laurel grew with walnuts, elms and oaks in northwestern United States. In the Arctic were found forests of maples, limes, poplars, cypresses and Sequoias, but as the climate became cooler they were forced to retreat southward.

The Tertiary period is known as the Age of Mammals or animals which suckle their young, for during this time the ancestors of many of the present-day mammals became evident, although their beginning is thought to date to the Cretaceous period of the Mesozoic era. Practically all trees existed as they are now known when the ancestors of the horse, rhinoceros, tapir, elephant, wolf, dog, fox, lion, tiger, leopard, bear, hyena, and whale were developed. They witnessed the rise and fall of the terrible sabre-tooth tiger and the mastodon.

During the Quaternary period, or the Age of Man, which began about one million years ago in the latter part of the Cenozoic era, the distribution of plants in North America and Europe was considerably changed and many species were lost by a lowering of the temperature and the formation of vast ice sheets. As trees were finding new homes or becom-
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ing limited to smaller areas, the mammoth flourished and passed, all animals developed to their present forms and man, who for the first time becomes evident, passed through his various primitive stages.

As geology merges into archaeology and history, man is found appropriating trees to many uses. The first recognition of trees by man appears to have taken the form of worship. Trees were reverenced and groves were the first temples. So deeply was this feeling imbedded in the human race that it still exists in many parts of the world and even the most civilized people of today have a regard for trees which is born of this early superstition.

The early custom of establishing sacred groves for religious worship seems to have been universal in extent, for such natural temples were used wherever man existed. Even the savage tribes of Africa, South America and the remote islands of the Pacific appropriated trees for this purpose. The myths and folk tales of all nations are largely an outgrowth of tree worship, which produced the belief in witches, fairies, dryads, demons, wood spirits, wood nymphs and the like. Trees were considered the home of many gods, and individual specimens or species of trees were frequently given the place of most sacred importance.

The influence of these mythical beliefs is deeply rooted in every human race. Many customs exist today which have to do with trees aside from the worship of those held sacred, although this is still
practiced in certain localities. Numerous references to trees are found in the Bible and the scheme of animate things is often referred to as the tree of life. Many incidents of importance have taken place under the protecting branches of large trees and these specimens have been preserved as living monuments, mute witnesses to the historic deeds of the past. Trees are planted at births, in memoriam of those departed, on Arbor Day or to commemorate almost any occasion of public or private interest, and Christmas would seem drab indeed without the customary lighted tree and decorations of holly.

The practice of tree planting is not new, and available evidence indicates that it existed in the prehistoric past. Primitive man must have depended to a certain extent upon wild plants for food and the nomad herder probably grew vegetables in a new garden each year. As man became more civilized and homes more permanent, trees were planted for fruit, shade, and ornament. The case of the Ginkgo tree, as previously mentioned, supports the theory of very early tree planting, especially since China is thought to have been a great nation when the Pharaohs ruled in Egypt. The Ginkgo was evidently brought under cultivation by the Chinese before it became extinct in a natural state, which may easily have been several thousand years ago.

Walnuts were eaten by the Swiss lake dwellers more than eight thousand years ago and undoubtedly walnut trees were planted and cared for by
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them. The Sumerians grew vegetables, barley and flowers and planted orchards in the Euphrates Valley about 3500 B.C. These people are credited with being the first systematic agriculturists and their methods and influence spread later to Syria, Asia and Egypt.

The tomb of Ptah-Hotep, who lived at Memphis in 4000 B.C., preserves records of grape culture and wine making. The ancient Egyptians knew how to plant trees and the estates of the better classes contained gardens and groves. Under the direction of Queen Hatshepsut in 1500 B.C., incense-bearing trees (Boswellia olibanum, the dried gum of which is frankincense) were brought to Egypt by boat from the land of Punt, or Puoni, on the coast of Somaliland. Other trees were also brought from Babylonia.

Hammurabi, the first law-maker who ruled Babylon, about 2240 B.C., advocated the planting of trees in public parks to afford recreation for his people. Trees were first protected under his code of laws, number fifty-nine of which states, "If any man without the knowledge of the owner of a garden fell a tree in a garden he shall pay half a mina of money."

Nebuchadnezzar, King of Babylon from 605 to 562 B.C., improved the appearance of the roads extending to and from the city and he is thought by some historians to have constructed and planted the hanging gardens because of his love for his Median wife. Others have attributed these gardens to Semiramis in the ninth century B.C., and also to an
Assyrian king who built them for one of the ladies of the palace from Persia. Regardless of who was responsible, they indicate that considerable knowledge of tree planting was available at that time.

The Persians were true tree planters. Cyrus, King of Persia from 590 to 529 B.C., is said to have personally planted gardens and cared for his own orchards. Xerxes, King of Persia from 485 to 465 B.C., would not permit his victorious and plundering armies to injure the trees of his enemies. The Persians considered a tree as sacred and the symbol of eternal life.

The ancient Greeks also had their sacred trees and the death penalty was inflicted upon anyone cutting down a tree. They also developed public pleasure gardens but their interest increased and their style was greatly improved after the Persian Wars. Alexander the Great (356-323 B.C.) marveled at the Oriental gardens which he found as he invaded Persia and India and his soldiers returning to Greece brought with them new and more elaborate ideas of landscaping and tree planting.

As the Persian influence spread to Greece, so that of Greece was felt in Rome. Magnificent villa gardens were planted in Rome and although they included tree-lined streets, they were for the most part wholly private. The Romans appointed foresters to supervise the care of trees and to protect them.

Although the Babylonians, Egyptians, Greeks and Romans planted trees extensively in gardens and
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parks, the Persians and Arabians were the first to plant trees along streets and roadsides, with the possible exception of the Chinese, of which little is known of their early practices in this respect. During the seventh and eight centuries A.D., the Arabs overran Syria, North Africa and Spain. They carried with them their ideas of gardening and tree planting, which were put to use in these new territories. Remaining in Spain until 1492, they left a permanent type of gardening known as the Moorish style, which is still considered an outstanding example of landscape art. It was brought to America with the Spanish Conquests in the sixteenth century and although somewhat modified, its effect is still evident in modern plantings. While the Persians are undoubtedly responsible for originating the practice of tree planting along public thoroughfares, the Arabs may be largely credited with spreading the idea to the civilized world.

During the Dark Ages in Central Europe from the fourth to the ninth centuries, all science and learning languished and only the monks kept alive and passed on the accumulated knowledge of tree planting and care. As culture revived, the principles and ideas spread by these individuals became known throughout western Europe and England and their services and advice in planting and caring for ornamental trees and orchards were much in demand. The Moorish influence in Spain crept north into France and blended with the surviving Roman prac-
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tices derived from ancient Greece and Persia. Thus after nearly two thousand years of separation, a culture was again united, bringing together an elaborate style of private development and one which to a much greater extent served the public.

From the beginning of the Middle Ages during the reign of Charlemagne (768-814) until the present time the science and practice of arboriculture improved and increased in popularity, slowly at first and later with more rapid strides. Marco Polo, the Venetian, in writing of his travels in China (1272-1293), states that, "The emperor (Kublai Khan), moreover, has taken order that all the highways traveled by his messengers and the people generally should be planted with rows of great trees a few paces apart; and thus these trees are visible a long way off, and no one can miss the way by day or night. Even the roads through uninhabited tracts are thus planted, and it is the greatest possible solace to travelers. And this is done on all the ways when it can be of service. The great Khan plants these trees all the more readily because his astrologers and diviners tell him that he who plants trees lives long."

For a long period, however, the planting of trees and shrubs was largely confined to private gardens and public parks. Trees and hedges were planted along streets to shield those within from the curious eyes of passersby. The villa gardens were extensive and included spacious walks or avenues which were lined with trees. Many public parks were con-
Red oaks in the proper soil are exceptionally fine shade trees.
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structured somewhat after the fashion of these private gardens and the trees were planted along the streets leading to and from them. Gradually the planting of street trees became common in Europe and was practiced by the Puritans who settled in New England. In Watertown, Massachusetts, a vote was passed at a town meeting in 1627 to indicate roadside shade trees by a particular marking and to fine anyone eighteen shillings who removed one of these trees.

Until about 1685 all European landscaping, including tree planting along avenues and highways, had been of a very formal character. At this time, however, a new influence from China began to be felt which favored a type of gardening without straight lines which became known as an informal style. By the middle of the eighteenth century this style had become quite popular throughout Europe, although its use along country roads was not extensively practiced until recent years.

The policy of planting roadside trees in rows is still followed in many foreign countries and in a number of localities in the United States, but the reason for this is largely because of a lack of space. Usually only a very narrow planting strip is available and the small amount that the trees could be varied in an informal style would appear much less attractive and they would be no more serviceable than if they were arranged in straight lines. At the present time practically all the towns and cities of
the civilized world have some provision for the planting, care and protection of street trees. In some instances they are confined to boulevards and pleasure drives only, while in others they are planted on all streets, even through sections devoted entirely to business.

The practice of planting trees along country roads in the United States by the highway authorities is a comparatively new undertaking and has only been followed in a systematic manner during the past twenty-five years. For some time prior to this, however, many rural land owners had set out trees along the front of their properties and a number of these trees are serving the public well as roadside trees today. These people realized many years ago the benefits of shade, comfort and appearance which such trees offered. They perhaps had a more kindly feeling for them because, being closely associated with the products of the soil, they fully realized the general importance of trees to man.

Civilization owes much of its progress to the use of trees, and the relation of trees to mankind is a subject which deserves much consideration. Next to the food required for the support of humans, wood is man's greatest necessity. The prehistoric ancestors of man made their homes in densely forested regions for protection and groups of trees were used as the first temples of worship for the same reason. Even the Eskimos living today in the Arctic Circle
do not extend their homes farther than the limit of driftwood.

Wood was as much of a necessity to the early settlers as clothing or food, and its status in this respect has changed but little. Although substitutes are now used, nothing can completely take the place of wood for interior finish, furniture, temporary buildings, poles, piles, barrels, casks, kegs, tubs, excelsior, veneers, boxes, ties, tool handles, and a thousand and one other articles. Nine-tenths of all the paper used in this country is manufactured from pulp wood. In addition to this, trees provide turpentine, maple syrup, rubber, quinine, cork, nuts, fruit, chewing gum, various oils and countless other products. Trees serve as windbreaks and forests prevent erosion and control floods. Although few of these uses are directly applicable to roadside trees, a knowledge of them should serve to create a better and more respectful understanding of this great group of plants. As Nature's most eminent effort in the plant world, they are well worth considering.

Trees live and breathe, they reproduce themselves both sexually and asexually, and they react to various conditions. They assimilate and transport raw material in liquid form from the soil to the leaves, where it is manufactured by a chemical process into usable foods such as starches and sugars. This process is known as photosynthesis, since it cannot proceed without the aid of light, and incidentally it has not been artificially reproduced in the labora-
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tory. The resulting food is carried to all parts of the trees, where it is deposited in the form of growth. New cells are thus created in the trunks, roots, branches and twigs, and food is stored in the buds and branches in readiness for the growth of flowers and leaves the following season. Liquids circulate through all parts of trees and one of the mysteries of Nature is the method by which soil water is raised to the tops of the tallest trees.

The tallest tree known is *Eucalyptus amygdalina*, or peppermint gum, of Australia. It commonly reaches a height of four hundred feet, and that of one specimen is reported to be four hundred and seventy-one feet. The giant redwoods, *Sequoia gigantea*, of California grow three hundred and twenty-five feet tall with a base diameter of from thirty to thirty-five feet. The age of these trees has been estimated at three thousand years, or they were one thousand years old when Christ was born.

The white cedar of Taiwan (Formosa), *Chamaecyparis formosensis*, grows to a height of one hundred and eighty feet, has a circumference of sixty-four feet at the base and, according to actual counts of annual rings made on felled specimens, varies from twenty-five hundred to three thousand years of age.

The dragon tree, *Dracaena draco*, is native to the Canary Islands. One specimen found on the island of Teneriffe is reported to be seventy feet in height and forty-five feet in circumference and according
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to Humboldt (1769-1859), a German naturalist and teacher who visited the site in 1799, its age is estimated at six thousand years.

The oldest tree in the world is thought to be a cypress, *Taxodium mucronatum*, at Oaxaco, Mexico, near the village of Santa Maria del Tule. Its age is placed at somewhere between five thousand and ten thousand years. It is one hundred and forty-one feet in height and one hundred and eight feet in circumference five feet above the ground.

The average ultimate height of trees commonly used in roadside planting, such as oaks, maples and elms, is from seventy-five to one hundred feet. The normal age of trees growing under natural conditions varies with each species. According to E. N. Munns of the Forest Service, United States Department of Agriculture, a few of the more common trees may be grouped as follows, with respect to age:

Maximum age less than one hundred years: butternut, poplar, Jack pine, birch, willow and soft maple. Soft maples and poplars frequently do not exceed forty or sixty years of age.

Maximum age one hundred to two hundred years: red oak, black oak, pin oak, scarlet oak, red maple, walnut, hickory, ash, blue spruce, red pine, Austrian pine, Scotch pine, Norway spruce, Swiss mountain pine, Ginkgo and white fir.

Maximum age two hundred to five hundred years: white oak, beech, chestnut, elm, yellow poplar, sugar maple, white pine, hemlock and cypress.
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Maximum age five hundred or more years: red cedar, white cedar, Douglas fir and Sequoia.

Trees are the oldest living things on earth and their use in roadside planting constitutes a relatively permanent improvement. The present age is typified by its apparent rapid progress in many fields. Time, which is such an important element in the development of things in Nature, is being given less consideration in modern construction. With respect to trees, time is a most important feature because they are not planted for the immediate future, but for one hundred years or more. Their benefits are lasting and as they increase in size to maturity they cost less to maintain. With reasonable assistance, trees improve themselves by growing, whereas all artificial improvements increase their maintenance cost with age.

In order that the importance of roadside trees be more correctly realized, suppose a hypothetical case is assumed. Considering an area of reasonable size, equivalent to any political area of the country such as a state or county, where at least a reasonable number of roads have been improved, suppose that every tree and shrub be removed overnight from the right-of-way of these highways so that not a single one could be seen growing except on private property. Little stretch of the imagination is required to realize the unpopular and undesirable results of this.

True, a community could exist without roadside trees, but no group of civilized people can merely
Informal plantings of sugar maples and white birch are especially attractive along the highways.
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exist. They must either thrive and progress or decline. Tree planting agrees with the most intelligent progress and if the matter were seriously condemned there would not be a single tree planted on private property throughout the entire country. This, of course, is not actually the case, since there are few homes without at least one tree. Millions of trees are planted annually on private property because they are desirable and because they serve some definite purpose. This alone should be a sufficient reason for proceeding with roadside development programs which involve tree planting. It is in reality a public necessity and if a community is sufficiently desirable for home sites, then the owners of these sites should be interested in improving that part of the community which is publicly owned and which is open to the view of every passer-by.

The meaning of trees to the public varies as individuals vary. Many consider them with admiration, regardless of their value to mankind and the part they have played in the development of civilization. Many admire them because they are the highest and most complicated forms of the plant kingdom. Others, however, merely take trees for granted and care little where they are growing. To worship Nature in any respect is unnecessary, but to have a profound understanding of Nature, which is shown in the consideration given trees, indicates a breadth of vision and is a mark of intelligent progress.
CHAPTER III

The Lowly Shrub

If shrubs could think, they would no doubt suffer from an inferiority complex. As compared to trees they are smaller in size, less majestic in appearance and less capable of providing shade. What they lack in these qualities, they attempt to make up in flowers, the color of their foliage and their various forms. Shrubs lacking these attributes are often referred to as so much brush, as are also some of the more desirable shrubs. Although such a name is hardly complimentary, it does little harm unless shrubs are actually treated as brush. In that event and because they are powerless to help themselves, someone must intervene for them if they are to serve their purpose in the roadside scheme.

Shrubs really differ from trees in that their growth is not confined to a central stem, but is renewed periodically from the roots as the old stems gradually decay. They have many main stems extending from a single root system, while a tree usually has but one. There are exceptions to this and the line between trees and shrubs is not always altogether clear. Some plants are extremely variable and there are tree forms of shrubs as well as shrub forms of trees. There are trees which produce suckers from the roots and yet they are decidedly trees.
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because they have one or occasionally more pre-dominating central trunks. There are also shrubs which produce one main stem larger than the others, but in general their characteristics are shrub-like. Both types may be created artificially by pruning. Ordinarily shrubs are smaller and lower growing than trees, but here again there are many exceptions. Form and habit of growth are the determining factors.

Undoubtedly shrubs represent a stage in the evolution of trees. If this is true, they may be the sub-shrubs and herbaceous plants of the past ages and the trees of the distant future. Regardless of this, they are a necessary part of the earth’s flora and should they pass on to trees tomorrow, new shrubs would evolve to take their place.

The secondary place allotted to shrubs with respect to trees can never be overcome, but they nevertheless serve a very useful and important purpose. In the forest they provide an ideal ground cover for the growth of tree seedlings. Their leaves add to the humus of the forest floor, and their roots assist those of trees in regulating soil moisture. They prevent erosion on slopes where trees fail to gain a foothold, and they offer refuge and food to helpful birds. From the standpoint of size and impressive appearance they occupy a position midway between trees and herbaceous plants, or, in other words, they complete the natural landscape.

Shrubs may or may not appear sooner than trees
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in newly made open areas, but once they become established they grow more rapidly and actually cover more ground surface. This accounts for much of the natural shrubbery growth along old roadsides.

Shrubs along country roads have been severely persecuted in the past. As brush in the fence rows, ditch slopes and unused areas, they have been removed annually from the highway right-of-way. In general they did little or no harm in such locations and their removal cost money, left barren and unsightly roadsides and caused erosion to increase. As road construction and maintenance methods improved, the value of shrubs became more evident until now they are quite generally given their normal place of relative importance in roadside development. They may be considered an effective and permanent part of such improvements.

Although shrubs reach maturity in a comparatively short time, little is definitely known concerning their span of life. That they live for a great many years is certain, and this fact together with their usefulness adds weight to the argument for their inclusion in roadside plantings.

In planting country roadsides, the carrying out of a natural development wherever possible is most desirable. This is not only an improvement from the standpoint of appearance, but it renders the roadsides most useful. All the functions of trees are supplemented to a lesser degree by shrubs and in addition to this, trees depend a great deal upon
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shrubs for support. Excessive open ground underneath trees, especially if it is accessible to the public, is not conducive to normal or successful tree growth. The soil surrounding trees must be kept moist and sufficiently loose to provide a certain amount of air circulation. Shrubs aid in this respect by their own growth, by depositing a mulch of dead leaves each fall, and by sheltering smaller shrubs, vines and herbaceous plants, which in turn aid the shrubs in a similar manner. This is a typical illustration of the interdependence of plants in Nature, and is true from the largest and oldest forest trees to the smallest microscopic terrestrial plants.

A grove of trees stripped of shrubs and thrown open to the public cannot survive for many years without underplanting and cultivation. This fact has long been known by experienced foresters and park superintendents, who preserve all possible undergrowths and adopt an annual program of planting and maintenance. Large trees represent a great many years of growth, but because they appear permanent is no guarantee that they will remain so. Without undergrowth and without proper maintenance, trees of any size may be killed in a single season by intensive and careless use of the surrounding ground. The cost of replacing large trees along country roads is prohibitive and if smaller ones are planted, many years are frequently required to fill the gap. The perpetuation of trees or the assurance that existing trees are not going to be lost without
trees of equal size to take their place, can only be guaranteed by far-sighted programs of planting and maintenance each year. In such a program for roadside trees, shrubs play a very important part.

To gain a comprehensive idea of the use of shrubs in roadside development, some consideration may be given to the combinations of the different species of shrubs and of shrubs and trees as they are normally found growing in Nature. These combinations are a result of the survival of the fittest, and where such a situation exists, only the most hardy survive. Such a natural condition is the most practical to consider, since it will outlast other combinations and will continue to serve a useful purpose over an unlimited length of time. Many divisions of plant combinations are formed in Nature and there are many ways of classifying these. Considering the most obvious, there are certain species that are usually found growing in the open, there are those combined with junipers on hillsides and with other trees such as birches, pines, oaks, hemlocks and a general mixture of hardwoods, there are those commonly found along streams, around ponds, in boggy lands and along the seashore. For each location and soil type there is a natural combination of plants which has survived the many handicaps expected in an unprotected and uncultivated environment.

In order to connect the cities, towns and various regions of this country, highways must necessarily penetrate, at one time or another, one or all of these
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conditions and if the planting along these roads is kept in harmony with the surrounding natural growth it will be most attractive and most successful.

Open areas are designated as such because they are more or less devoid of trees. In these situations, particularly where the soil is light and somewhat dry, will be found the gray dogwood, pin cherry chokecherry, hazelnut, witch-hazel, sumacs, sweet fern and roses. Where the soil is more fertile and moist, the meadowsweet, steeplebush, arrowwood, withe-rod, prickly ash, shrubby cinquefoil, hawthorn and red osier dogwood abound. Scattered trees may be in evidence, such as the wild black cherry, elms, red maple, scrub oak, wild plum and alder. The Virginia creeper, wild grape, honeysuckle, bittersweet, and other climbing vines may also be found.

The shrubs which usually grow among the junipers or red cedars are gray dogwood, prickly ash, withe-rod, bittersweet, ground juniper, sweet fern, honeysuckle, sumacs, roses, chokecherry, low blueberry, bayberry, nannyberry, blackberry and raspberry. On the floor of pine forests will be found ground hemlock, bunchberry, partridge berry and sweet fern, and in the more open areas Juneberry, chokecherry, and pin cherry. Stands of oak trees provide for the growth of many shrubs, including Juneberry, virgin's bower, bittersweet, witch-hazel, mountain laurel, buckthorn, winterberry, New Jersey tea, bladder nut, wild grape and arrowwood.

Beeches, maples and other hardwoods are usually
associated together and the shrub undercover consists of flowering dogwood, Juneberry, mountain laurel, arrowwood, witch-hazel, alternate-leaved dogwood, Canada yew and wayfaring tree. With the hemlocks will be found alder, witch-hazel, mountain laurel, various willows, Juneberry, hobblebush and Canada yew.

Shrubs which prefer a moist soil and locations near streams and water areas may be grouped with such trees as red maple, hickory, blue beech, the ashes, willows, walnut, butternut, swamp white oak, pin oak, basswood, elms, sweet gum, sycamore and hop hornbeam. Such shrubs include hawthorns, Juneberry, spicebush, bladdernut, ninebark, alder, winterberry, pussy willow, sweetgale, red osier dogwood, roses, nannyberry, arrowwood, steeplebush, meadowsweet, witch-hazel, virgin's bower and grapes.

The various combinations cited are only rough examples of the many and varied associations found in Nature, but they may serve to illustrate what is meant by a practical or logical mixture of shrubs used along roadsides. Observations made of native plants growing in the immediate vicinity in each case will provide considerable information as to the kinds of shrubs to use.

There are those who are exceedingly partial to the use of native material in planting the roadsides. While there are many native shrubs which have been more or less neglected and which would serve ad-
miraibly for such plantings, there are also many exotic shrubs which are worthy of equal consideration, provided information is available concerning their hardiness, soil requirements, and their appearance when combined with other shrubs or trees. The arrangement and planting of exotic shrubs requires a great deal of forethought and exact knowledge of their habits and hardiness. If one is not familiar with these characteristics a much safer and simpler method is to follow the existing combination as found.

The purpose here is not to stress the proper combinations of shrubs or of shrubs and trees from the standpoint of appearance alone, although this is an important factor, but also from a more practical standpoint because certain groupings of shrubs survive and serve their purpose better in some situations than in others. This becomes most evident after the material has been planted for a number of years and time spent in comprehensive planning before any work is done is an economical procedure.

A proper knowledge and recognition of shrubs by those responsible for roadside development will save a great deal in money and create the most satisfactory results. A personal preference for particular shrubs because of attractive flowers, foliage or other characteristics should not govern the selection of these plants for the roadsides. The best choice may be determined by considering the questions: Will the shrubs survive a normal life in the location for
ROADSIDES, the Front Yard of the Nation

which they are intended, and will their flowers, foliage, size and shape blend naturally with the surroundings? In other words, those selected must be hardy, suitable for the situation, and generally accepted as attractive.

Attractiveness in connection with roadside shrubs is of considerable importance, for these plants add materially to the appearance of the roadsides as a whole. Unattractive shrub plantings would result in similar roadsides and this would invite criticism of a nature which might condemn an entire program. The idea is not difficult to understand. Large department-store officials have found that the merchandise which is most marketable is that which is attractive in appearance in addition to its useful and practical qualities. Anything to be successful must appeal to those who come in contact with it. Regardless of how necessary roadside development might be, it may be completely discarded because its initial effort is unattractive.

The point is not that people wish to drive along the highways and revel in the beauty of their surroundings. Such things are perhaps for a privileged few. The mass of people are busy and while they use the highways mostly for pleasure, they are bound to and from definite places and they have little time to marvel at every spot of beauty the roadside might present. But with the roadsides unattractive there is danger of public criticism and unconsciously or without knowing why, the people might enjoy motor-
Plantings of native shrubs should be arranged in an informal manner
THE LOWLY SHRUB

ing much less. To a great extent roadside development involves a problem in human nature, and fortunately it is being recognized as one of extreme importance to the welfare of the people as a whole. While there are many other things in connection with the everyday life of individuals which may contribute much more to their happiness and pleasure, there is no other one thing that is brought more consistently before them day after day than the roadsides along which they travel. Roadsides are viewed more times daily by more people than all the articles of merchandise in every department store in the country, and their effect upon the mental attitude of the public is much greater than is generally supposed.

The part that shrubs play in the appearance of the roadsides and the resulting effect upon the public is outstanding. Shrubs, in reality, are of less importance than trees, but they are by no means useless or undesirable. Money spent for their planting and care along the highways is far from being wasted, provided they are correctly selected and located. They are an indispensable part of the rural landscape and much can be gained by their proper use. Shrubs reach mature size in a relatively short time, they deliver the goods of ultimate appearance quicker than trees, they may make or ruin a roadside planting, and their presence or absence may be the determining factor as to whether the appearance of a roadside planting is a success or failure.
CHAPTER IV

The Rôle of Flowers

HERBACEOUS flowers have long been associated with sentiment. They are admired to a more or less degree by everyone and they even appeal to those who are totally without a sense of appreciation except for the more practical things of life. To them, what cannot be made materially useful can only be admired to a limited degree, and the possibility of feeding the mind by relaxed enjoyment gained through the powers of perception is not thought of as practical. The mind, which normally functions as much or more than the muscular parts of the human body, must be relaxed, recuperated and permitted certain forms of recreation if one is to live a healthy and normal life. Herbaceous flowers aid a great deal in this respect by virtue of their attractive appearance. Poetry has been written about them, stories woven around the sentiment they reflect, and customs and traditions upheld because of the influence they have had upon all people since the earliest times. The significance of these facts is revealed today in the folk tales, legends and beliefs which have been preserved for centuries.

Flowers are of the utmost importance to civilized people. Their cultivation and care and the resultant
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appreciation which their appearance excites involves a form of recreation for which there is no substitute. As contrasted with cultivated flowers, those growing naturally in their native habitat are only seen and appreciated, yet an equal pleasure is found in discovering them as they compete with their neighbors for existence. There is also a certain grandeur about Nature's massed display of wild flowers as well as an exclusive fineness about the individual specimens which cannot be achieved in cultivated gardens.

Fields or woods of native wild flowers may often be seen here and there along most every country road from early spring until late fall. Large groups of these plants frequently extend to the roadsides and ditches and sometimes to the very edge of the traveled way. Where the adjacent land has been cleared and cultivated, the flowers have struggled to survive or spread themselves to greater distances along the highway. This marks their last stand against the necessary progress of agricultural practices. As roads are improved and traffic increases, highway maintenance becomes more intensive. Modern methods must be followed and, because of this, the native herbaceous plants are finding their roadside existence increasingly more difficult.

There are few locations where desirable wild flowers predominate for any great distance along the roadside. Almost invariably, the greater part of the area is occupied with weeds or grass. Also wild flowers which are desirable in one community are
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frequently regarded as weeds in another, and the cutting of them is made necessary by law. Others are harmless and add to the attractiveness of the landscape. Weeds may be defined as plants which grow where something else is desired to grow, and therefore opinions may differ according to the locality or the individual as to what plants are weeds and what are not. Many flowers which are very attractive by the roadside may be a serious menace in a farmer’s field. This point is very important and should be given consideration if herbaceous plants are encouraged to grow on the highway right-of-way.

The mowing of the roadsides to the property lines several times each season is a customary practice in most localities and this is done to prevent the spread of noxious weeds, to lessen the danger of fire, to provide for safe travel, and to maintain the entire road right-of-way in a presentable and attractive condition. As a result, many wild flowers which are scattered through the area must necessarily suffer. If they are avoided, they cannot be left in a presentable condition without additional hand labor, and the locations are few through the open country which would warrant such a procedure. Large masses of wild flowers growing in pure stands, however, could and should be left, provided they are not considered as noxious weeds and that they are not detrimental to the highway or its use. Such groups should be confined to the outer part of the right-of-way or between the ditch and the property line, as the shoul-
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ders and immediate slopes must be kept mowed to afford motorists a safe view of the ground level.

The preservation of roadside wild flowers is desirable wherever possible and practical. Such preservation may consist in the main of merely allowing them to grow and bloom, as care other than this in most cases would not be economical. The gathering of wild flowers by the public may or may not be permitted. Much of the pleasure derived from them, however, comes from the opportunity to collect them, and careful picking is seldom seriously harmful. To prevent the gathering of a comparatively few wild flowers in this manner, when thousands are available, seems somewhat unreasonable, yet protection must be afforded against those who thoughtlessly and needlessly destroy plants. This is difficult to control without proper supervision, which, in most cases, would involve an excessive expenditure of money.

Wild-flower conservation along roadsides is of less importance than that of shrubs or trees, because in maintaining existing flowers they are often more difficult to separate, within the limits of practical effort, from the weeds and grass, which must be kept mowed. Shrubs and trees, on the other hand, are more effective units in the landscape, they are more permanent and their preservation may not interfere with necessary highway maintenance. Considering all the roads in every section of the country, a pure stand of flowers covering an area sufficiently large to
be worth while preserving, is not commonly found. Many flowers, however, may mature before the surrounding weeds and grass or between the periods in which the grass is cut. In such cases, general mowing may often be deferred until after the flowers fade. This is not always favorable to the healthy and normal growth of flowering plants and it may cause them to gradually die out, but it is better than to completely destroy them in a single season.

The case of existing flowers along the roadsides is little different from that of flowers which are planted. Many individuals, garden groups and others sincerely believe that the planting of the roadsides to flowers is very important and one of the first steps to be considered in roadside development.

Flowers, however, should not constitute the main issue in advocating a complete program of this kind. Perhaps the mention of roadside beautification brings to mind visions of highways lined with thousands of flowering herbaceous plants. These visions are as misleading as the phrase which suggests them. Nothing could be more impractical or more detrimental to the really necessary work of roadside development than over-enthusiastic propaganda of such an idealistic nature.

As previously mentioned, however, flowers are always, more or less, attractive and desirable, but they are not always necessary in a scheme of improved country roadsides. They are useful only from the standpoint of appearance and they are of less im-
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importance than any other plants used. Nevertheless, they should not be entirely eliminated where their planting is warranted.

They appear at their best when naturalized in large groups, but if this involves extensive soil preparation and any great amount of future maintenance, the plan is impractical. Cultivated beds of flowers have no place in the rural landscape, although they may be appropriate on highly improved boulevards in and adjacent to towns and cities. Also, if flowers are to be considered, only such species and varieties should be selected as are not termed noxious weeds in the community and they should be arranged in a manner that will not interfere with the mowing of the weeds and grass.

Roadside flowers which are planted are as likely to be gathered by the public as existing wild flowers and many would no doubt be lost in this manner. Even the most destructive gathering of wild flowers can be tolerated much easier than a moderate loss of planted flowers which have cost not a little in time, money, and effort. Losses of this sort will occur to a more or less degree, regardless of the kinds of plants involved, but they will be greater if unusual flowers or those not native to the community are used. The best solution to the problem is to encourage the spreading of those desirable ones which already exist in the area landscaped or in the immediate vicinity. Usually these are so common that few people desire to gather them, yet they add a touch
of color to the roadsides which is most welcome. In areas where supervision is possible, other plants could be considered. In order to be at all effective, thousands of a single species should be planted in large groups and the type selected should be hardy and able to survive without cultivation. Perennials which require little or no attention after planting, and annuals which will reseed themselves from year to year, provided they are not cut before they produce seed, are the most practical plants to consider.

The types of all plants used along roadsides, in the order of their importance, are trees, shrubs, including vines and herbaceous plants or flowers. Because of their place of importance in the rural landscape, herbaceous plants should be the last to be considered in any program of roadside development. Shaded roads and an effective and permanent landscape, formed by planting trees and shrubs, is far more necessary than flowers. If flowers are included, however, they will appear at their best when given their place as they occur in nature, which is usually in masses through open spaces or in front of and somewhat mixed with trees and shrubs. There are a great many people who have a very high regard for flowers, and such opinions are to be commended, but to overdo in the planting of flowers is an impractical and uneconomical procedure, and because of this it serves to lessen the importance and necessity of roadside development in the eyes of the general public.
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The proper place for the elaborate development of flowers is in the home garden, where suitable care can be given when needed, where they can be viewed by only those who appreciate them and where they are reasonably safe from the unscrupulous, who have no regard for the rights of others. The object of roadside development is not a matter of beautification alone, although attractiveness and an improved appearance provided in a practical manner is highly desirable. Considering this, flowers should be planted along the roadsides only where their cultivation is an asset rather than a liability, with regard to public opinion as well as cost.
CHAPTER V
Nature's Ground Cover

EVERYONE realizes the importance of grass and its necessity is well understood. Grass is such a common plant that its presence is usually taken for granted and its absence in places where it should be grown is regarded with more or less criticism. The general and accepted practice is to surround homes with lawns, residential streets and boulevards in towns and cities have grass-covered parkways, open spaces in parks are planted with grass seed and grass is maintained along country roadsides. The reasons for developing these areas in such a manner are numerous. Grass properly cared for improves the appearance of the landscape, renders the areas so treated more desirable for various uses and prevents the loss of soil by wind action and erosion. These advantages, including that in particular of soil protection, are as important along country highways as in other locations.

Grass along the country roadsides adds pleasure and comfort to motoring because without it the unattractive appearance of barren soil is more or less monotonous and dust blown from such soil creates a dirty and disagreeable atmospheric condition. Dusty roads are also frequently hazardous to traffic be-
cause the safe view of motorists is obscured. Although this condition is largely the result of the material in the road surface, such as untreated stone, gravel, and ordinary dirt common to the locality, yet barren roadsides, particularly where the soil is light, are often the source of considerable dust during moderate or high winds.

Usually when roads are constructed and especially where heavy cuts and fills are necessary, the soil over the greater portion of the right-of-way is more or less disturbed from its natural state. Practically all existing grass and other herbaceous plants are destroyed in this process and the top soil removed with the subsoil for grading purposes. In some sections where these areas are flat or gently sloping, grass will gradually reappear after a few years, while in other localities weeds become rampant or the soil remains devoid of any plant growth. Unless the steeper slopes are properly treated the action of water may prevent the growth of all plants.

Changed and improved methods in road grading are now being followed by many highway organizations which help to prevent the permanently scarred appearance of the roadsides resulting from construction work. The top soil is first stripped and piled to one side or in some other convenient location near the area to be graded. After the grading is finished, the top soil is again spread over the surface of the new grade. There are many cases where this procedure is not practical, but for the most part it adds
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little to the total cost of the completed road and it creates much better appearing roadsides of a more permanent nature. Also, it serves to materially reduce future maintenance costs by providing an immediate and suitable seed bed, thereby eliminating constant repairs to washouts.

The seeds of most grasses are slow to germinate on ground from which the top soil has been removed. On the other hand, there are many undesirable weeds which frequently establish themselves in such a situation in a very short time. Weeds, however, seldom form permanent and satisfactory ground covers and they detract rather than add to the appearance of the roadsides.

As previously mentioned, grass often forms a natural ground cover along roads without the necessity of artificial seeding. This satisfactorily serves the purpose in some instances, but it cannot always be depended upon and there are many situations where a natural growth of grass will positively not occur. In such cases seeding or sodding is desirable and necessary. The most important things to consider in this work are grading, soil, moisture and drainage, kinds of seeds, fertilizers and soil preparation, sowing, sodding, and maintenance.

Roadbeds are now being graded to greater widths than previously in order to safely accommodate the increase in the speed and number of automobiles. This necessitates wider shoulders for safe parking and the placing of parallel ditches at greater dis-
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tances from the traveled way. All slopes are also being made less steep with gentle vertical curves at the breaks in the grade. Wider rights-of-way are therefore needed to accommodate these changes, which result in wider roadside areas to be seeded or sodded.

The proper time to grade the roadsides for seeding and other landscape work is at the time the roads are being constructed or reconstructed. It can be done later, but the cost is much greater and the development of planted material is considerably delayed. Natural rolling slopes are to be preferred wherever possible rather than smooth, flat slopes with the break in grade plainly perceptible as a straight line. Level areas should be sloped only enough to allow the water to run off and smoothed sufficiently to permit mowing with a tractor having a sicklebar unit attached. On boulevards or at particular locations along other roads where more intensive maintenance is necessary the grade should be much smoother to provide for the cutting of the grass with either power or hand lawn mowers.

The grading of the roadsides for grass does not need to be as elaborate as when shaping the soil for a lawn around the home, because perfectly smooth grades are seldom desirable or necessary. Natural grades or rolling ground with gradual variations in elevation are most fitting, but undrained depressions should be avoided. Standing water is responsible for much winterkilling of grass, and to guard against
this, a surface outlet may be provided when grading. Underground tile other than that sometimes installed to drain the roadbed is seldom necessary.

Proper drainage on slopes is not a common problem, but the rapid run-off of water in such cases presents other difficulties. The normal frequency of spring and fall rains will result in the washing away of grass seed from slopes on most soils before it has time to germinate. The steepness of slopes which can be seeded successfully depends upon the kind of soil involved. Light or sandy soils erode much more readily than those of a denser nature, such as clay, and the loam soil of southern Iowa and northern Missouri are hardly affected by ordinary rains. Sodding is the best method of establishing grass on slopes where erosion is a matter to be considered. The grade in such instances is most desirable when it has a natural appearance rather than that of a smooth surface in a single plane. This can be effected by rolling the slope at the top and bottom to avoid a sharp break and to blend it gradually with the adjacent grades. The face of the slope may be broken by sweeping humps and hollows to destroy its otherwise artificial effect. All slopes will provide a much better appearance when made as flat as possible. Their degree of steepness may depend upon the kind of soil, the grade of the adjacent land, the amount of money available for grading other than to provide a suitable roadbed and the desirability of preserving existing trees and shrubs.
Much desirable natural plant growth along the roadsides is often irreparably ruined by improper grading. This is most noticeable with respect to large trees which are frequently left on a small mound of earth high above the surrounding grade. Sharp grading around trees is not always necessary, although any tree worth saving will justify a steep slope. When the ground surrounding a tree is cut to a lower level, the old or original grade should not be disturbed closer to the trunk than at least a few feet beyond the spread of branches on all sides. The slope from the break in all directions should be as gradual and as natural as possible and the area left around the tree need not be in the form of a perfect circle. This method, of course, represents the ideal and cannot be followed in every case. An approach to this ideal, however, is much better than the useless mound of soil only a few feet in diameter which is usually left around trees by grading crews. Even the sodding of such slopes is a waste of money, since the trees will not survive such treatment for any length of time.

If the grade is raised around existing trees they may be preserved by leaving wells of a diameter slightly greater than the spread of branches where possible with the original undisturbed ground surface as the bottom. The slopes may often be sodded, but in most cases the diameter of the wells is so small that in order to expose all of the original ground area possible, the perpendicular sides must be held in place by artificial means such as rocks or timbers.
Wherever such wells are constructed, land tile should be placed underneath the roots to an outlet in order to provide proper drainage. In some cases if the fill is not great the soil may be placed around the tree trunks without leaving a depression, provided the area above the roots is covered to near the new surface with stones, vertical tiles are placed at intervals to permit the proper circulation of air and drain tiles placed underneath the roots. This method of preserving trees is not always successful and seldom permanent and is only recommended when the established grade or location of the trees offers no alternative.

The preservation of trees and shrubs as roads are constructed is very desirable and gradual grades or gentle slopes established over the roots not only aid in this respect but they also offer a more substantial seed bed for grass and result in a general improvement in the appearance of the roadsides. In addition to this, some consideration must also be given to the type of soil encountered.

Extensive soil preparations are frequently necessary in constructing lawns about homes, and these are often followed to a somewhat lesser degree in the building of parkway strips along boulevards. Intensive work of this nature, however, along country roads is seldom warranted because of the vast area involved and because the location does not demand the same quality of turf. Furthermore, the maintenance of the average country roadside as a
lawn would be highly impractical. A good stand of grass, however, is desirable, even though it is cut by means of scythes only two or three times each season and the quality of grass obtained depends to a great extent upon the kind of soil which supports it. In most instances the soil along the country roadsides may be taken as it is found and the kind of grass seed planted which will grow best in the situation at hand. If the soil is reasonably good, this is the most practical method to follow. The addition of top soil is not always necessary but frequently desirable, especially when the original top soil has been removed. Its use in most cases may be found too expensive unless it can be salvaged on the site, as previously explained. Regardless of the extent to which the ground is prepared, some knowledge of soils is necessary in order to get the best results from sowing grass seed.

Any soil is extremely complex and there are many closely related factors which designate its fitness for grass. The texture is improved by the proper arrangement or relation of the soil particles to each other with respect to their sizes. Varying amounts of organic matter are required to provide humus. Also certain bacteria are necessary to form a fertile soil, but they cannot live unless organic matter and other foods are present and unless the soil is of the proper structure to provide suitable air, moisture and temperature conditions.

Soils are commonly referred to according to their
physical characteristics as sand, loam, clay, muck, and peat, or various modifications of these as one blends with another. They may then be known as sandy loam, silt loam, clay loam, and so on. Sand is made up of loose soil particles which lack the ability to stick together. It has a very low moisture-holding capacity and humus content and contains little or no available plant food. The soil particles of clay are much smaller than those of the finest sand and they adhere together much more readily. A pure clay represents the extreme opposite of sand in its ability to hold water, in fact this is the major reason why such a soil is undesirable. A loam soil falls about midway between sand and clay with respect to its texture, water-holding capacity and workability. Muck is made up of completely decomposed organic matter and a relatively large amount of mineral matter. It is usually found above peat deposits. Peat consists of fibrous organic matter which has been arrested in the process of decay. It is the result of an accumulation of marsh, bog and water plants formed over a long period of time. There are many grades and kinds of peat, but as such they are of little value until they have been given special treatment. Organic matter undergoing the process of decay in the soil is known as humus and it may be formed artificially by treating muck or peat with animal manures or it may occur naturally as a result of an accumulation of animal matter or dead leaves and other plant material.
The physical make-up of a soil does not always indicate its degree of fertility. Two soils may appear exactly alike, yet one may support a good stand of grass while on the other the grass may be scattered and of poor growth with numerous bare areas. This result is due to the difference in the chemical composition of the two soils and can only be determined by certain tests and by the appearance of the plants which grow on them. At the present time, sixteen elements are thought to be necessary to plant growth and seven of these are found in the soil. Soils which are lacking in these elements or which contain them in unavailable forms will not grow plants satisfactorily. Cultivation and the use of manures, humus and lime frequently aids in releasing elements which are otherwise impossible for plants to obtain.

Soils are also either acid or alkaline in varying degrees or they are neutral and many plants are very sensitive to the reaction produced. The most desirable grasses grow better than most weeds on a soil which is slightly acid. If a soil can be maintained in this condition, less trouble will be had with weeds and a better stand of grass will result. Lime is frequently used to neutralize acid soils in addition to improving their physical condition, but lime must be cautiously applied on soils which are intended for grass. Ammonium sulphate is often used to promote an acid reaction in soils which are decidedly alkaline.

Grass does not require the best soils for a good growth, but will produce a good turf on those which
have only moderately favorable physical and chemical properties. One specific kind of soil cannot be designated as ideal for grass, since some kinds of grass will grow better in some localities and situations than in others. A variety of soils is found along country roadsides and for the most part they have not been improved artificially. Rather they have been allowed to deteriorate by the removal of all vegetation and general neglect and in most cases, as a result of road construction, the subsoil is exposed while the topsoil has been wasted in fills. To attempt to improve the soil in such areas by the addition of fertilizers, manure and humus, would be impractical and the most that can usually be done within reasonable limits is the addition of top soil. All average soils will support grass and some poor ones do a fairly good job of it, provided the drainage is satisfactory.

A soil must be able to supply great quantities of water if the grass is to remain green and thrifty. Too much moisture, however, will do more harm than too little, especially if the drainage is poor. The addition of humus increases the water-holding capacity of soils and it also improves their physical condition. Underdrainage for grass is often desirable, but seldom practical along country roadsides except where steep slopes are concerned. In most cases, the more or less level areas can usually be sufficiently well drained over the surface with shallow gutters or by proper grading. The banks of
newly formed cuts, however, frequently extend below a natural underground drainage course or table of free water, commonly referred to as the seepage line. This usually occurs directly above a strata of clay or rock. The water in such cases must be intercepted by a parallel tile drain before it reaches the surface if grass is to survive on the slope. Such a drain is usually placed in the bank at a sufficient distance from the face of the slope to permit a gravel or stone backfill to be placed perpendicular to the surface of the natural ground level at the top of the bank and back of the break in grade.

In the case of heavy fills, where the road shoulder is sloped to the natural ground level below, a shallow gutter or a tile drain with catch basins should be placed along the top to intercept and collect the surface water. If this is not done, the grass will be rapidly washed from the slopes. These underdrainage recommendations are for slopes which are to be sodded. Slopes which are seeded will seldom prove satisfactory, anyway, and underdrains will aid but little in maintaining seed until it germinates.

The proper installation of a tile drainage system is almost always necessary in order to provide the best lawns. Insofar as roadside development is concerned, such preparations are seldom considered practical except perhaps along boulevards or in locations where the adjacent improvements warrant such a procedure. Underdrains placed along sodded slopes to prevent seepage water from coming to the
surface are necessary, however, wherever such a condition exists. The expense of installing the tile in such instances is far less than that of continually repairing the eroded slopes.

The matter of proper drainage suggests another reason than that of appearance why the grade of slopes should be as gradual or flat as possible. Steep slopes encourage a rapid run-off of water from rains, which has an eroding effect. Also, much water is lost over the surface which would otherwise penetrate the soil of more gentle slopes and aid considerably in the root growth because in such instances the grass receives only a small amount of water at the surface of the ground. This in turn causes the turf to dry or it is killed out entirely, especially on steep slopes which face to the south, regardless of the kind of grass used.

Different kinds of grasses are selected for lawns because of the color and texture of the leaves and because the situation may be shaded or exposed to the sun. The soil is usually changed to suit the type of grass desired and this in turn may largely depend upon the owner’s preference.

The complete renovation of the roadside soil as a general policy is impractical and, as previously mentioned, it must be taken largely as it is found. For example, a clay soil may be improved by a reasonable amount of tillage and the addition of humus or manure, but it will still remain basically clay. The same is true of sand or any other type of soil, and
therefore the kind of seed used must depend more or less upon the kind of soil encountered.

Exposure is also an important factor which governs to some extent the selection of seed. Some grasses grow better in the shade than others, while some prefer a more open and sunny situation. Insofar as texture and appearance are concerned, the general public will be well satisfied if a permanent green ground cover is established. Grasses must, therefore, be selected which will form a dense and lasting turf. If this is done, the texture and color will be quite satisfactory and the resulting ground cover will prevent the occurrence of bare areas and erosion.

A common practice in the seeding of roadsides is to use rye, timothy and clover because the seed is cheap and the growth is rapid. These plants alone will never produce a satisfactory sod because they are short lived. They may be mixed with other more desirable grasses to protect these slower-growing kinds from the sun until they become established, but if seeding is practiced at the proper time of the year, better grasses should be used for this purpose. Plants which are designed to protect desirable grasses in the early stages of their development are referred to as nurse grasses. All things considered, the mixtures of grass seed used along the highways should contain much more seed of the permanent and good turf-forming grasses than that of nurse or temporary grasses.
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Owing to the variations in soil and exposure, several different grass-seed mixtures are frequently required on a single project. There is no one kind of grass that will survive every condition, and to attempt to use a single variety or even the same mixture for all locations will result in the complete failure of more or less of the planting.

Mixtures are used instead of a single kind of grass seed for several reasons. The permanent grasses, or those which are to form the permanent turf, are slow in establishing themselves and, as previously mentioned, grasses which grow more rapidly should be mixed with them to protect them and to form a temporary sod until they develop. Different kinds of grasses mature or become at least partly dormant at different times during the summer, and proper seed mixtures help to provide a constant growth from early spring until late fall. The kinds of seed in mixtures should vary to a reasonable extent according to the types of soil, but there are many soil differences which cannot be provided for in detail without the work of seeding becoming very impractical. To guard against this, mixtures may be prepared for each general type of soil and the soil variations in each general type may be provided for in the kinds of grass seed used. One or more of the varieties included will then develop and a good stand of grass will be assured. The percentage of each kind of seed to use in a mixture depends upon the climate, soil, exposure and moisture conditions and
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can only be determined by experience or by seeking the advice of an expert. If large quantities of grass seed are required, the best and least expensive method is to purchase each kind separately and prepare the mixture to suit the conditions at hand. Standard seed mixtures, however, may be found satisfactory if only a small amount of work is to be done, provided cheap seed is avoided and only reliable dealers patronized.

The purchase of grass seed on the basis of guaranteed purity and germination tests will insure the best quality. The acceptable percentages of purity and germination may vary somewhat from year to year depending upon weather conditions, which affect the seed crop and the growth of weeds. Current information concerning such percentages may be obtained from state departments of agriculture or the United States Department of Agriculture. Seeds of the best quality have the highest germination percent and the smallest content of weed seeds. The cheapest mixtures frequently contain more seeds of weeds and of the less desirable grasses in addition to sometimes having a lower germination percentage. Many of the less desirable grasses have little real value and are occasionally placed in mixtures to render possible a reduced price, while the proper bulk and weight is maintained. If reliable seed companies are dealt with and if price is not the sole issue, little difficulty will be experienced in obtaining the best possible results.
Kentucky blue grass is the best permanent grass for northern United States and Canada. It prefers a good soil and is not at its best in extremes of sand, gravel or clay. It usually requires about three years to form a good thick sod, but with proper care it will improve with age. Canada blue grass grows fairly well on poor or dry soils but has a tendency to establish itself in bunches and should be used only sparingly in mixtures.

Rough-stalked meadow grass is the common name given to another member of the blue-grass family which is very desirable to use in shady locations. It is a permanent grass and will survive in situations where Kentucky blue grass would require more sun. Annual blue grass reseeds itself each year and may be included in mixtures to produce a rapid and dense growth. The bent grasses are not recommended for roadside use because of their refined nature and because of their excessive maintenance requirements.

Chewing’s New Zealand fescue is a basic grass which is suitable for light soils and dry situations. It is of creeping habit and forms a dense turf with an extensive root system where conditions are favorable for its development. Sheep’s fescue and red fescue are more or less undesirable bunch grasses and are frequently found in the cheaper seed mixtures.

White clover forms a good nurse crop because of its wide leaves and rapid growth. It succeeds well on poor or sandy soils, but unless allowed to reseed itself it will die out after the first or second year.
Red top is probably the best of the nurse grasses. It germinates rapidly and forms a dense growth, but with close cutting it will disappear in about three years. English rye grass, American rye grass and timothy are also used as nurse crops. They are only temporary and cannot be depended upon to form a permanent turf.

Grasses commonly used in the South and which are most suitable for roadside planting include red top, white clover, rye grass, bur clover and Bermuda grass. Bermuda grass is frequently killed by frosts, and where such weather conditions are likely to occur, it should be planted in the early spring. The best time to sow grass seed in temperate localities, however, is in the fall from the middle of August until the middle of October, depending upon climatic conditions. At this season of the year the cool weather and normal rainfall is ideal for the growth of most grasses, a strong root system is developed and there is a greater tendency toward spreading instead of excessive leaf growth. Weeds are also less serious at this time, since those which do develop are usually killed by frosts, which will not damage the grass. Spring seeding is less advantageous because it encourages a rapid leaf growth at the expense of the roots and weeds are much more troublesome at this time. The soil, however, should be prepared well in advance of either fall or spring seeding.

After the soil has been properly graded and drained, the preparation of the seed bed may pro-
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ceed. All too frequently much seed is wasted and a poor stand of grass obtained by trying to economize at this stage of the work. Many may hesitate to spend money for top soil, fertilizers and humus and are of the opinion that the necessary work prior to seeding is the result of fussy and impractical ideas born of landscape theories. Such work, of course, can be made impractical and frequently this is the case, but at least some attention must be given to soil preparation if a reasonable stand of grass is expected.

Ideally, the soil for grass should be prepared about one year in advance of seeding. During this time it should be constantly worked to prevent the growth of weeds and to improve its texture. Clay soils, however, should never be worked when wet, as this causes the formation of hard lumps which are difficult to break. The exposure of bare soils to the action of winter weather aids in placing them in proper condition for seeding. Deep plowing followed by continued cultivation with a disc harrow until seeding time is the best method to follow. Usually, however, roadsides are seeded in haste, the object being to secure a stand of grass as soon after construction work has been completed as possible. This is desirable from the standpoint of appearance and occasionally because of dust, but more often more time could be taken which would add to the appearance later on and also reduce the future maintenance costs of reseeding and repairing washouts.
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Good or average soils need not be treated with fertilizers or manures, but frequently this is necessary. If green manure is used it should be worked into the soil with a spring-toothed harrow well in advance of seeding. Well-rotted manure may be treated in the same manner, although it can be applied much later with safety. Stable manure may be applied at the rate of thirty or forty tons per acre.

The use of commercial fertilizers in preparing seed beds for grass has been found very beneficial. They afford easily available food when the plants are young and aid them considerably in becoming established. Commercial fertilizers used for such a purpose should contain the three elements which are least abundant in most soils, namely, nitrogen, phosphorus and potassium. Phosphorus is considered the most important element required by grass during its early stages and the fertilizer used should therefore contain relatively more of this than of the other two. One having a formula of 4-12-4 or similar, is satisfactory for average conditions. The formula indicates the percentages of available nitrogen, phosphorus and potassium in the order named.

Commercial fertilizers should be applied at least one week before seeding and at the rate of from five hundred to one thousand pounds per acre, depending upon the type of soil and its condition. An even distribution is important and this may be accomplished by the aid of a lime or fertilizer spreader. After spreading, it should be worked into
the top three or four inches of soil with a spike-toothed harrow. Just prior to seeding, the surface should be smoothed with a cultipacker, smoothing harrow or an improvised timber drag.

The amount of grass seed to apply per unit of area or the rate of seeding is an important consideration. Many are of the opinion that twenty-five pounds per acre or the amount usually sown in fields for a hay crop is sufficient, but this is a mistaken idea, for the object in each case is entirely different. When grass seed is sown for hay it must be planted sufficiently thin to permit each stalk to grow to maturity. A full and complete development of the stalks above ground is desired, while in sowing grass seed for sod, the opposite is desired. A thick mass of roots is necessary to produce a good turf and the stalks, by frequent cutting, are not allowed to reach maturity. This aids in developing a heavy sod which is necessary to form a permanent and protective ground cover.

The amount of seed to sow depends somewhat upon the kind and quality of the seed used, the fertility of the soil and losses which may be due to deep covering, wind, rain, and various amounts eaten by birds. Considering these factors, the amount recommended for the average situation is one hundred pounds per acre. In general, this will provide a substantial growth with a minimum amount of bareness or thin distribution of grass.

Seeding is often practiced by hand, although those
given the responsibility of this work must be thoroughly experienced if an even distribution of seed is to be obtained. Wheelbarrow seeders are more or less impractical on roadside work and grain drills are unsatisfactory because they distribute the seed in rows and some length of time is required for the grass to spread in the spaces between. The best device is a small mechanical seeder which is carried by one person and by turning a small crank the seed is thrown out uniformly over a wide path.

As soon as a short stretch of seeding is completed, immediate covering is necessary. Not more than one-half inch of soil should be placed over the seed or the seed may be thoroughly mixed with the top one-half inch of soil. This can be rapidly accomplished on heavy soils by a spike-toothed smoothing harrow and on lighter soils with an improvised wood drag. Light tractors may be used, but horse-drawn implements are more satisfactory, since the wheels of power machines usually bury the seed too deep.

A light rolling is advisable after the seed has been covered or mixed with the soil. This flattens out the ridges caused by harrows and firms the soil about the seed. Compressing the soil in this manner permits the capillary moisture to rise from below more readily and provides a solid footing for the grass roots. Heavy soils should be compacted with a lighter roller than that used on light soils and in no case should the soil be seeded or rolled when it is excessively wet.
Artificial watering is usually required in the construction of lawns to promote a rapid and suitable growth, and the watering of grass seed on boulevards may also be found desirable and necessary. This, however, is not practical along country roadsides except possibly in special locations, while seeding at the proper time may eliminate much of the necessity for watering. If water is applied, the soil should be kept continually moist until the grass is well established. Water applied slowly and with a fine spray will properly saturate the soil without danger of washing or disturbing the seeds. The frequency of watering depends upon the weather, and since the soil should never become thoroughly dry, applications of water may be made over long or short periods, depending upon the amount of natural rainfall. The greatest danger to grass caused by drought usually results when dry weather occurs soon after the seedlings appear. At this time the tender shoots are easily killed by the hot sun and a dry soil. Water may be applied by hand or suitable sprinklers may be employed.

Newly planted grass will survive much better if it is not mowed for the first time until it is at least five inches in height. Usually the grass along country roadsides is permitted to grow much taller, since it cannot be readily cut with tractor mowers when less than six inches tall. The grass in the parkways of boulevards is usually cut with lawn mowers and maintained much in the same manner as a lawn.
Cutting the grass to a height of about two inches in such localities is recommended and the clippings need not be removed. Also the cut grass along country roadsides may be left unless it is exceptionally long and constitutes a fire hazard or provides too much of a covering for the growing grass.

The light rolling of sandy soils after the seedlings appear is sometimes advisable in order to form a smooth and firm sod. Reseeding may also be found necessary in areas where the grass fails to appear. This may be done as soon as such conditions become evident, or if the season is too far along it may be deferred until the next seeding time.

As the seeding of roadsides is contemplated the fact must be remembered that grass seed will not germinate in all situations and that a satisfactory turf cannot be secured by merely scattering seed in the same manner over all areas. As a general rule, slopes cannot be successfully seeded, as the seed will be washed away by rains before it starts to grow. Much time and money can be saved by sodding such slopes and seeding only level areas or those which have a very gentle slope. Steeper grades of heavy soils may be more successfully seeded than the same grades of lighter soils, although much depends upon the frequency and severity of rains. The exact grades which require sodding can only be determined according to local conditions.

Suitable turf may be purchased from sod nurseries or it may be taken from fields where it is growing
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naturally. If commercially grown sod is not obtainable, areas used for pasturing are to be preferred as a source, since in such places the roots are well developed because the grass is kept short. Sod grown on a rather light loam and cut to from one to one and one-half inches in thickness is the most economical to handle. There are many methods of cutting sod. Some prefer handling it in long strips which are rolled, while others desire it in small squares. This is a matter which must be worked out on each job. In sodding slopes the sod should be placed at the bottom first and adjoining pieces laid until the top is reached. If the slope is unusually steep, pegging the sod may be necessary, and in any event it should be well watered, a small amount of grass seed spread over the surface and the area rolled.

The following specifications are used by the Board of County Road Commissioners, Wayne County, Michigan, for the purchase of sod:

"The term sod as herein used shall mean the top one and one-half inches of well-established field or nursery grown turf furnished according to the following specifications:

"Sod to consist in major part of blue grass grown on loam soil and cut to an even and uniform thickness throughout of one and one-half inches, in squares approximately twelve inches by fourteen inches in size or in strips about sixteen inches in
Sodded slopes planted with appropriate shrubs are best for utility as well as beauty.
width and seven feet in length as required. Where strips are required, the sod must be rolled with the top folded inside. The method of cutting the sod must be regulated according to the requirements of the job. Sod cut in strips and rolled will be generally permitted, but in some cases blocks of sod as previously mentioned may be preferred.

"Sod grown on soil which is too light or heavy clay or sod which cannot be handled without breaking, tearing or otherwise being unavoidably damaged will not be accepted. Sod shall be of such texture and toughness as to permit handling and placing on the job without excessive waste.

"All sod must be reasonably free from quack grass, crab grass, pigeon grass, dandelions, buckhorn plantain, broadleaf plantain, chickweed, wild carrot, thistle, goldenrod, ragweed or other undesirable grasses and plants.

"The grass must be mowed before the sod is cut so that the grass on sod delivered will not exceed three inches in length.

"All sod must be delivered to the job within thirty-six hours after being cut.

"All sod which does not conform to these specifications or sod not otherwise satisfactory will be rejected on the job."

After a stand of grass is well established along the country roadsides the most important item of maintenance is that of mowing. Large areas must
necessarily be covered in this work and a number of tractor mowers and a considerable amount of labor is required. To keep all the grass cut in the same manner as lawns are mowed is impractical and at times impossible. If the grass is maintained at a height of six inches it will serve all purposes exceedingly well and in doing this a number of men equipped with scythes must be employed in addition to the many tractor mowers.

Fertilizing and weeding are seldom practical considerations except along boulevards where lawn areas are maintained and they may then be undertaken only as found necessary. Diseases and insects likewise cannot be treated within practical limits and remedial measures need only be applied when a serious outbreak occurs. Reseeding, however, is frequently necessary and in such cases the soil and drainage should be improved. Also, the sod which has been placed on steep banks sometimes slips before it becomes established. The re-sodding of such areas as soon as the damage occurs is advisable.

The burning of the grass along the roadsides in the spring and fall is a common practice in many localities. The purpose is to destroy the accumulated dead grass, weeds, and weed seeds and to improve the general appearance. This method of clearing the roadsides, however, cannot be recommended as the grass roots are severely damaged by fire and much of the humus in the soil is destroyed. A better practice would be to mow the grass and weeds more fre-
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Quently during the growing season, thus preventing the accumulation of an excess amount of dead material. The shorter and newly grown clippings of grass and weeds will disintegrate rapidly during the summer and be more or less beneficial to the turf.

The seeding and sodding of the roadsides within practical limits and the maintenance of the resulting grass in a similar manner is a very important part of any roadside development program. Grass areas maintained as lawns are commonplace, they surround every home and they appear inappropriate in few locations. From the standpoint of appearance, people in general are more interested in grass than in any other class of plants; they are accustomed to seeing grass where it should be grown and they are even frequently concerned with weeds in their lawns when they do not have flower beds or shrubs. The necessity and popularity of grass cannot be questioned and its use along the roadsides invites little criticism, while serving a most economical purpose.
CHAPTER VI
The Nursery Question

There are hundreds of large nurseries now operating successfully in this country and there would be no reason for their existence if satisfactory plants could be otherwise obtained. This, however, has been proven impossible and experience has shown that properly grown nursery stock is far superior to that taken from its native state in uncultivated areas. The question of quality is involved and the quality of plant material used in roadside development is a very important consideration. In fact, it is so important that it may be solely responsible, in many instances, for the success or failure of the work. Tall, thin and sparsely branched trees taken from the woods seldom grow to be desirable specimens and many from this source fail to survive the first season. A roadside planting containing trees and shrubs of a poor quality creates a more unfavorable public opinion than the appearance of the same location before the attempted improvement. The reason for this is the evident waste of the taxpayers' money, which constitutes logical grounds for dissatisfaction.

Unfavorable public opinion is also frequently created because of the destruction of existing trees and shrubs during the process of constructing a new
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road. This loss, unfortunately, cannot always be avoided, since the way must be cleared for the road-bed, shoulders and ditches. Occasionally the alignment may be changed, or more often the location of the ditches altered or water courses tiled in order to save existing plant growth, but this cannot always be done.

The chopping down of trees, the digging out of stumps and the grubbing of shrubs to make way for a smooth, wide highway and the purchasing of new trees and shrubs to take the place of those removed, although in a new location and at a greater distance from the traveled way, may appear to many as a very inefficient practice, since at least some of those existing could be moved rather than destroyed. Also, even though none are destroyed, more trees and shrubs may be needed and the question may arise as to why native plants growing in the vicinity are not used instead of those grown in nurseries which may have to be shipped from great distances. In spite of the apparent inconsistency of this practice, which is gained by a first impression or by limited experience, properly grown nursery plants should always be used in preference to collected stock. Collected stock refers to plants obtained from a natural state which have been growing entirely on their own without the aid of man.

Trees properly grown in a nursery are stronger, of a better shape, more vigorous and better able to survive transplanting than those taken from the
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fields or woods. They are usually cut to the ground the second or third year in order that the resulting surplus of roots may produce a straight, sturdy and thrifty trunk upon which can be built a satisfactory form. The time and method of such pruning depends upon the species and various other methods of indoor and outdoor culture, such as grafting, budding, transplanting and treatment of seeds are practiced in order to secure the best possible foundation for desirable plants.

Approved nursery practice involves, among other things, the correct spacing between plants in order that each may properly develop. In order to maintain such a spacing they must be frequently transplanted as they grow. As this is done, or at more frequent intervals, the roots are pruned. This cutting off of the roots at a short distance from the trunk stimulates or forms a heavy growth of fibrous and feeding roots directly beneath the trunk. When any tree is dug, more or less of the fibrous roots are lost or torn away, but in the case of a properly grown nursery tree more fibrous roots are obtained by reason of their induced concentrated and comparatively safe location underneath the center of the tree. All roots possible should be obtained when a tree is dug for replanting in order to provide the top with at least sufficient nourishment to survive.

In contrast to this, a tree which has not been cultivated or root-pruned extends its roots over a wider area in search of food and water. Normally, the
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greatest number of fibrous roots are developed at approximately the same distance from the trunk as the ends of the branches. This is largely due to the branches and leaves forming a water shed which directs the drip in a circle about the trunk corresponding with the circle described by the ends of the branches, or the top acts as an umbrella in directing the water to the ground. Some fibrous roots are developed within this circle and as the tree grows the circle becomes wider and the roots more branching. Because of the spreading habit of such roots fewer are obtained when the tree is dug and less nourishment is provided for top growth than in the case of a root-pruned tree, which can be moved with a greater number of fibrous roots.

The practice of root pruning is considered a very important factor in the successful transplanting of trees. Many of those which develop vertical or tap roots and which are consequently difficult to move with safety, may be induced by root pruning to grow more lateral roots, and if the vertical roots are frequently severed the trees are much easier to remove. This, however, must be a gradual process from the seedling stage.

Experienced tree movers have found that large trees moved from a natural and uncultivated state transplant most successfully after they have been root-pruned or when each root, including all attached fibrous roots, is removed to its full length when dug. The root pruning of such trees requires
two or more years of preparation before final digging. In the late fall or winter of the first year a trench severing all roots is excavated half-way around the tree at a distance from the trunk equivalent to the proposed ball of earth to be taken with the roots and at a depth to include the lowest lateral roots. The soil is replaced and the following or second year the same procedure is repeated around the opposite side of the tree. One or two years after the last trench is dug, the tree, which in the meantime has developed a number of fibrous roots within the area and at the rim of the prepared ball of earth, is ready to be transplanted. This involves a great deal of time and labor, but in any event the moving of large trees is a more or less expensive operation and every precaution possible must be taken to prevent a loss.

Large trees are frequently moved from a natural state by carefully excavating each root throughout its entire length. When this is done, root pruning is unnecessary, and although the actual cost of moving is greater by this method, it is advantageous in that it can be accomplished at once and without loss of time. Native trees moved without consideration given to the roots as required by these two methods have much less chance of surviving. In so far as roadside development is concerned, the cost of moving large trees is prohibitive except in rare instances. The inconvenience and expense of securing small trees from a natural state for roadside planting and the failure
of the majority of them to survive results in this practice being very uneconomical and unsatisfactory. Trees growing in the woods are more or less shaded and in the struggle for light the trunks become tall and thin with few side branches. Even if a tree of this type should survive transplanting, it would never possess a typical or satisfactory form. The top is also easily bent or broken by storms.

Trees growing in the open fields may have very desirable forms, they may be typical of their species and sturdy, healthy growers. They have not, however, been cultivated or root-pruned and their roots are widely scattered with the greater number of feeding or fibrous roots at some distance from the trunks. To secure the necessary quantity of roots in digging and to properly plant the long roots thus obtained would require an excessive labor cost. To purchase such trees over a period of years for transplanting would also involve, with perhaps a few exceptions, too much time and expense and the uncertainty of a definite public program of more than one year in advance might result in the total loss of work already done. In addition to this, there would be the added drawback of excessive losses. These losses, together with excessive expenditures, may be avoided by the use of smaller trees obtained from reliable nurseries. A further advantage of this is that trees of desirable shapes and forms can be secured.

As properly grown nursery trees increase in size,
the tops are shaped by pruning to prevent the formation of dangerous crotches, cross branching and general weak development not typical of the species. To be effective, this work must be started when the trees are seedlings and continued as found necessary until they are marketed. Native trees have not had this care and although many may be well developed, the majority are far from satisfactory.

In regular or formal plantings, trees of a uniform size and shape are most desirable. To collect trees which would suit this purpose would not be an easy task and much time and extra expense would be involved. To select them in a nursery is much more convenient and a great deal less expensive, since trees of a uniform size are grown in separate blocks or areas.

The extra time and the additional cost of digging and replanting native trees has already been mentioned. In addition to this, the inconvenience of slow transportation must also be considered, for, during the planting season, if any reasonable program is followed, all labor and time available must be devoted to receiving and planting. Trees can be dug easier, quicker and earlier in the season in a nursery than in a natural location and they can be shipped to the receiving point when desired. This is a great advantage over the practice of collecting. If the trees were collected and delivered by others, there would still be the disadvantage of using inferior and undesirable stock.
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The advantages of securing properly grown nursery stock are not limited alone to trees, but they apply to evergreens, shrubs, and herbaceous plants as well. Only reliable nurseries should be considered or those in which plants are properly propagated and developed. The results will be a direct saving in time and money, a lower percentage of loss, sturdier, hardier and healthier plants and a more attractive and rapid growth. Also, plants grown in nurseries are inspected from time to time by representatives of Federal and state governments for the presence of injurious insects and diseases. Those affected are not permitted to be sold until they are free from these pests. The inspection of all plants which might be collected, to determine the presence of these pests, is physically impossible, and if such plants are used there is always the danger of some infestation or infection being spread to new areas.

Because well-grown nursery stock is the best material to plant, many publicly owned nurseries have been established to serve the needs of cities, counties and states. Government owned and operated nurseries established to provide trees for reforestation are practical and economical largely because tremendous quantities of trees limited to a few species are grown and these are usually transplanted to their permanent locations in the seedling stage or when very small. Such nurseries are for the most part propagating institutions and the plants are set out over the areas to be reforested as soon as they
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are able to survive alone and establish themselves. Growing trees for timber, flood control and to prevent erosion is considerably different than developing them for highway planting where shade and appearance is most important, although to some extent they may serve the same purposes. The appearance of trees designed for forestry purposes matters little and if they are planted sufficiently close together they will grow tall, produce clear timber and at the same time serve other uses for which they are intended.

In addition to propagation, several years of nursery development are required to produce trees suitable for roadside planting and consequently the land upon which they are growing remains occupied during this time. Large quantities of forest trees grown in a Government nursery to the larger sizes commonly used in highway planting and the labor required to transplant these trees would involve a prohibitive cost, at least at the present time. Forest nurseries are, therefore, quite distinct from those in which plants are grown for other purposes, and to attempt to convert them to uses other than that for which they are intended would be highly impractical.

Many subordinate branches of county and state governments frequently support small nurseries and greenhouses where various plants are grown for ornament and shade. The governing authority of almost all public institutions, involving the control
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of land ranging from very small areas to large tracts, decides at some time or other that a nursery would be an economical benefit since it would provide the plants necessary to properly decorate the buildings and grounds. The thought is that they have the land, so why not grow their own trees, shrubs and flowers.

If this idea is carried out, the usual results after a few years are an accumulation of too many plants of the wrong kind, too few of the desired kind, the plants need moving because they are overcrowded, and there is no money available for this purpose or there are no funds for proper maintenance. Money needed for these purposes is usually the first to be removed from public budgets when further economy is required. Many municipal nurseries have been established by city park and forestry departments, but in general these cannot be considered strictly economical.

A varying number of years are necessary to produce trees and shrubs of a size suitable for ornamental planting. In the propagation of some plants three years are required for them to develop under glass or indoors before they can be placed in the nursery row, and several years more are necessary before they can be used in permanent plantings. From six to twelve years are required for deciduous trees to reach a size of three inches in diameter, and larger trees must be grown a correspondingly longer time.
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To grow such plants intelligently means that the total number and kinds must be known several years in advance. This is more or less of an impossibility, since public budgets are usually made up from year to year only and future expenditures cannot be correctly anticipated beyond the season at which approved budgets apply. Furthermore, the personnel and policies of the department or board may be changed, which may result in different plants or quantities of plants being required. The usual results of such uncertain conditions is a shortage in some species and an oversupply in others, which means that some additional plants must be purchased each season, while others are destroyed or left to grow without serving any purpose. A further undesirable condition may be created if those in authority insist that the surplus plants be used regardless of their appropriateness or fitness for the situation considered.

In addition to this and on a fair comparative basis, which includes land values, the cost of growing plants in a municipal nursery is usually greater than in a commercial nursery. Commercial nurseries are operated as a business, and unless a reasonable profit is forthcoming each year they cannot survive. Municipal nurseries, on the other hand, are not operated for profit and there is therefore less tendency to reduce operation costs. Also, the business of all public authorities who have need for ornamental nursery stock is the planting and maintenance of the
A methodical procedure in unloading, pruning and heeling-in trees is most economical
material only, and to engage in the production of plants is a step beyond the necessary. The only real advantage of a municipal nursery is that the material is available when needed, provided the kind of plants needed are grown.

The most economical arrangement insofar as roadside planting is concerned is to maintain a receiving yard where all plant materials can be unloaded, inspected, pruned, heeled-in, and sprayed preparatory to planting. A central yard for this purpose is of great help in planting, for it permits the plants to be assembled in one location from which they can be more easily transferred to each job with less confusion and cost than if they were delivered directly to each job from nurseries. By purchasing only the plants needed, the yard can be completely cleared at the end of each planting season, the difficulty of accumulated surplus stock will be avoided and additional land will not be required except as may be necessary for the growing of a few trees, shrubs and herbaceous plants which cannot be secured from other sources.

In contrast to this practice, a few municipal nurseries which may be considered successful are being operated, and in these cases full credit should be given to those in charge who, with a great deal of honest effort and against innumerable difficulties, have given the public a dependable and economical source of plants. Without question the finest and most successful municipal nursery in this country for
the growing of ornamental trees and shrubs is that operated by the Department of Parks and Boulevards at Detroit, Michigan. This nursery was established and developed under the direction of C. E. Smith, Superintendent of Forestry and Landscape for that department, and has been in operation since 1913.

Such nurseries, however, are exceptions and even these cannot supply the demand made for material each year. In general, municipal nurseries cannot be considered economical as long as suitable stock can be purchased from commercial nurseries at reasonable prices. Should the nurserymen fail in this respect, then the establishment of publicly owned nurseries will be a necessity.

The operation of municipal greenhouses is of less importance than nurseries, since practically all herbaceous plants necessary to public works and which require such protection can be produced and used in a single season. The anticipation of such plants required beyond a period of one year is for the most part unnecessary. Municipal greenhouses, except those for display and arboretum purposes, are most practical when used to shelter tender plants through cold weather and to start annuals in the late winter. The propagation of hardy perennials may well be left to reliable commercial nurseries, since more than one year is required for their development before they can be used.

There are a number of reliable and experienced
commercial growers who thoroughly understand the proper methods of propagating and developing plants. Some are specialists and are concerned with only certain groups of plants, such as perennials, shrubs, deciduous trees or evergreens, while others operate nurseries of a more general character. In spite of this, the species of plants desired occasionally cannot be found and at times others can be obtained only in limited quantities. While the correct anticipation of all future requirements is impossible, the progressive nurseryman should be alert to probable developments and endeavor to be prepared well in advance.

Nurserymen have made a great deal of progress during the past few years in the growing and handling of ornamental nursery stock. The more improvement that is made along this line the less will be the necessity for the establishment of municipal nurseries, provided, as previously mentioned, that prices are maintained at a reasonable level. The requirements of municipalities with reference to the quality of stock purchased are being made more specific and are being more rigidly enforced each year, although not unduly so, and as a result the public is being given the benefit of the best grown plants obtainable.

The following specifications for deciduous and evergreen trees and shrubs as adopted by the Board of County Road Commissioners of Wayne County, Michigan, is an illustration of this:
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SPECIFICATIONS

FOR

DECIDUOUS AND EVERGREEN TREES AND SHRUBS

1. Definition of Terms

Wherever in these specifications the following terms are used they shall be interpreted in accordance with the definitions given herewith:

"Board" — The Board of County Road Commissioners of the County of Wayne, State of Michigan.

"Vendor" — The person, firm or corporation receiving a written order from the Board for the supplying of plants.

"Plants" — Deciduous and Evergreen Trees and Shrubs.

2. Estimate of Material

The estimate of material to be purchased under these specifications is approximate and represents the anticipated requirements of the Board. The right is reserved by the Board to alter sizes, quantity, species and varieties of plants and, if desirable, to secure new or additional quotations covering such changes.

3. Subletting or Assigning Orders

The Vendor will not be permitted to assign an order in whole or in part to any person, firm or corporation without the written consent of the Board and in case of such consent his responsibility as represented by these specifications shall in no way be impaired.

4. Names of Plants

All plants ordered according to these specifications must be true to name. The standard names are those adopted by the American Joint Committee on Horticultural Nomenclature. The plants corresponding to these names are those described in Bailey's Standard Cyclopedia of Horticulture
THE NURSERY QUESTION

(as referred to in the list of the American Joint Committee on Horticultural Nomenclature) or Rehder’s Manual of Cultivated Trees and Shrubs. No substitution of species or varieties will be accepted without the written consent and approval of the Board.

5. Size of Plants

All plants on which prices are quoted must be of the sizes specified, the size stated in each case being interpreted to mean the dimensions of the plant as it stands in its natural position in the nursery without straightening out any of its branches or leaders. When a minimum or maximum size is specified for a number of plants of one species or variety, the plants must average the dimensions specified. For example, 2½ to 3 inch caliper must average 2¾ inches, 3 to 4 feet in height must average 3½ feet and 3 to 3½ foot spread must average 3¾ feet. Wherever the word “varied” is used, the plants must vary proportionately in size between and including the smallest and greatest dimensions given.

All diameter measurements must be made with standard tree calipers at a point 6 inches above the ground for deciduous trees from 1 to 4½ inches in diameter and 1 foot above the ground for deciduous trees 5 inches or more in diameter. The ground in all cases refers to the normal even ground level according to its proper relation to plants growing in a natural and normal position and not to ground level which is uneven, unnatural or which has been disturbed either by cultivation or in some other manner. Diameters measured or computed by means of graduated tapes or flexible rules are not considered standard in these specifications. Deciduous trees 1 inch in diameter must be 6 to 8 feet in height and deciduous trees 1½ inches in diameter must be 8 to 10 feet in height. All measurements must be in multiples of ¼ inch for deciduous trees from 1 to 3½ inches in diameter and in multiples of ½ inch for deciduous trees from 3½ to 6 inches in diameter.
ROADSIDES, THE FRONT YARD OF THE NATION

Wherever the word "clump" is used, the plants must have three or more leaders or main trunks extending from the same root system.

Wherever the word "specimen" is used, the plants are not to be the ordinary nursery run grade but they must be fully developed, bushy and branched to the ground or at a natural height above the ground common to the species. Such plants must be grown individually and not in the usual nursery rows and they must be so spaced in the nursery that at no time throughout their life are they contacted or crowded by adjacent plants. They must also be plants which have been transplanted three or more times.

Wherever the word "heavy" is used, the plants must be markedly more sturdy and vigorous and more compact, bushy, or branched according to species than those grown in the usual nursery rows.

Plants which have been cut back from larger grades to meet specifications will not be accepted.

6. Habit

All trees (deciduous and evergreen) must be normal and uniform in height according to species, with straight trunks; well developed leaders, tops and roots; they must be free of all insects, diseases, mechanical injuries, disfiguring knots, sunscald, burns, frost cracks, broken bark, broken or dead branches, broken roots, stubs or any other objectionable features or the result of any of the above mentioned objections; they must be thrifty and well grown in the nursery; they must bear evidence of proper and acceptable top and root pruning.

All shrubs (deciduous and evergreen) must be well branched and normal in height and spread according to species; they must possess a healthy, normal and unbroken root system; they must be free from insects, diseases, mechanical injuries or the results of these objections.

All plants must be typical of their kind and nursery grown
having been subjected to proper transplanting. Woods grown, field grown or collected plants, culls, trees with crotched or improperly developed tops or roots or plants not conforming to these specifications in any other respect will not be accepted. All plants must be freshly dug from the nursery rows immediately before shipping. Plants from storage or those not freshly dug as specified will not be accepted. Plants must not be dug or shipped during weather which might prove harmful to them.

7. Quotations

Prices must be quoted only on plants growing in the nursery to which the enclosed letter is directed on the date these specifications are received. Quotations on plants otherwise located will not be considered.

8. Preparation for Shipment

All plants must be dug with reasonable care and skill immediately before shipping, avoiding all possible injury or loss of roots. Particular attention must be given fibrous roots in this respect. Extreme care must likewise be exercised in handling and packing the plants with due regard to their species, size and character as related to the soil, weather and climatic conditions at the time and place of digging and to the method of transportation including the time consumed and method of handling in transit by the transportation agencies selected. All precautions which are customary in good trade practice must be taken to insure the arrival of the plants in good condition for successful growth.

Plants marked B & B are to be balled and burlapped. This must be carefully done as the plants are being removed from the nursery rows and a sufficient quantity of earth must be equally taken on all sides and bottom of the plants to include the necessary roots and to properly accomplish the purpose intended. The sides of the balls must be parallel with the upright growth of the plants or perpendicular and they must
also be of sufficient thickness to include the necessary depth of roots according to species. The balls must be prepared in a workmanlike manner and firmly formed to prevent slipping. Plants so treated must be handled only by the balls of earth on their roots and not by the branches or trunks extending above the balls.

With relation to the height and caliper of plants, the diameter of the balls of earth must at least be equal to those given in the following schedule:

<table>
<thead>
<tr>
<th>Height</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 4 ft.</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4 to 5 ft.</td>
<td>15&quot;</td>
</tr>
<tr>
<td>5 to 6 ft.</td>
<td>16&quot;</td>
</tr>
<tr>
<td>6 to 8 ft.</td>
<td>18&quot;</td>
</tr>
<tr>
<td>8 to 10 ft.</td>
<td>20&quot;</td>
</tr>
<tr>
<td>1 1/4 in. diameter</td>
<td>21&quot;</td>
</tr>
<tr>
<td>1 1/2 in.</td>
<td>24&quot;</td>
</tr>
<tr>
<td>1 3/4 in.</td>
<td>27&quot;</td>
</tr>
<tr>
<td>2 in.</td>
<td>30&quot;</td>
</tr>
<tr>
<td>2 1/2 in.</td>
<td>33&quot;</td>
</tr>
<tr>
<td>3 in.</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

In case plants of the above sizes require larger balls of earth, the diameters must be increased.

The above schedule does not apply to plants whose dimensions are described by their spread. In such cases as well as in all others not mentioned, the balls of earth must be of sufficient size to properly include the necessary root system.

9. **Labels**

Legible labels must be attached to all specimens, boxes, bundles, bales or carload lots of plants indicating the botanical genus, species, and variety name, the common name and size of each species or variety.

10. **Certificates of Inspection**

All shipments must be properly inspected before removal from the nursery by authorized Federal, state or other
THE NURSERY QUESTION

authorities as may be required in the area where the nursery involved is located. Each shipment, invoice or order of plants must be declared and certified free of diseases and insects of any kind. All necessary inspection certificates to such effect must accompany each shipment, invoice or order of plants as may be required by law. All local, state and Federal laws relative to the shipping of plants must be respected and strictly complied with.

11. Inspection

Information as to the location of the plants must accompany all quotations submitted. All plants shall be subject to inspection by an authorized representative of the Board before they are removed from the nursery rows and while they are being dug, prepared and loaded for shipment. Such inspection shall not be construed by the Vendor as constituting final approval and acceptance by the Board. Final and conclusive inspection of all plants will be made by an authorized representative of the Board as they are unloaded at the place of delivery.

12. Rejection of Plants

All plants which do not meet these specifications will be unloaded and heeled-in at the receiving yard at the expense of the Vendor. The Vendor involved will be notified as soon as possible and must arrange for the immediate removal of the plants. The unloading and heeling-in of plants shall not be construed as constituting their acceptance.

13. Notification of Shipment

The Board must be notified by letter when the plants are shipped including an itemized list of the number and kinds of plants, the date and manner of shipment, the name of the transportation agency and bill of lading. The above information must be given for each shipment made. The mailing
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address for all correspondence is—Board of County Road Commissioners, 3800 Barlum Tower, Detroit, Michigan.

14. Shipping Directions

All plants must be delivered F.O.B. Norton Yard, Beech, Wayne County, Michigan, care of Pere Marquette Railroad. To avoid confusion and delay, the word “Detroit” should not appear in the shipping directions as given to the railroad company involved.

15. Date of Delivery

The seasons for delivery are given in the enclosed letter. The exact dates of delivery will be more definitely specified after purchase orders have been issued by the Board.

16. Interpretation of Specifications

Should any question arise as to the proper interpretation of these specifications the decision of the Board, or an authorized representative of the Board, shall be final.

In purchasing nursery stock for public use, a well-ordered procedure is most advisable. Bidding blanks, giving the quantity, name and size of the material desired, together with the specifications and other necessary information, are usually mailed to various nurseries in the late summer for fall and spring planting and also in the late winter for spring planting. All reliable nurseries within a reasonable distance and where the stock desired is grown may be notified, regardless of state or county boundaries. In some sections there is evidence of a feeling among nurserymen that purchases made by the state or county should be kept within these respective limits.
Everything else being equal, this may be advisable, but if the best interests of the public are to be served, the selection should be as broad as possible.

There is considerable difference in the quality of stock grown in different nurseries and likewise there is often a considerable difference in prices. Many plants can be grown better and more cheaply in some sections than in others. Climate, soil conditions, labor costs and other factors have much to do with this. Also, some nurserymen are better propagators and growers than others. If a planting plan of any reasonable size is being followed, all the material can seldom be furnished by a single nursery or a group of nurseries in the same locality.

Sealed bids for the furnishing of nursery stock are usually received at a given place and time and they are then publicly opened and read. The time of planting depends entirely upon the seasons, and bids should be received sufficiently previous to the intended planting season to permit the stock to be inspected and selected before the orders are placed.

After the bids have been tabulated, the low bidder in each instance should be so indicated and the plants inspected at the nursery. If much material is to be purchased, the one responsible for the selection will find that by taking notes on the condition, size, quantity and quality of stock as it is inspected, a final decision can be rendered more conveniently and correctly than if an attempt is made later to recall these various details from memory. If the stock of the
ROADSIDES, the Front Yard of the Nation

lowest bidder is unsatisfactory, then that of the nearest low bidder should be considered and so on until acceptable material is found. This will necessitate the inspection in many instances of more material at each nursery than is indicated by the low bid. With a little experience, however, much time can be saved and re-inspections will be unnecessary.

If all the material for both fall and spring planting can be advertised for, selected and ordered in the late summer or early fall, the rush season will be avoided, deliveries can be made more promptly and the plants will be less likely to suffer from late-season weather conditions. Also, deciduous plants can be selected most conveniently and satisfactorily before the leaves drop. September is the best time of year for this, but if purchases are made in the late winter, the material should be inspected as early as possible before the planting season.

A natural conclusion is that detailed specifications should remove the necessity of inspection, but specifications are interpreted differently by different people and many have ideas of widely differing character as to the choice or desirability of plants. Regardless of the character of the vendor or the product represented, satisfaction can never be guaranteed without first viewing that which is desired. There are also many points to be considered which cannot be effectively covered in the specifications, such as methods of propagation, source of stock and various cultural methods. In the case of evergreens and deciduous

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PLATE VII

Trees should be carefully packed on trucks when they are taken from the storage yard for planting.
THE NURSERY QUESTION

trees, each plant desired should be marked with a weatherproof tag. The same practice may be followed with specimen shrubs, although for the most part these plants can be selected in groups.

After all the material has been inspected, the final decision as to the successful bidders can be made and the orders formally awarded accordingly. The orders should be placed as soon as possible to avoid undue delay, and detailed packing and shipping directions should be included. These considerations are important even though the nurseries involved are known to be reliable.

Reliable nurserymen are not classed as such solely because they grow plants of good quality, but also because they dig, pack and ship the material properly and promptly, because they are considerate of weather conditions and because they do not misrepresent their stock. Experience in dealing with nurserymen will determine more accurately than any other method the extent to which they can be relied upon. All nurserymen taken as a group are for the most part honest and fair-dealing men the same as those engaged in many other legitimate businesses. They have a natural and sincere regard for plants, they are familiar with the requirements of the various species and they are in a great measure responsible for the material used in all ornamental plantings made to date on both public and private property.

The importance of this can be more fully under-
stood by picturing the result if all nursery-grown plants now serving their various purposes on home grounds and in public places were suddenly removed. The part they play in the lives of everyone would then be effectively realized and nurseries would be recognized as indispensable. Just as the nurserymen have provided the thousands of homes with the surroundings which make them homes, so they must also be responsible in the future for furnishing the plants which contribute so much to the pleasures and comforts of those who use the highways.
CHAPTER VII

Other Services

The main purpose of highways is to accommodate vehicular traffic. They are intended to serve the public as routes of travel for all vehicles properly adapted to their use. Their importance and their necessity for being is based entirely upon this use which provides a rapid and improved means of transportation from one community to another. Every home must be accessible from a highway or common route of travel and therefore as every highway may serve a community as a whole it also serves the individual.

Largely because of the fact that roads eventually lead to everyone's door and because they connect communities, both large and small, they are also used for distributing the services of various public utilities and for accommodating the trunk lines of such utilities between communities.

A public utility may be defined as a business, the product of which must serve the public generally and without a choice of customers. The types of businesses which may eventually become public utilities are practically unlimited and those which exist as such at the present time include electric companies, railroads, ferries, gas companies, motor bus companies, express companies, aviation companies, pipe
ROADSIDES, THE FRONT YARD OF THE NATION

lines, warehouses, telephone and telegraph companies, water companies, and numerous others of a similar nature.

Because such utilities provide improved comforts and conveniences, they are recognized as necessary to the public welfare and they exert a powerful social influence. Only those, however, which make use of public highways as a right-of-way for their plants are considered here.

There has been a rapid increase in the usefulness, economic importance and power of public utilities since 1920. Public opinion has become more evident as to their fairness and the question of ineffective regulation by state commissions has been raised. Municipal ownership versus control by commissions has become a national issue.

Regulation by commissions eliminates competition and tends to create monopolies. When the exclusive right is given to furnish a specific commodity, it constitutes a form of monopoly, and in addition the free right-of-way generally obtained by public utility companies on public highways is seldom, if ever, granted to private industry. These considerations provide such companies with advantages and rights which can be secured only from the public.

In return for this, the companies provide service to the public at reasonable rates. This necessary relation between public utility companies and the public requires toleration and co-operation on the part of both if such an arrangement is to be success-
Other Services

ful. Private, monopolistic business methods should not be imposed on the public and the public in turn should not make unreasonable or political demands upon the companies. Differences are bound to arise and criticisms must be expected from both public utilities and the public. These should not be suppressed, but handled honestly and diplomatically with proper consideration given to the companies as well as the public.

The regulation by state commissions and the Federal Government has largely concerned the establishment of rates, operation methods, service, franchises, inventions, valuations, working capital, depreciation, expenses, financing, mergers, reorganizations, fairness to other utilities and similar considerations. Apparently the matter of highways and their complete service to the public as affected by public utilities has been left largely to the highway authorities. This is as it should be, since the control of highways does not come within the authority of public utility commissions.

In providing regulations for public utilities, however, the services which they render should be realized as permanent. They are becoming more of a necessity and because of this, temporary demands made of them should not be superfluous or unreasonable. On the other hand, the companies should realize that the service rendered by highways is also permanent and at least equally important and that modern roads are much more permanent than any.
utility plant that has yet been placed upon them. The relation between the highway authorities and the public utility companies or the regulation of public utilities by the highway authorities largely concerns the use of the highways by the companies.

The use of highway rights-of-way for overhead and underground utilities has been common practice since the possible distribution of such services became apparent. The custom is undoubtedly an outgrowth of similar and earlier practices in cities and villages where streets were probably first used as locations for water lines. Roads and streets were first built as common routes for pedestrian and vehicular traffic, but they have been called upon through changing conditions to accommodate many other services. Although the number of services thrust upon the highways is increasing, a significant fact is that few, if any, considerations are being made for their complete accommodation. The development of highways, which has been outstanding since automobiles became common, has been largely for the accommodation of traffic alone. As a consequence there has been an increase in the congestion of highway rights-of-way with respect to uses outside the traveled portion.

At the time that rights were first granted utility companies to occupy highways, the tremendous increase in traffic and the necessity for wider and better roads because of automobiles was not foreseen. Also the importance of distributing utility services
OTHER SERVICES

was then paramount. There was and still is, however, a real need for them and the custom of using the highways for such purposes has been generally accepted as the most satisfactory method of their distribution.

But in view of the original purpose of highways, which cannot be neglected in any sense, the creating of special provisions for utilities at the expense of the roads seems hardly practical. If highways must be completely developed for highway purposes only and there is not sufficient space left to accommodate utilities, then they should seek a right-of-way elsewhere. This may be objectionable for many reasons, but it also has many desirable advantages.

Public utility companies maintain that they cannot afford private right-of-way without increasing the rates charged for their services. This may be true, but the matter of rates is still a question and the additional cost cannot be determined until and if proper figures are available. In any event the increase in cost may be compensated by reduced maintenance involving tree trimming and the moving or rebuilding of lines because of various highway improvements.

In analyzing this, a distinction between underground and overhead services should be made. Underground services can be more easily accommodated along highways than can those which are overhead. By locating them as close to the traveled way as possible they are less likely to be disturbed in the
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future. The ideal procedure is to place them under-
neath and sufficiently to one side of the road surface
to permit proper maintenance through the use of manholes without unduly obstructing traffic. This,
however, cannot always be done and in such cases a
position as close to the road surface as possible is
most desirable. The right-of-way between the road
surface and the property line is utilized for shoul-
ders, ditches, planting and other necessities which
would suffer to a more or less degree from the in-
stallation of underground structures.

Considering the relative merits of underground
and overhead service with respect to the effect on
roadsides, the former is the least objectionable, since
the damage to trees is usually less and when com-
pleted, there is nothing evident above ground to mar
the appearance of the landscape. Pole lines carrying
cables are less objectionable than those carrying
open wires because less tree trimming is required for
clearance, although in both instances pole lines are
undesirable from the standpoint of appearance.

The advantages to utility companies in occupying
the right-of-way of highways are mainly that such
locations provide a free right-of-way and that the
lines are easily accessible for maintenance. Also,
private property adjacent to both sides of the road
may be served from a single line at the least cost.
The only advantage of such a location to the public
is a possible minimum rate charged for service. The
fact that the occupation of highways by public utili-
ties has become an accepted practice renders a radical or sudden change rather difficult. The disadvantages of highway locations to utility companies, more especially in connection with pole lines, includes increased costs for line clearance because of trees and for the moving and rebuilding of lines to accommodate road improvements.

The advantages to the public of locating lines, particularly pole lines, off the highway right-of-way cannot in all cases be measured in terms of money, although direct values are frequently placed on trees. To anticipate the future appearance of roadsides where pole lines do not exist is not difficult. Mature trees and shrubs growing unhampered by constant trimming and the natural landscape unmarred by wires, cables or poles would be a most desirable departure from the present average highway, regardless of how carefully trees are trimmed or how judiciously poles are located.

Although in most cases governed by statute, the custom of placing utility lines on highways should not persist merely because it is a custom, and if other locations can be found practical and to the advantage of the public, then they should be given serious and immediate consideration. That lines paralleling highways and at an average distance from roads to serve rural homes could be constructed across private property with little or no damage to the area involved is not impossible. Extensions to and across roads could serve residents on the opposite sides of
ROADSIDES, THE FRONT YARD OF THE NATION

the highways where the construction of two parallel lines would be impractical.

The ideal arrangement from the standpoint of the public use and convenience of highways would result in the removal from the highways of all lines which are not placed underground. In view of the increasing importance of roadside development, this ideal will undoubtedly be eventually realized.

Modern highways are being constructed of greater widths than formerly and owing to the increased traffic, there is a serious growing demand for attractive-appearing roadsides. The public is becoming more and more concerned about roadside trees and the damage which they must suffer to permit public utility companies to operate. The importance of this can be readily understood when the fact is realized that roadside trees are becoming more important as a useful and convenient part of highways. They are necessary to the modern road and their services are being recognized and appreciated.

Any tree appears at its best when left to grow naturally and unmolested. Arguments have been advanced that tree trimming, properly done, for line clearance does no harm. Even though such trimming may not impair the health of a tree, live branches can seldom be removed without damaging its appearance. As a matter of fact, trees may be commonly seen along the highways with their natural shapes entirely altered by under trimming, side trimming and topping to accommodate the wires of utility
PLATE VIII

Improper trimming for line clearance is not only unsightly but damaging to trees
Other Services

companies. If properly cared for, they may continue to live for years, but as long as line clearance is necessary, their odd and unnatural shapes must be preserved.

The damage to tree roots by the installation of underground lines is perhaps of more importance, as in many severe cases the trees are killed within a short time. The severing of roots by trenching close to trees weakens them to such an extent that they are frequently blown over during storms. Tunneling under roots is but slightly more expensive and does the least harm to the trees.

With respect to tree trimming, many companies maintain their own trained foresters for this purpose. They co-operate fully with highway authorities in the proper execution of their work, but the fact remains that the trees must be trimmed in order that the lines may function properly. And the fact must be remembered that trimming to clear lines is not beneficial to the trees in any way. It is a direct damage. Much expense would be saved by public utility companies if there were no trees to trim, and, from the standpoint of their service, trees constitute a gross hindrance. For this reason, the assumption is that the favorable attitude of public utility companies toward trees is but a public policy and that in reality they would rather remove than trim those which interfere with their lines.

Public utility companies resort to many methods for securing the good will of the public. Among
these is their apparent willingness to completely trim an entire tree, provided permission can be secured to allow trimming for line clearance. Or perhaps the trees in an entire yard may be trimmed for the privilege of removing one or more growing close to a line. In some instances the trees in an entire city or village are kept completely trimmed in order that permission for line clearance may be easily obtained from public officials and property owners.

These methods may fall within the scope of good business ethics, but they indicate that unless regulatory measures are enforced, there might ultimately be few trees left along the public thoroughfares where at least some public utility lines exist.

There can be no question as to the importance of the services rendered by public utility companies. Such services are considered necessary to the public welfare, but the rendering of these services should not take the form of an imposition on the public. After all, the public pays the bills and the highways are public properties which are set aside for a specific purpose. They were never designed to accommodate public utilities, and laws which permit them to be used by such companies include provisos to the effect that the primary purpose of highways must not be interfered with. Roadside trees are a part of this purpose.

Roadside development has only within recent years become an important part of highway improvement programs. Thousands of trees, however, have been
planted and much progress has been made in many states. This work is now recognized as necessary by the United States Bureau of Public Roads and a significant point worthy of note is that its importance in every locality has been brought about by popular demand. The public prefers shaded, attractive and well-kept roadsides as well as smooth and permanent road surfaces.

Contrary to a common opinion, this demand on the part of the public does not reflect an attitude of extravagance. Little excuse can be found for the run-down condition of a home-owner’s front yard even in times of the worst depressions. How, then, could the road authorities be excused for neglected roadsides, the public’s front yard? The proportional cost is no greater and the labor employed is doing a constructive work. Also considerable money can be actually saved by maintaining the roadsides in a proper condition.

As the interest and demand for this work increases, more trees will be planted. As the trees grow, more interference will be found to exist between pole lines and trees. If the highways are to be properly developed, the tree planting and the actual growth of the trees cannot be moulded to suit the location of public utility lines. The roads must be completely developed as roads, and the public utility companies must recognize this and prepare for the future.

What the future may offer with regard to meth-
ods of distributing light, power and communication, is still a question. Many guesses have been made and many experiments performed. Without a doubt the public utility companies with their well-equipped experimental laboratories are in the best position to foretell the future. Many improved methods of distribution might be in use today if they would not force the abandonment of present equipment.

Future prophecies are mere conjectures, but the certainty that progress will be made cannot be ignored. Regardless of what happens, there is little likelihood that the public utilities will suddenly leave the highways for new locations. The change will be a very gradual process, perhaps as gradual as the rate of growth of the trees.

In the meantime and until such time as changed conditions become evident, the public utility companies and the road authorities must co-operate to the fullest extent if both are to render the best service. The most important point in this relation is the proper location of public utility lines and new trees within the highway right-of-way. The maintenance of existing trees is also important, but because they are seldom located in accordance with any plan, they must often be severely trimmed to provide clearance for overhead wires. And further, they are more or less mature and their future may be short as compared with the younger trees being planted. Many are already damaged beyond satisfactory repair and many are of undesirable types and species.
PLATE IX

Altering wires and proper trimming for clearance prevents excessive tree damage and eliminates unsightliness.
OTHER SERVICES

In locating trees and public utility lines the most important consideration is permanency. This even takes precedence over appearance, insofar as the trees are concerned, since to have trees improperly located is better than a total absence of trees. Their actual service in rendering shade and protection does not depend upon their landscape arrangement.

If the proper trees are planted and if they are permitted to grow normally, they should live to be from one to four hundred or more years of age. This is a longer time by far than the known life of any public utility field equipment. Trees, then, because they are most permanent, should be placed in a location where they are the least apt to be disturbed.

The widths of highway rights-of-way are necessarily limited to accommodate road improvements only. Few will accommodate trees and pole lines without interference. The trees, then, should be placed only where they will be harmed the least, and this location is as far from the centerline of the road as possible, within reasonable limits, the maximum distance being somewhere between forty and sixty feet.

The poles should be placed between the trees and the traveled way and at a minimum yet safe distance from the roadbed. There are many who object to this arrangement of poles and trees, but when all is considered, it seems best for the future. Also where highway lights are concerned, such service is greatly facilitated by locating the poles in front of the trees.
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True, poles in front of trees are more conspicuous than when the order is reversed, but only until such time as the trees reach the height of the poles. Their weathered surfaces then blend unnoticed with the trees and they would be equally evident for the same length of time if they were placed behind the trees.

If the trees were placed in front of the poles, a lack of space would necessitate side trimming on the far side of the trees. Also by virtue of this arrangement the trees would be close to the traveled way and the removal of branches to provide safety for traffic might be necessary. Trees trimmed artificially on two sides have little chance of ever assuming a natural or attractive form and in addition, future road widening might cause their removal entirely.

Poles can be moved much easier than trees. The cost of moving trees increases as they grow, while the corresponding cost of moving poles remains essentially the same. Therefore, poles should occupy a more temporary location or, rather, the trees should be given the most permanent location at a greater distance from the traveled way than the poles. Such an arrangement might necessitate the trimming of the trees on the roadside for line clearance, but they would only be affected on one side instead of two and, hence, only suffer one-half as much damage.

Another consideration from a landscape standpoint has to do with the logical appearance of the entire scheme of the highway right-of-way. The
most highly artificial part of the right-of-way is the center, which may be a permanent pavement or other improved surface. The most natural part of the right-of-way is at the property lines, where the least disturbance is necessary for road construction. Beyond the property lines, yet well within the view of motorists is the rural landscape.

These two extremes may be found in this order on practically every country road, and if appearance is to be considered, all operations affecting the road-sides should be consistent with this order. In other words, the sequence of change from the center of the right-of-way to the property lines should be from the most artificial to the most natural, without any interrupted change in the reverse order.

As an ideal example, a highway right-of-way may include the following as placed in a logical order from the centerline to the property lines: Pavement or other improved surface, underground utilities, shoulders, ditches, pole lines, shrubs and trees. As previously mentioned, the appearance of this type of road blends gradually and consistently from the highly artificial at the center to the natural landscape of the surrounding country.

If trees were planted in front of pole lines, the logical sequence of this scheme would be interrupted and the view to the adjacent landscape would be broken by artificial structures appearing beyond the line of planting.

This entire landscape consideration can only be
followed as a general rule, although it will apply in most cases. There are, of course, many locations where the adjacent landscape should be blotted out or screened from view, but through the country these instances are comparatively rare. Then, too, existing trees located close to the traveled way are frequently well worth preserving, and public utility lines are routed behind them. This, however, should be considered as a temporary condition. Such lines may often be moved when new trees planted near them are sufficiently large to interfere, and by that time the original trees which were saved may be deteriorated to the extent that they should be removed.

A further consideration of the logical order of things in the cross section of a highway right-of-way has to do with permanency. The artificial parts of a highway are less permanent than the natural parts and thus cannot be depended upon to remain fixed for as long a period of time. Road surfaces are frequently rebuilt or widened and the future demands with respect to this cannot be foretold with certainty. Ditches may be altered, deepened or tiled, and public utility lines, both overhead and underground, are constantly being added to, rebuilt or altered.

Trees, on the other hand, if left undisturbed will remain fixed and live for many hundreds of years. In contrast with public utility lines their future is definitely known. Therefore, by confining the changing factors to the center and the permanent ones to
OTHER SERVICES

the outside of the right-of-way, less confusion will result and much less damage will be suffered by the trees. This is not pure theory, but an actual fact, and examples may be found along most any improved highway.

A final item of appearance may be mentioned with respect to the recommended arrangement of pole lines and trees. The trees will eventually become much taller than the poles and will dominate the landscape. Nothing adds more to the appearance of improved highways than a broad width flanked with trees. Motorists like to feel that they have plenty of elbow space as they drive, and this feeling is hampered when trees seem to crowd the traveled way. The element of danger, of course, should always be considered and although trees, when located completely off the right-of-way, are sometimes struck by motorists, the closer they are to the roadway, the more likely they are to cause serious accidents. Also, new trees must be grown over a period of several years in order to replace those which are killed by motorists, while new poles may be set within a few hours. There is no reason why trees should serve as a protection for pole lines by being planted in front of them.

The question of formal and informal planting, or the arrangement of trees in rows or natural groups, is governed entirely by the amount of planting space available. Since no additional widths are provided for public utilities and if they are to be considered
along the highway, they must occupy space that would otherwise be used for trees and shrubs. This reduces the planting space to a minimum and on many highways prevents planting altogether.

Three considerations may be taken into account along highways having insufficient space for both poles and trees. In such cases the planting may be suspended, the trees may be placed on adjacent private property through proper permission or they may be placed on the highway, where they are to remain with the understanding that the pole lines will be removed when the trees reach a height to be interfered with. Adjusting the situation by removing pole lines from the highways must necessarily be a gradual process because of expenditures involved, because such a custom cannot be suddenly changed with economy and because the normal progress of roadside planting and tree growth would only require the removal of pole lines at a similar rate. Some definite plan of ultimate development, however, should be agreed upon between the road authorities and public utility companies.

The increased widths of modern highways has made possible, in many instances, the accommodation of both pole lines and trees. In these cases a specific location for each, with reference to the centerline, is necessary. Such an arrangement usually necessitates the placing of trees in a straight line parallel with the traveled way or it so limits the variation from a straight line that any attempt at in-
formal arrangement appears out of place and impractical.

Critics of straight-line tree planting should take into consideration the practical reasons which force the adoption of such measures. Trees in a straight line are better than no trees and, after all, while naturalistic planting through the country is ideal and most desirable, roads are designed for a practical service, and intensive landscape construction cannot be practiced on a wholesale scale. The well-meant enthusiasm of those interested in landscaping the roadsides, frequently leads to ideas beyond the necessary and into the field of luxury, which can be realized only on private property.

A very desirable naturalistic or informal effect may be created by varying the spacing of trees placed in straight lines and by planting shrubs a few years later in various places between and in front of the trees in order to break or obscure the solid line of tree trunks. If the highway is of sufficient width, pole lines can be placed in front and in the clear of the trees, and since shrubs seldom grow sufficiently tall to be interfered with by pole lines, they may be scattered over the area reserved for poles as well as that reserved for trees. In following this plan, however, the principles of developing a rural landscape should not be forgotten. A solid and continuous planting of trees and shrubs is not always advisable. Spaces should be left here and there and the number of plants contained in each group varied according
to the requirements of the situation. The natural landscape of the adjacent countrside and the grade of the highway are the determining factors. Rows of regularly spaced trees are most appropriate through level country, particularly in the vicinity of settled communities. A varied spacing and the possible grouping of trees is to be preferred in rolling, hilly or rough country.

Pole lines and trees can exist together on a highway provided there is sufficient space for both of them. The amount of space required depends upon the types of pole lines and the kinds of trees. Some lines require more clearance than others and trees vary in the amount of space needed for development according to species. By careful planning, by the proper training and trimming of trees and by complete co-operation between the road authorities and public utility companies, trees can be maintained surprisingly close to pole lines without damage or interference to either.

The planting and maintenance of roadside trees is now considered as a permanent part of highway development. As a function of the highway authorities it is a comparatively new undertaking in this country, but it has come to stay and it is a logical and necessary improvement. Although the custom of placing public utility lines on highways existed long before the organized practice of tree planting and maintenance was adopted by road authorities, public utility companies should not claim unreason-
able rights at the expense of existing trees or proposed trees, because trees are a function of the highways and pole lines are not.

The matter of public utility companies occupying highways, however, deserves a great deal of serious consideration. These organizations are necessary, their services to the public are vital and everyone who enjoys such services realizes their value. The same is likewise true of roads. Public utility companies and road authorities should refrain from making unreasonable demands upon each other. General plans, and in many cases specific plans, will be found difficult of adoption without exceptions, but each case should be considered on its merits and, above all, the people should not be deprived of the services due them.

Highway lighting may be considered as a public utility service. Such lights are desirable but not altogether practical along country roads at the present time because of the expense involved in maintenance and costs of electricity. They are most important in or near cities and towns and at dangerous locations, such as curves, intersections, railroad crossings, bridges and the like. Usually, highway lights are the responsibility of the local community, and the road authorities seldom participate in this service except perhaps in the cost of installation and in designating the type, and the location of poles or underground conduits.
CHAPTER VIII
Motoring in Comfort

ROADSIDE development is not new. It is the continuation of time-worn practices which have existed for centuries, but which have been modified and revised to meet modern requirements. It should not be upheld as impractical, superfluous, out of the ordinary, or beyond all reason, because it cannot be so classified in any sense. It is a logical combination of desirable and necessary services and it merely takes its place with other modern improvements. It has changed as conditions and people have changed and should be recognized as the various parts of an old order long existing which have been revamped, brought up to date and placed under a single head. Its collective and modern name and its comparatively recent appearance on road improvement programs have largely been responsible for objections expressed by an uninformed minority.

There is no part of roadside development which can be termed spectacular and it lacks the glamour which so appeals to the modern sense of recreation. On the other hand it cannot be referred to as old fashioned, but it must be grouped with one thousand and one other long-tried necessities which are vital to the lives of everyone and which are basically sound and enduring. It is one of those things that is
easily taken for granted, yet cannot exist without intelligent and co-operative direction.

One of the seemingly least important phases of roadside development is the construction and maintenance of roadside comfort stations or buildings placed at intervals along roads for the purpose of providing sanitary toilet facilities, safe drinking water, rest rooms and a source of highway information for the traveling public.

Upon first thought, such buildings may appear unnecessary and the cost of their construction and maintenance may seem an unwarranted expenditure of public funds. The truth is, however, that their actual existence has proven them necessary, economical, beneficial and highly desirable not only of late years on modern highways, but for centuries past and in various parts of the Old World.

The evolution of roads probably involves a gradual development from primitive hunting trails to the modern types. That they existed for a considerable period prior to the dates indicated by recorded history is evidenced by the fact that improved roads of some sort must have been necessary over which to transport materials for the hanging gardens of Babylon and the pyramids of Egypt. Prehistoric trade routes also extended across Europe from the Mediterranean to the Baltic.

Improved roads are thought to have been first built for commercial and military purposes, although very little authentic information is available concern-
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ing their construction and maintenance from earliest times until Rome became a power. At the beginning of history, caravan routes were already established in Arabia, North Africa and Asia. These routes were carefully laid out between the life-saving oases, the primitive comfort stations of the desert, in order that the travelers and their animals might be properly rested and refreshed. Drinking water and physical comfort was as essential then as it is today.

According to Herodotus, a great road was built in Egypt to aid in the transporting of materials for the construction of the pyramid of Cheops near the present city of Cairo. This pyramid may have been erected between 2800 and 2700 B.C., during the reign of King Cheops, although authorities differ regarding this. The date has been placed at prior to 3000 B.C., and its age has also been estimated at fifty thousand years. The road mentioned in this connection is claimed to have been paved with massive stones and in places it is reported to have been ten feet in thickness. It was bordered with mausoleums, temples and statues, doubtless for the convenience of travelers desiring to rest or worship, as well as for memorial purposes. Herodotus also mentions an old prehistoric road known as the Ancient Royal Road, which was used in earliest times as a main route of travel from Persia to the western coast. A great number of way stations were erected along this road to protect travelers and to serve as resting places.
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Strabo, an ancient Greek traveler and geographer from Pontus who lived from 64 B.C. to 21 A.D., mentions three main roads leading from Babylon which were constructed before 2000 B.C. Credit for much early road building has been given to the Persians, Assyrians, Carthaginians, Chinese and Peruvians, although reliable records concerning their operations have been either lost or forgotten. The Carthaginians are thought to have originated systematic road construction and their influence apparently spread to the Romans, who are now recognized as the first great road builders of whom reliable records have been preserved. Paved highways leading from Rome extended to the farthest parts of the Empire and evidences of many of these still exist. Camps were established at various intervals for the quartering of troops and relief stations were erected at a distance of five or six miles apart where relay horses were kept.

According to Æthicus, a Greek geographer, a general survey or record of these roads was started in 44 B.C., under Julius Cæsar. This record was revised and first published under the name of "Itineraria Antonini" by Antoninus Caraculla, Roman Emperor from 211 to 217 A.D. "Itinerarium" was the name given by the Romans to a table of stopping places between important cities, and many of these intermediate stations as mentioned in this report were presumably relief stops for horses and travelers.
The Mongols of Asia, under the able leadership of the great Genghis Khan, in the thirteenth century established a vast system of travel routes each with its series of relief stations or yams spaced at convenient intervals. So complete and efficient was the system that the speed of the horses and hardy Mongol messengers over long distances has never since been equaled by a similar method of travel. A stationmaster or caretaker was placed in charge of each yam and a military escort consisting of a few guards was constantly on duty to prevent thievery. The caretakers were responsible to a district road governor or daroga, who together with a clerk resided in a large town of each district.

During the days of stage travel in Europe and America, inns, taverns and roadhouses were established at frequent intervals to provide a change of horses and drivers and for the rest and physical comfort of the passengers. The famous Pony Express of the western states was similar to the official dispatch system of Genghis Khan. Horses and riders were afforded relief at stations built for this purpose.

When railroad travel became established as the accepted means of transportation, the placing of toilet and drinking water facilities in each passenger car was found necessary, convenient and a saving of time. Also in traveling great distances a change of engines and a relief train crew at designated stations was found necessary.

Today the most popular means of travel is by the
use of automobiles. Filling stations and garages have sprung up along the highways for servicing motor cars, and many of these buildings include facilities for personal comfort. They are a valuable aid to motorists, but from the standpoint of complete highway service they are, with few commendable exceptions, quite unsatisfactory.

Privately owned and operated filling stations along the highways are objectionable as places of business and as substitutes for public comfort stations when they are not properly or attractively designed, when they do not include proper sanitary facilities and when they are improperly located. Progressive and co-operative operators have in a comparatively few instances done a great deal to eliminate these objections and they deserve unlimited credit for their efforts. The results have been profitable in many ways both for themselves and their respective communities.

While roadside filling stations are important for the servicing of automobiles, roadside comfort stations are at least equally necessary for the relief of motorists. Both in a modern sense are a direct result of automobile development.

In the horse-and-buggy days highways were not improved as they are now and comparatively few people traveled long distances over them. Toilet and drinking water facilities were less necessary, since few would have been accommodated. Had highway rest rooms existed in addition to the inns
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and taverns, they would have been of little use. There was also small use for highway information, as nearly everyone knew the route to be traveled.

There has been, however, a rapid and radical change in the use of roads. People travel quickly over long distances and motorists constantly find themselves on unfamiliar ground. Motoring is the most popular method of travel and while there has been a great improvement in the type of roads built, they have served for the most part in providing only smooth and wide roadbeds. While lifting the motoring public out of the mud is of first importance, transportation on modern highways necessitates more accommodations than this, and of these, sanitary toilet facilities are most important. Sanitation is most vital on public property because it concerns the health of the community.

Nuisances committed along country roadsides may seem of little consequence, particularly in unsettled or unimproved areas, yet they may easily and seriously affect the public health. Roadbeds are constructed to drain the surface water to parallel ditches, and these ditches are nearly always of the open type. They frequently carry water for some distance and if the grade is slight, as is often the case, stagnant pools cannot be avoided, especially in dry weather. During rainy weather or with a greater fall in the ditch grade the polluted water may be carried much farther and contamination spread over a wider area.

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In connection with the danger of such contamination, Edward D. Rich, C.E., director, Bureau of Engineering, Michigan Department of Health, includes the following in a recent bulletin:

"Proper disposal of human excrement has been one of the major problems of sanitarians since the beginning of history. The laws of Moses show that the danger of indiscriminate disposal of human excrement was appreciated even at that early date. The enormous toll taken by typhoid fever from the armies in all wars previous to the World War was no doubt the direct result of the neglect of latrine wastes. Cleanliness is instinctive among all higher forms of life, yet our insanitary habits of disposal of the discharge from kidneys and bowels are largely responsible for the existence of typhoid fever, dysentery, cholera, and diarrheal diseases of infants. According to Dr. L. L. Lumsden: 'Every person fit to live and every community worthy of existence is able to do or to have done the small amount of work necessary for cleanly and safe disposal of human excreta. Therefore, the continuation of insanitary practices in this respect in our communities generally is inexcusable, indefensible and difficult to understand.'

"Germs of typhoid fever, dysentery, cholera and diarrheal diseases of infants find their only exit from the body by way of the bowel and kidney discharges. Normally, the excretion of such germs ceases after recovery of the patient, but they may be discharged,
in the case of typhoid fever at least, by well individuals months or even years after recovery. Such persons who intermittently or constantly discharge typhoid germs are known as 'carriers.' Michigan health authorities are constantly tracing outbreaks of typhoid to just such carriers. Particles of excreta large enough to contain enormous numbers of the germs may be carried to our food by flies, rodents, domestic animals or on the hands. Water and milk are the most frequent means of transmission, however."

In addition to the danger of spreading disease and as a matter of common decency, all users of the highways should have enough self-respect and a consideration for the rights of others to refrain from appropriating the roadsides for such purposes. Regardless of the impropriety of this promiscuous practice, the public at the present time is forced in most localities to seek relief in the outhouses of country schools, churches, along wooded sections of the highways and on adjacent private property. None of these, however, are to be recommended. Obviously, the toilet accommodations of schools and churches should not be available for unrestricted use and owners of private property may rightfully protest against such trespass. Filling stations may not be conveniently located, since the sites for them are usually selected with an eye for business rather than for personal comfort. Also the toilets of these
buildings may not be maintained in an approved sanitary condition.

In view of the apparent necessity for sanitary highway toilet facilities and due to the fact that they must be stationary and not attached to vehicles, it becomes the duty of the road authorities to provide such accommodations. They are a logical and necessary part of modern highways and they reflect the common sense and respectability of the community in which they are a part. They are also far more effective in preventing roadside nuisances than rules, signs or laws. People in general are more than glad to avail themselves of a decent place for relief than to be forced to depend upon the conditions as found at the moment.

Comfort stations are a convenience in more than one respect. Speed is important and time has increased in value. To stop at hotels in towns or cities requires time to park and more or less delay, while to stop at a roadside comfort station requires a minimum of time and no delay in parking.

Toilet facilities at roadside comfort stations do not represent a luxurious convenience, but a necessity of the first order. Such accommodations not only render a needed service to the motorist, but they are a safeguard in preserving public health. Approved drinking water is necessary at such buildings for the same reasons. Water which has not been approved by the proper authorities should not be considered safe for public use. This is particularly true of
springs and wells, and many fatal cases of typhoid fever have resulted from their use.

To be most serviceable, comfort stations should be located on land acquired immediately adjacent to the road right-of-way where space is available for parking without interference with highway traffic. The road right-of-way may be used for this purpose provided it is of sufficient width, although such is seldom the case.

The greatest number of people will be served by placing comfort stations along heavily traveled main roads, at the outskirts of cities and villages, at important intersections, near parks or other recreational areas and near natural or artificial features which otherwise attract motorists. The buildings should be fewer and farther apart on roads which carry less traffic, and on those of least importance they may be widely scattered or omitted altogether.

The ideal roadside comfort station may be built of wood, stone or brick. It should be heated, supplied with hot and cold running water, drinking water, wash bowls, sanitary flush toilets and urinals, a rest room and an information booth, where road maps may be obtained. The size of such a building depends upon the amount of traffic, and the design may vary according to the locality or immediate surroundings, although it should of course be appropriate. The advice of a competent architect is recommended and the plans and specifications should be prepared by someone thoroughly responsible.
PLATE XI
Roadside comfort stations may be permanent structures with modern conveniences
MOTORING IN COMFORT

Wherever water mains and sewers are available, little difficulty will be experienced in providing the proper sanitary facilities. This, however, is not often the case and it may be necessary to drive wells and install septic tanks or to provide outdoor privies and do without water at least for sanitary purposes.

The problem of water is important. It should never be used for public drinking purposes, regardless of the source, without the approval of the health authorities. Tests should be made periodically and if polluted the supply should be immediately purified, closed or posted with signs prohibiting its use. Water in city mains is frequently found to be impure from various causes, particularly in the stub ends of a system where the regular flushing of hydrants is not practiced.

Water may be made available on the site by driven or drilled wells and a pump, or the same type which results in a flowing well or a spring. Open wells are not recommended. Driven or drilled wells are both known as tubular wells because of a continuous iron or steel casing surrounding the pipe. Such wells should be fifty or more feet in depth. Automatic power pumps and pressure tanks capable of supplying all the needs of a comfort station may be attached to a well, provided sufficient water is available.

Flowing wells having enough natural pressure may be piped to serve every purpose without the aid of pumps or pressure tanks. Springs, however, are
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extremely shallow wells and cannot be piped successfully without the help of gravity. If they are located at the necessary height above the building site the capping and piping is a simple process.

An approved method of capping springs consists in placing a concrete box around the source of supply, the bottom being left with open joints to permit the spring water to enter the collecting basin. The top should be fitted with a tight concrete cover to prevent the entrance of animals, insects and vermin and an outlet pipe placed at the proper height through the side of the concrete box.

Contrary to a general impression, spring water is not always safe to drink. Its source is sometimes difficult to determine and the fact that it frequently flows just below the surface of the ground renders it susceptible to many forms of pollution. Springs are often fed by ground or run-off water, which absorbs many impurities from the surface soil, ditches and tile drains. As a matter of fact, many broken or forgotten drains have been mistaken for springs and some of these have served as outlets for barnyard drains and drains from house cellars or septic tanks.

If no water can be made available on the property, arrangements may be found practical for the delivery and storage of water for drinking purposes only. Water for toilets, urinals and lavatories is desirable, but if such a supply cannot be had, washing facilities cannot be installed and dry toilets or privies must be substituted.
Wherever a connection can be made directly into a sanitary sewer the problem of sewage disposal is greatly simplified. In the absence of this advantage, but with water available, an approved type septic tank should be installed. An important consideration in such an instance is to provide sufficient fall or difference in grade between the outlet of the toilets and the septic tank and between the septic tank and the final outlet. The effluent should not be dumped into an open ditch nor should it be allowed to flow into natural water courses unless it has first passed through a proper filtering system. The most usual method is to provide a series of tile drains placed with open joints and leading from the septic tank. These permit the effluent to percolate slowly into the surface soil, where a natural purification process takes place.

A common opinion among many is to the effect that the effluent from a properly constructed septic tank is pure. This is not true unless the discharge is subjected to a filtering process. By the action of various organisms, septic tanks serve only to remove the solids and the resulting effluent is thereby transformed to a liquid. This may be carried away in a closed sewer or distributed in the surface soil by the use of tile, as previously mentioned.

The purifying action of the surface soil on the effluent is brought about by the roots of grass and other plants and by the activities of a great number of organisms including worms, bugs and various
microscopic and visible insects and plants. All these agencies require a proper amount of air in order to exist, and they are therefore seldom found at a greater depth than five feet below the surface of the ground.

This fact constitutes the greatest objection to the use of cesspools. Cesspools are deep holes dug in the soil for the reception of raw sewage. The solids are not readily absorbed by the soil and the liquids soak away below the level of where helpful organisms exist. Such a concentration of waste materials becomes a menace to the community because of the unavoidable pollution of the ground water. Wells at some distances may easily be affected, particularly where the soil is of a gravelly or rocky nature.

Dry toilets are not recommended except where water is unobtainable. They should never be constructed within seventy-five feet of a well or spring and should always be located on the down-hill side to lessen the danger of contamination by seepage. The pit should be of concrete, watertight and accessible for cleaning from the outside of the building. A modified form known as a septic tank privy is more suitable, since it requires cleaning less often. It includes a larger pit and an outlet for liquid sewage. The vaults of both types should be provided with a fresh-air vent. The floors, seats, risers, vents and portion of vaults outside of such toilets should be absolutely fly tight and chlorinated lime or hydrated lime may be liberally used for disinfection
and the elimination of odors. The contents of the pit, upon removal, should be immediately taken to an isolated spot and buried in thin layers under at least six inches of earth.

In order to properly serve the needs of the public and to prevent the misuse of other facilities, a separate urinal for the use of males has been found necessary in addition to separate toilets for men and women. In the absence of a water supply, such accommodations may be provided in the form of an enclosed soakage pit about four feet deep, eighteen inches wide and as long as necessary. This should be filled with stones varying in sizes from one inch to two inches in diameter. The top should be curbed with concrete and a tile placed near the base for drainage in heavy soil. Chlorine water composed of chlorinated lime and water in the respective proportions of one ounce to two gallons should be frequently sprinkled over the stones to control the odors.

The plans for all toilet facilities, regardless of the type, should be approved by the proper health authorities before they are made available for public use. After a comfort station has been placed in service, a caretaker should be in attendance twenty-four hours of each day. In some instances, especially when traffic is heavy, a woman attendant will be found necessary. The most important duty of the caretaker is to maintain all parts of the building in a sanitary and clean condition at all times. He should
also be responsible for preserving proper order and conduct, the maintenance of the grounds, minor repairs and the dissemination of road information.

As automobiles increase in number, the need for roadside comfort stations will become more evident and as the highways become more intensively developed to accommodate motor traffic the services rendered by such buildings will necessarily be of a broader nature. As a matter of service and economy as well as a community pride in the appearance of the roadsides, these intermediate stations will include facilities for servicing automobiles as well as those which provide for personal comfort. Wayside buildings combining the advantages of gasoline stations, tire shops and comfort stations and operated and regulated by the road authorities will gradually supplant the varied and too numerous structures now separately used for such purposes. This can be accomplished through effective and workable zoning laws and by the road authorities taking the initiative in establishing and operating or regulating such buildings where they will render the greatest service at a minimum cost to the motoring public.

This may appear to many as a radical departure from present-day methods, but even though this may be true, it is a most logical change. Roads are improved for traffic, but the responsibility of the road authorities does not stop with that, for the roads must also be forever maintained for traffic, and traffic must be maintained with proper service or
else the very purpose of improved roads is defeated, and they cannot be efficiently used. This, and the matter of public health insofar as highways are concerned, is strictly a responsibility of the road authorities.

The first step in improving roads is to provide a surface over which automobiles may be driven without the danger of becoming "stuck" because of mud, sand, ruts, or other reasons. The second step is to provide smooth, wide and permanent road surfaces to accommodate traffic comfortably, swiftly and safely. The third step must be a provision to maintain the standard arrived at in the second step. The best of roads are useless to automobiles without gas, oil, water and tires being available, and people cannot travel forever without making use of comfort stations. These services must be provided and the responsibility logically belongs to those having jurisdiction over the highways.
CHAPTER IX
Timely and Untimely Signs

SIGNS may be grouped into two general classes, insofar as highways are concerned: those erected and maintained by the road authorities for directional and informational purposes and those erected by private interests for advertising purposes. Road signs, or those erected by or with the consent of the road authorities, may be further divided into five classes for the convenience of discussion. These various groups may be listed as (1) safety signs, (2) route signs, (3) intersection signs, (4) geographical signs and (5) interesting-site signs.

Safety signs are the most important, because when properly located they serve to minimize the number and to lessen the seriousness of accidents. They include all signs having to do with the safe use of the highways such as those for dangerous curves, obstructed views, steep grades, narrow and unsafe bridges, low grade separations, soft shoulders, traffic directions, speed regulations, and detour signs where construction or maintenance work is in progress.

Route signs or road signs denoting directions and distances have been known at least since the time of the Romans, when stones were used as markers.
TIMELY AND UNTIMELY SIGNS

Long before this, however, the ridgeways or ancient roads of England are thought to have been built by Neolithic man. One of these roads on Willersey Hill near Gloucestershire is estimated to be from six thousand to ten thousand years old and is marked in conspicuous places by mounds of rocks which were evidently intended as direction sign posts. Improved roads were constructed to the six Cities of Refuge in the Land of Israel by Joshua about the thirteenth century B.C., according to the instructions of Moses. Direction signs were placed at all the crossroads. The custom of labeling highways in order to facilitate travel has grown with the development of roads and now all important highways throughout the world are known by name or number.

In spite of the vast number of highway route signs erected, there is still an insufficient supply to properly direct traffic in all its ramifications. In most instances improved highways are well marked, but as less important roads are encountered, fewer signs will be found. This is generally accepted as a very ordinary state of affairs, since the demand for road information is much less on minor roads. In reality, however, the absence of proper direction signs on any public road, regardless of its importance, is a gross neglect of necessary public service.

Someone is responsible for all public highways from federal and state roads to the winding trails of remote townships, and all should be marked if only a board on a wood post can be afforded. The saving
to a single motorist of a gallon of gasoline or one hour's time in attempting to find the correct route would easily provide and maintain the cheapest effective sign for at least a year.

On all Federal and state roads and on a great number of county roads a system of road marking has been adopted which provides a sign with the road number on each side of the road at regular one-mile intervals. Such signs are placed on the right hand and on the far side of crossroads to indicate through routes and on the near side with turning instructions at intersections where the direct route is altered. Signs giving the name or number of important crossroads are also visible at each such intersection.

These signs serve to point out the main routes of travel and to prevent motorists from losing their way. As for short cuts, distances, landmarks, points of interest or other information, especially that concerning intersecting roads under the jurisdiction of different road authorities, motorists in too many instances are forced to depend upon a map. There are many maps and road guides produced by others than road authorities which frequently contain more practical information than similar publications from an official public source.

The question of how much road information is actually necessary is a common one in all highway departments. Also, regardless of how completely roads are marked, someone is continually lost or
else doubters check adequate signs by obtaining additional information from others along the road. The fussy double-checker cannot hope to be satisfied, but on the other hand the average motorist is not as familiar with roads as the road officials, and although complete and simple information may at times appear foolish, the reasonable assumption is that few motorists are trail blazers, the most of them are but periodic travelers and only a comparatively few are familiar with all the roads on which they travel.

Considering this, the proper marking of roads should include more information than the indication of the main routes by name or number. Through the open country a sign placed at each intersection, regardless of the importance of the crossroad, indicating the mileage and distance to the nearest point or points of importance would be desirable. Motorists must know where a road will lead them and the distance to such an objective.

Intersections of secondary roads, unimproved roads and trails should be likewise marked. One has only to drive through the unsettled, barren, wooded or cut-over parts of the country to realize the full value of direction signs at trail crossings. In such remote sections a cedar post, a board, a few nails and a little paint would serve the purpose, while on more improved roads, better and more elaborate signs are necessary. The point is that all road authorities should at least be supplied with sufficient
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funds to mark the roads, even if no money is available for any other form of improvement. There are many trails existing today through the remote parts of this country which are easily accessible from other roads, but which may end abruptly on the bank of a stream where an old bridge has been washed away and where there is not even sufficient space to turn around. A sign at the last intersection indicating a dead end at a certain distance would prevent many in such instances from becoming marooned for hours.

The first consideration, then, in completely marking highways is the matter of safety. The second is the labelling of all routes of travel in order that motorists may proceed safely, continuously, intelligently and as rapidly as possible to their destination.

The third consideration should include signs at intersections giving distances and directions to places of interest or importance. Those who wish to motor leisurely over so-called back roads should at least be provided with information as to where they can go and how they can get there. The location of comfort stations should be indicated on such intersection signs at a reasonable radius from these buildings in addition to appropriate signs at the actual sites.

The fourth consideration in intelligent highway marking, or the use of geographical signs, should include the correct labeling of unincorporated villages, town and city limits, county and state lines, streams, lakes, mountains, parks, forests, preserves
Lighted road signs are a great help to motorists
and other important points of distinction which would materially assist motorists in knowing at least their approximate location at all times. While this is of most importance on improved roads, it is highly desirable on all roads, regardless of the amount of traffic carried.

A fifth consideration, which is not a necessity but a desirable convenience, has to do with interesting-site signs. These may be located at various points having general, specific, mythical, or historical interest. Valleys, battlegrounds, dams, inns, famous homes, old or newly planted trees, graves, bridges, churches, and an unlimited number of other places and things which would be interesting to many if properly indicated. Signs for such purposes may be in the form of metal tablets, stone monuments, simple wood placards or more durable and more attractive structures, depending upon the importance of the site. Simplicity in most instances, however, should be favored and the name, description or account given should be brief and easily read.

While the design of all road signs is important, it should never be elaborate, and above all the signs should be, insofar as possible, plainly readable from passing automobiles. The height, type of letters and diction should be carefully considered in each case.

Road signs are for the most part necessary and all may be classed as either a necessity or a desirable convenience. The design in all cases may be appropriately simple and the size need not be large. Such
signs properly designed and located do not detract from the appearance of the roadsides and they serve a necessary and useful purpose in aiding all types of motorists from Sunday drivers to seasoned tourists.

There is a sharp line of distinction between road signs and advertising signs, regardless of the fact that many of the latter carry road information. The policy practiced in some sections of allowing the erection of flashing signals or other devices or signs intended primarily for advertising, yet carrying information of value to motorists, is not to be recommended. Public highways should never be appropriated for private gain and, further, such a practice suggests a compromise that is not in the interest of the taxpayers. The placing of road information on advertising signs is merely a means of attracting motorists to a commercial display, and in many such instances the highway directions given are inaccurate. At least they are not authentic and are of secondary attraction.

Advertising displays along all highways may be divided into two general groups, those advertising a product or services which may be secured at a different location and those indicating a product or service to be obtained on the site. The former includes the greatest number of undesirable signs ranging from political stickers to elaborate displays of various designs over which there has been much controversy and comment.

Various organizations and individuals having the
TIMELY AND UNTIMELY SIGNS

appearance of the roadsides at heart have directed campaigns against such advertising, and to the outstanding credit of a few companies they have discontinued the practice. Others have sought a solution to the situation by landscaping their signs, while the majority have ignored the protests altogether.

To begin with, highway advertising of the sort which directs people to secure the product or services mentioned elsewhere or general highway advertising, may be effective to a certain extent, but an absolute or accurate check on this is doubtful. Also, if such advertising were restricted to magazines, newspapers, various periodicals, mailing lists, and the radio, an equal field of likely prospects could be reached.

Such signs are objectionable because they are a menace to safe driving and because they detract rather than add to the appearance of the roadsides. Frequently they block a clear view at dangerous intersections and their glaring notices and illustrations often distract motorists from the all-important business of safe driving. These objections are not theoretical, for many accident cases are on record which can be traced to no other source. Should these be doubted, a little investigation along the main highways in most localities will conclusively convince any fair-minded person.

Insofar as the appearance of roadsides is concerned, the ideal situation is a natural landscape
ROADSIDES, THE FRONT YARD OF THE NATION

commensurate with the surrounding country. Advertising signs represent the reverse extreme. Regardless of the quality of art employed to produce a high-class picture, it becomes extremely artificial when placed in the open landscape. And it is unfair to the artist, because it only cheapens his effort. All such signs shorten the view to the surrounding country, and those of a larger size block such views altogether.

One of the most undesirable forms of roadside advertising is the practice of placing political posters on trees, stumps, fence posts, junk piles, buildings, and anywhere that offers an exposed surface of suitable size. This form of publicity in connection with political campaigns is more or less of a habit and it probably does not secure many votes for the candidates. In spite of this, the practice might be pardoned to some extent if such signs were not placed on trees and if they were set up a few weeks before election, and removed immediately thereafter. Actually, however, the greater number of these signs, many placed well in advance of an election, remain, sometimes for years afterward, their weathered and tattered remnants flying in the wind until they are worn out by the elements. The prompt removal of such signs after each election is one thing which every community could accomplish at little or no cost.

The practice of erecting advertising signs along highways has grown to such an extent that much of
TIMELY AND UNTIMELY SIGNS

the adjacent private property is put to the same use. This is especially true where such signs are no longer tolerated within the right-of-way of the roads. The evil is, therefore, not cured, but scattered over a much wider area, and the only hope for control is by the aid of adequate zoning laws restricting the use of private property for certain distances on either side of the highways.

While highway authorities do not have jurisdiction beyond the limits of highway rights-of-way, and while the motorists who travel roads have no authority over adjacent private property, yet all undesirable advertising signs might be termed a public nuisance or a menace to public safety. If all the people who go to the polls in favor of a political candidate would also band together to register an opinion against undesirable conditions, improvements would be more rapid and widespread.

When located close to highways, advertising signs more or less completely obstruct desirable views to the surrounding country. When located at some distance from the highways, they usually occupy a prominent spot and one which in itself is an attractive natural feature. The best and most artistic advertising sign ever made would fail to enhance such a feature.

The most damaging practice, however, in the erection of advertising signs is the destruction of trees and shrubs between the signs and the road. How anyone can disfigure trees or remove them alto-
ROADSIDEs, THE FRONT YARD OF THE NATION

gather in order to permit advertising of questionable value and temporary duration appears to be beyond the realm of common sense and reasoning. An advertiser who preserved the natural landscape would undoubtedly reap a far greater financial reward and in addition have the good will of the public.

An editorial in a recent issue of House and Garden suggested that the best form of highway advertising, or that which would net the best results, might consist of the complete landscaping of a section of road with a small tablet erected to the sponsoring company or individual. An even better suggestion might be for such advertisers to select a particularly attractive bit of adjacent land and by proper arrangements with the owner erect a fitting sign to the effect that such natural landscape is being preserved for the view of passing motorists by a progressive firm or individual. Such signs or tablets should be simple, containing only a few words and devoid of glaring colors or vivid pictures. There is in reality a great difference between the appearance of a conservative and informative sign and a colorful billboard, the first mentioned being by far the most desirable.

The principle of simplifying signs in favor of the natural landscape is far more effective than that of elaborating on them at the expense of their surroundings. The landscaping of advertising signs is perhaps the greatest error in this respect, for no matter how much they are embellished, they are still
merely advertisements and, regardless of the skill employed in the making, they have no legitimate place in Nature's art gallery. Landscaping such signs merely indicates a cheap diversion of Nature's resources and it creates a still cheaper impression of the sign itself and the product represented, since they have nothing in common with the natural landscape but rather represent a misuse of the great outdoors.

In the vicinity of cities and villages where adjacent private property is grossly neglected, where junk piles, old basements, abandoned buildings and other similar conditions are evident, advertising signs may serve to hide these eyesores to some extent. This, however, is merely an excuse for their being, as they are only a veneer for areas which should be cleaned or improved.

The general movement of various organizations, highway officials and individuals throughout the entire country toward the elimination of advertising signs from the roads and from adjacent private property, is not an outgrowth of foolish sentiment. It represents an opinion of sane, clear-thinking and intelligent people. It represents a human and sincere desire to preserve the natural landscape, undefiled, for the benefit of everyone. There is nothing selfish in the motive, because all who pass would have equal opportunity to profit by the unrestricted and impartial appearance of the landscape. Perhaps to the mass of people, advertising signs are of little concern
except as they might attract them in various ways. Perhaps the advantage of their elimination does not occur to everyone. People, however, have changed but little since civilization began and a few are frequently called upon to do the thinking for many. Once properly informed and fully convinced, however, as to improvements which are to their interest and to the best interests of everyone, there is no doubt as to the wholehearted support of all. The question of proper-appearing roadsides is a very simple matter to understand and one which should appeal to the self-respect and decency of the people in every community. The American people are noted for their progressive spirit, modern tendencies and clean, efficient workmanship. To suppose that they will permit the continued and increasing destruction and ruination of natural features because of their proximity to improved highways is unthinkable. The best and most expensive highways of the world are in the United States, and likewise the best and greatest number of automobiles travel them. Also, the adjacent landscape is second to none. The American people cannot afford to ignore their roadsides, the front yard of the nation, for in the present age of automobile travel they exert a penetrating and lasting influence on all who come in contact with them. Therefore, if roads are to properly serve every individual in the best possible manner, advertising signs should not occupy a dominant place in the landscape. Their complete removal is the ideal sought.
Timely and Untimely Signs

As previously mentioned, however, there is another class of advertising signs which, with certain restrictions, should be permitted along roads. These include signs which call attention to an existing business or a product obtainable on the site. Everyone is or should be entitled to some sort of business display on their own property. Signs used for this purpose, however, should be limited in number and restricted as to size and exact location. Little difficulty would be found in regulating such signs, the quantity along country roads would be small and they would never need to interfere with the natural landscape, since in most instances they would be on or near buildings.

As more and better highways are built and as more people make use of them, a greater understanding and appreciation will develop concerning the necessity for proper road signs and the total lack of necessity for advertising signs. The phrase, "Signs of the Times," has been used a great deal to denote many things, but it seems to be most appropriate here, for all signs along highways indicate, by their increasing or decreasing numbers and types, the trend of progress or lack of progress in modern highway development.
CHAPTER X
Shacks and Fantasies

As NEW roads are completed, various businesses or would-be businesses spring up along the way, particularly on the outskirts of cities and villages and near important intersections. The majority of these enterprises may be termed a mushroom growth, as for the most part they are temporary, being established overnight in the hope of gleaning at least a wage income from motorists who are more concerned with traveling than stopping. As a consequence, all sorts of means are used to attract attention, from grotesque building designs to signs actually commanding everyone to stop.

Such buildings which fall within the criticism of the public include cheap gasoline stations, poorly maintained garages, stores, lunch or hot-dog stands, unreliable roadside markets, candy, ice cream and popcorn wagons and the individual dispensers who offer motorists everything from linen caps and lottery tickets to admissions to firemen's and policemen's field days.

This, however, is in no sense a condemnation of a legitimate highway business properly housed and conducted, and many of these exist which are a credit to the highways and communities, as well as to those who operate them. There are gasoline stations,
garages, restaurants, lunch stands and roadside markets which are appropriately designed, well constructed and located and properly operated. Much can be gained by the encouragement of such enterprises and the public can be educated to a desired standard by receiving information as to those classed as undesirable.

For the most part, all roadside businesses are conducted on adjacent private property and off the right-of-way of the highways. Since the jurisdiction of the highway authorities stops at the property line, there can be no control beyond this except through zoning laws and building restrictions. Zoning laws will probably ultimately correct such operations, including the erection of advertising signs on private property, but the public must first feel that such laws are completely constitutional. Much progress in this respect has already been made in a number of localities. Restrictions may be adopted by any property owner and his tenants and those to whom parcels of land are sold may be required to fully conform to them. A division of the highway department set up for the purpose of interviewing and educating property owners in this respect would be a progressive step in the right direction. A code of building construction and business operation could be adopted to serve as a guide to all who could be favorably influenced. With constant attention given to this, the undesirable operators would gradually cease to function because of a lack of business.
This can perhaps be most clearly illustrated in the case of gasoline stations. In some localities there are so many of these in a short distance that none produce a sufficient profit. The wise owner in such a case will realize that a well-designed and well-maintained building, attractive surroundings, prompt and courteous service and a pleasing personality of the attendant will attract far more customers than all the signs which could be erected on the property.

The process of eliminating the undesirable in this manner may be slow, but it is usually ultimately effective. Many so-called gasoline or oil stations do not rate a building, but the product is dispensed from steel drums stacked close to the highway right-of-way. Signs are erected at short distances either side of the station and the operator may recline in the open, in the body of an old car or in a boxwood shack patiently or, rather lazily, waiting for customers. The opposite extreme in the undesirable class includes permanent structures, but of grotesque designs, vivid colors, and with the surrounding grounds more or less plastered with signs. The design of filling-station structures ranges from this type to the attractive and acceptable. Steps toward the improvement of these conditions should be undertaken through a program of education by the highway department in co-operation with the community involved.

Garages, lunch stands, roadside markets and all other forms of roadside business could undoubtedly
be improved in the same manner. Many roadside garages are conspicuous because they are surrounded with worn-out automobiles, piles of junk and old tires. Some actually use great heaps of tires for advertising purposes, while others display wrecked cars to indicate towing and wrecking service.

Perhaps the most common disregard for community improvement is reflected in the variety of designs used for hot-dog and lunch stands. These may be found in a variety of types from mere shacks to fantastic replicas of old shoes, mammoth vegetables, animals, Dutch windmills, wigwams, Eskimo houses and Hottentot huts, until the motorists wonder whether they are in a foreign country, the land of Oz or on the main street of Coney Island. If such styles of architecture must exist, they should no doubt be segregated in certain localities, but to force the motorists to run the gauntlet of these monstrosities plus a maze of billboards before entering a city or smaller community constitutes a poor advertisement for the municipality and an imposition on those who travel.

The construction of modern highways is restricted to the nth degree by detailed and iron-clad specifications. This is done for the purpose of serving the motorists in a safe, sane and lasting manner. Why, then, should any community permit cheap, faulty, unattractive and unhealthy enterprises to spring up along the very threshold of results produced by the highest intelligence solely for public good?

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Perhaps the history of improved roads will parallel that of early mining camps and oil fields. Many of these tent towns which sprang up overnight passed through the periods of wild, rapid and unplanned growth to emerge eventually as attractive and well-built communities. Perhaps the heyday of highway frontiers is being witnessed and later will follow a saner and more substantial development of adjacent private property. Such a development, however, requires the leadership of far-sighted and progressive individuals. Roadside conditions do not happen, they are man made and directed.

In this respect the improvement of highways has had a distinct effect upon the marketing of farm produce. Insofar as fruits and vegetables are concerned it represents a change or evolution in the dispensing of these foods. The field has broadened from a centralized market to embrace a decentralized one where motorists may secure such supplies direct from the producer. Roadside markets in increasing numbers serve as an additional outlet to the markets of the cities.

Roadside markets properly established and operated constitute a legitimate and desirable business. At the outskirts of cities and towns, however, many markets exist which are no different than those in the business districts, since the products offered are frequently secured elsewhere. Through the open country, motorists are many times falsely led to believe that the fruits and vegetables or other farm products
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offered originate on the site. As a matter of fact, much of the stock in many cases is secured from city dealers, wholesalers and storage houses. Businesses conducted in this manner are undesirable and misleading. The majority of customers are motorists from near-by cities and towns and they can secure the same quality of goods nearer home.

Roadside markets, however, which serve as an outlet for the products derived from the adjacent property are desirable when properly housed and conducted. They offer the motorists fresh supplies from the farm which are frequently well worth driving some distance to secure.

Many accepted and desirable plans for roadside market structures have been suggested which are well worth consideration. Due to the nature of the business, much of the building in each case must be of open construction. The actual design may vary according to the locality, but it should conform to the ideas of a competent architect. Substantial buildings having a conservative yet desirable appearance are, of course, to be preferred.

The location of each structure and of all products offered should be entirely off the highway right-of-way. Parking areas connected with the highway by driveways should receive similar consideration, for there is no greater danger to traffic than promiscuous parking on the road right-of-way. Few if any signs are needed since the bulk of the goods offered, or the nature of the business, can usually be made plainly
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visible to passing motorists with little or no advertising.

Roadside markets along the main highways represent a growing business throughout the entire country. They enable growers and producers of farm products to dispose of a large percentage of their goods direct to consumers without the added expense of handling and hauling. The customers are benefited in that they may secure fresh products direct from the producer at a reasonable price.

One of the most effective means of eliminating undesirable and unreliable roadside markets is by patronizing only those which are desirable, dependable and properly operated. A cheap business conducted in an unsatisfactory manner cannot withstand the clean and fair competition of a sound business for any length of time. Prospective customers should therefore exercise good judgment in selecting those from which to purchase supplies.

Perhaps the most undesirable method of dispensing goods along highways is that practiced directly from trucks or cars parked on the highway right-of-way. Not only foodstuffs, candy and ice cream, but practically every small article imaginable is offered, including animal images, toy windmills, outdoor furniture and knicknacks of all kinds. This method of selling creates an extremely dangerous condition along the roads, for not only do the vendors occupy a part of the highway, but the parked cars of customers cause an actual congestion of traffic. Laws
SHACKS AND FANTASIES

are sometimes inadequate to cope with such a situation. These should be revised and effective laws passed where none exist and all should be enforced to prevent the use of highway rights-of-way for such purposes.

Another dangerous form of roadside business which obstructs traffic and which is frequently a menace to safe driving is that practiced by the pedestrian vendor. Policemen and firemen often stop cars at intersections or at traffic lights for the purpose of offering tickets for various functions. Incredible as it may seem, those on whom the public depends for safety are in many cases the very ones to ignore such responsibility. This is in addition to the imposition on the public in general of offering such tickets, since most people, although disinterested, feel that in making the purchase they are protecting themselves. This practice is misleading, dangerous and unfair to the motorists.

In addition to lottery tickets and tickets to various functions, the pedestrian vendor offers practically every other article that can be carried in quantity by a single individual. Of late years linen caps by the thousands have been sold in this manner. Peanuts, candy, popcorn, ice cream and toy balloons constitute some of the most common articles.

Vendors or peddlers should not be permitted to use the highways for such purposes, for they are not only undesirable and disturbing from the motorists' point of view, but they serve to distract motorists,
cause congestion and create a dangerous traffic hazard. Only legitimate businesses occupying a permanent location along the highways and on private property should be permitted to operate and in no case should any business, whether conducted by a peddler, pedestrian, truck or otherwise, be allowed within the limits of the highway right-of-way. The roads should be relieved of these conditions as well as those involving improperly located and operated lunch stands, gasoline stations, garages, markets, and other features previously noted. The maintenance of roads in a safe and presentable condition involves the correct regulation of physical encroachments. Motorists pay well for the construction and maintenance of highways and for the privileges which highways afford, and the road authorities should assume the responsibility for the improvement of dangerous and undesirable conditions caused by encroachments and obstructions.
CHAPTER XI

The Ever Present Upkeep

The success of roadside development depends largely upon maintenance. Consistent and regular attention to upkeep day after day indefinitely is the best method of permanently and properly preserving the service rendered by any physical plant or manufactured article. The quality and extent of such service may be measured in terms of maintenance, which is therefore a determining factor in the success or failure of the plant or article involved. If the cost of proper maintenance is destined to become unreasonable or prohibitive, then no capital expenditure should be made. In other words, if this is true, a project or plant should not be developed or an article should not be purchased. Roadside development is no exception, but rather it represents a most typical example of this.

One of the greatest dangers affecting the improvement of roadsides is a direct result of over-enthusiasm for the institution of the work, with little or no provision for maintenance. There is either a mistaken idea in such cases as to the need or cost of upkeep or else such a thought is never considered. With respect to trees and shrubs, the original planting is only the beginning. Nature cannot produce the
desired results alone and maintenance must therefore begin at once and continue indefinitely.

Money appropriated for roadside development without provision for future maintenance is largely wasted. Garden clubs and other organizations and individuals frequently promote roadside planting to the extent of guaranteeing the initial cost. Even though the money is successfully provided, its expenditure is unwise unless some assurance can be had that funds will be annually available for upkeep.

When such a project is sponsored by outside agencies or those not officially affiliated with the road authority, the main purpose may be to plant as much as possible or to execute an elaborate or spectacular design with much ado, pomp and publicity. Due to inexperience or a lack of professional training, highway officials may also frequently adopt a too pretentious planting plan without sufficient thought given to necessary future maintenance costs. Unless competent men are employed, highway engineers should have training and experience beyond that of their profession before responsibility is assumed for roadside planting.

Regardless of the sponsor or the type of planting carried out, the results cannot be indicated with pride or satisfaction for very long unless proper maintenance is provided. One of the reasons why elaborate landscape plans are impractical for most roadsides is because of the high cost of upkeep. Actually the public cannot afford and should not be asked
to pay an unreasonable amount of money annually for the intensive maintenance necessitated by such planting. A request of this nature would not be necessary if a practical program befitting the community involved were adopted and judiciously carried out.

The unattractive and useless appearance of neglected roadside plantings, even though the plans are practical and initial efforts modest, rightfully excite public sentiment against the work. The immediate effect may be favorable, but a lack of maintenance may prevent additional new work being done. Enthusiasm for highway planting should not be brought to a too hasty realization unless the future is well provided for. If consideration is not given to this, many sincere attempts will be defeated and the adoption of consistent and logical plans will be thrust further into the future or deferred indefinitely.

If outside agencies are permitted to finance roadside planting, then they or the road authorities should provide sufficient funds annually thereafter for maintenance. Largely because this is seldom done and because the plans and ideas of others than the road officials nearly always fail to embrace the situation from a proper highway service standpoint, the practice of surrendering all or any part of the work to outsiders cannot be recommended. Not to plant is always better than to permit improper or neglected plantings to become a public joke.

Many landscape plans for roadsides are impractical and if executed are impossible to maintain in a
satisfactory condition. Too often the designing of the landscape is one thing and the practical application of such a design is another. The plan in all cases must be consistent with its practical execution and future use or it is worthless.

A common opinion is that the preparation of a plan and the planting of trees and shrubs is all that is necessary, since Nature should guarantee that plants will grow. If a planting is left solely to Nature, the law of the survival of the fittest immediately begins to assert itself and a race for survival becomes evident which is not only confined to the trees and shrubs planted but involves all existing and adjacent plants, including grass and weeds. Also, transplanted material requires care to aid in overcoming the shock of moving and continued care to insure the proper rendering of the service it is intended to provide.

Assuming that the planting of trees has been a correct operation, which involves proper root pruning, top pruning and the firming of the soil about the roots, the next step is to do everything possible within practical limits to aid their survival, promote normal growth and perpetuate the stand. This may involve guying, cultivating, mulching, fertilizing, watering, maintenance trimming, various methods of controlling insects and diseases and replacing. The extent to which these practices should be followed depends upon the quality and size of trees planted, location, types of soil, weather conditions
The careful pruning and planting of large trees will reduce the loss to a minimum (six-inch American Elm)
and the nature and presence of insects and diseases. A qualified directing head should be placed in charge of these various items of maintenance in order that they may be economically executed, that they may not be overdone or practiced too frequently, and that they may be reasonably limited, yet sufficiently followed to produce proper results. Because of the dependence of maintenance upon so many different and changing conditions, the work must proceed in most instances as found necessary within a general program established each year and with few exceptions not according to a detailed routine. Many unexpected emergencies may occur which require immediate attention, and these, together with the regular work properly timed and judiciously performed, represent the maintenance or upkeep of newly planted trees.

The guying or bracing of newly planted trees to maintain them in a perpendicular position against strong winds and heaving by frost is not always necessary. Most trees three inches or less in diameter will remain in an upright position if properly planted. The few which fail in this respect can be easily straightened by men doing other roadside maintenance work or by crews sent out for this purpose alone. Trees larger than three inches in diameter, with few exceptions, should be guyed in three directions with wires attached to the trunks at a sufficient height from the ground to insure safe bracing. The wires may be looped around the trunks
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and covered with old garden hose, burlap or similar material at the point of attachment to prevent injury to the bark.

The question of guying trees is not always determined by their size. Those planted in light soils or exposed situations are more susceptible to being blown from their natural upright positions than those planted in heavier soils or protected locations. The extent and types of root systems also determine somewhat the need for guys. Trees planted in the fall are more likely to be loosened by winter winds than those planted in the spring because they seldom become sufficiently established before winter to prevent such damage. Trees of small diameter which are unusually tall may be held in place by tying them to supporting stakes placed in the ground beside them. In most cases, however, if trees to three inches in diameter are properly cared for during the first growing season after planting, the need for guying or bracing will be slight. Such care includes among other things the important consideration of cultivation.

Cultivation or the loosening of the soil is a common and well-known valuable aid in promoting the health and growth of plants. It conserves moisture by preventing rapid evaporation of soil water, it discourages the growth of weeds, which take much from the soil, it aerates the soil and prevents stagnation and it lessens the danger from grass fires, which are common along heavily traveled roads.
THE EVER PRESENT UPKEEP

The actual execution of this work may be carried on periodically by crews of properly trained men or a certain number of miles may be assigned to one individual who works continuously throughout the season. The latter method seems most satisfactory, since trees, especially, need constant observation for the presence of injurious insects and diseases and they frequently require straightening, some slight pruning or repairing from mechanical or other injuries. Also by practicing this method someone is always present in the vicinity to extinguish grass fires. If the proper distance is allotted to each man, he will cultivate each plant sufficiently often and yet not excessively, provided he remains steadily at work.

Experience has indicated that the area of ground cultivated around newly planted trees should be somewhat greater than that occupied by the spread of the roots. For example, a circular area about six feet in diameter should be cultivated around an average tree three inches in diameter. During dry times the surface may also be somewhat dished to catch all available rain water. The depth to which the soil is disturbed may be from three to four inches, but should not actually reach the roots.

The cultivation of the ground in this manner should start in the spring as soon as the soil can be worked and continue until September or October. The soil may be termed workable when it does not adhere to the tools used because of excessive moist-
tured. Obviously, then, the exact date at which this work must start in the spring and the dates of succeeding cultivation depend entirely upon weather conditions and the types of soils. Cultivation is always advisable soon after a rain, in order to retard evaporation and to conserve as much of the recent precipitation as possible. The frequent stirring of the soil during dry weather serves to interrupt or lessen the constant evaporation of soil moisture because of the layer of loose soil formed. This layer will not conduct soil moisture toward the surface as readily as soil which remains undisturbed and it therefore acts as a mulch.

A mulch is a material applied to the soil surface for the purpose of preventing excessive evaporation, retaining moisture, discouraging the growth of weeds or to prevent sudden temperature changes during freezing weather. A soil mulch may be formed by cultivation, as previously mentioned. Materials which may be added to the soil for this purpose include manure, leaves, straw, and leaf mold. Paper mulch, which has apparently been found useful in the commercial growing of many crops, is impractical for roadside use.

The application of a mulch to roadside trees in many respects reproduces artificially a similar condition that is found in natural wooded areas. In such places the soil has been covered with leaves year after year until a protective layer has been formed. This retards evaporation, maintains the surface soil
in a more or less loosened condition and provides to some extent for aeration.

Such a condition seldom exists where planting is done along the roads and it should therefore be created and maintained at least until the trees become well established. In a measure the successful planting of trees involves an attempt to produce ideal growing conditions in a comparatively few years, similar to, yet improved over those created by Nature over a period of centuries.

A mulch of well-rotted manure is undoubtedly the best for roadside work. It has some fertilizer value and when broken up and mixed with the soil, it serves as an ideal conditioner. It adds humus to light soils and renders heavy soils more porous and workable. It serves as the best protection in winter against sudden temperature changes which might otherwise heave or freeze the roots, particularly if the soil is dry. The recommended use of manure in this respect, however, applies only to trees or shrubs, since herbaceous plants require a lighter material, such as leaves or straw.

The best time to apply a mulch to trees and shrubs is in the late fall after the ground is first frozen. The normal growing season is practically ended in August and September and cultivation may be practiced less frequently and only to the extent of destroying the fall crop of weeds. Some time of inactivity in this respect may elapse between the final cultivation in September or October and the application of a mulch
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in October or November. If the weather remains mild it may be deferred until December.

The area over which the mulch is applied should be equal to that cultivated and the thickness may vary from three to six inches. Usually evergreens should be given a mulch of greater thickness than deciduous trees. Direct contact with the trunks or stems of the plants should be avoided by a distance of about six inches. This precaution may prevent rotting and other diseases or damage from insects or mice.

The most economical method of applying a mulch is by the use of trucks and crews of men. If manure is used it should be occasionally broken up and gradually pulverized during the warm periods of February and March. This process will permit the available fertilizing elements to be leached into the soil by the late winter and early spring rains. Also, a goodly portion of the humus left will be in condition to easily mix with the soil during spring cultivation. The excess material, if there is any, may be removed in early spring and placed in a compost pile to be used later as a milder mulch on more tender plants or as a soil conditioner where needed.

The fertilizer value of a mulch, of course, depends upon the material used, and although practically all such materials contain something beneficial in this respect, it is in most cases negligible. Even the fertilizer value of manure is low as compared with approved and balanced commercial brands. It, how-
ever, has been used as a fertilizer since agricultural methods were first practiced, while the so-called commercial types have been employed for less than one hundred years.

Commercial fertilizers are inorganic salts and organic materials such as fish scrap and tankage, excepting animal excrement, which are offered regularly on the market for the promotion or stimulation of plant growth. They are designed to supply plant nutrients by supplementing those already existing in the soil, rather than to serve as a substitute for the natural source. They are also intended to establish a proper quantitative relation between the necessary nutritive elements in order that a normal growth will result. The over-stimulation of plant growth is as important to avoid as is under-stimulation desirable to correct and an abnormal development of any kind is to be avoided.

There are about sixteen elements which are known to be necessary to the growth of plants and more may still be found. Of these, however, nitrogen, phosphorus and potassium are by far the most important. Although other elements may be included, a complete fertilizer cannot be placed on the market according to state laws without a guaranteed formula involving the three elements mentioned. A simple example of such a formula may be taken as 8-6-4, which means eight per cent total nitrogen or ammonia (as specified), six per cent available phosphoric acid and four per cent water-soluble potash.
An incomplete fertilizer may contain any two of the three essential elements as indicated by its formula.

A balanced fertilizer is one which contains the proper proportions of nitrogen, phosphorus and potassium to correct the condition of the soil and produce a normal growth. The formula of a correct balanced fertilizer can only be determined by giving consideration to the type of soil and its possible available nutrients, the kinds of plants involved and weather conditions. Experience and good judgment play an important part in this.

There are a great number of instances, however, where the same balanced formula will apply within reasonable limits and this has led to the manufacture of many standard brands by reliable companies. These are designed for certain plants and soil conditions and in most cases some will be found suitable for roadside trees and shrubs. If a great amount of fertilizer is required and conditions are such that a reliable standard formula does not apply, then the materials needed should be purchased separately and mixed to suit the case at hand. This will require considerable knowledge as to the source, availability and reaction of the principal elements as well as correct information concerning the needs of the soil and plants, the quantity to use per unit of area or per plant and the time of application.

Organic nitrogen fertilizers include dried fish scrap, dried blood, animal tankage, garbage tankage, tobacco stems, castor meal, cocoa-cake meal, and
cottonseed meal. They liberate nitrogen gradually throughout the season, since they must first pass through the process of decay. They produce the best results in a warm soil and they also aid in improving the physical condition of the soil. For the amount of nitrogen which they liberate, however, they are expensive as compared to the inorganic types.

The most common sources of inorganic nitrogen are nitrate of soda and sulphate of ammonia. The nitrogen from the former is immediately available even in a cold soil, but because of the residue formed of sodium carbonate, it gradually creates an alkaline condition.

The nitrification of sulphate of ammonia is necessary before its nitrogen becomes available and it is therefore slower acting than nitrate of soda in a cold soil. It is equally effective, however, in a warm soil. It develops an acid residue which can be counteracted by the use of lime or nitrate of soda.

The production of synthetic fertilizers containing nitrogen fixed from the air has decreased the cost of nitrogen and made many new compounds available. Nitrogen apparently has the most rapid and evident effect on plants of any of the elements. It promotes the growth of leaves and stems and is responsible for the deep green color of the foliage. A yellowing of the leaves indicates its absence. It tends to encourage a succulent growth and also regulates to some degree the effect of potassium, phosphorus and other elements.
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Raw rock phosphate treated with sulphuric acid produces superphosphate, which is the most important phosphorus fertilizer. This fertilizer is not completely effective on an acid soil and therefore in such cases lime should be added first. Bone meal releases available phosphorus in the soil rather slowly and, although popular, it is an expensive form to use. Phosphorus from basic slag is readily available and has an alkaline effect. Raw rock phosphate must be finely ground when applied because of its insolubility. It is more readily available when mixed with decayed organic matter such as farm manure. Other phosphorus fertilizers include ammo-phos, potassium phosphate, diammonphos, nitrophoska, and ammo-phos-ko.

Phosphorus is necessary to the normal cell division of plants and to the formation of albumen and fat. The necessary action of changing starch to sugar will not take place in its absence. It hastens maturing and ripening and encourages the growth of fibrous roots. It strengthens the stems of plants, stimulates energy and in some instances increases the resistance to diseases.

The largest commercial source of potassium fertilizers is the potash deposits in Germany. During the World War new sources were developed, as saline brines, kelp, old lake-bed deposits and flue dust. These are now used to some extent. The most common potash fertilizers are manure salts and kainit. Other potash salts are essentially the same except
for the presence or absence of nitrogen and phosphoric acid. These are readily available since they are water soluble. Tobacco stems and wood ashes are sometimes used for the potash they contain.

Potassium serves to improve the tone and general vigor of plants and therefore serves largely as a conditioner. It tends to prevent debility, counteracts the effects of excess nitrogen and delays maturity. It stabilizes the effect of excess nitrogen and phosphoric acid and is necessary for the formation of starch and the development of chlorophyll. It stimulates root development and improves the color of the flowers.

The extent to which commercial fertilizers should be used in the maintenance of roadside trees and shrubs depends a great deal upon the condition of the soil. A common opinion is that since native trees and shrubs grow and flourish in the fields and woods without being fertilized artificially, those planted along the roadsides should also survive in the same manner. This is true to some extent and there are soils along the highways that need little or no correction.

The purpose of using commercial fertilizers in such cases is to aid in overcoming the shock of transplanting and to permanently establish the plants as quickly as possible. Existing trees and shrubs growing naturally spring largely from seeds and are not transplanted. They gradually establish themselves over a period of years beginning from their seedling
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stage. Many fail to survive and those that do are hardy and can at least exist in an inferior soil by virtue of being allowed to grow undisturbed from seed.

One important reason for planting trees and shrubs of a certain size instead of seeds is that the desired effect and service is secured in the shortest possible time. Also, if seedlings were used, many would lack the vitality to withstand transplanting. In any case, an extra effort on the part of plants is required to overcome the shock of being moved. Commercial fertilizers applied at such a time, especially if the soil is poor, is a great help in preserving life.

Ordinarily, newly transplanted trees should receive one application of commercial fertilizer in the spring and one in the early summer of the first season. This should be continued for two or three years or longer, unless the soil is extremely favorable. It should gradually be discontinued, however, as soon as possible and future applications given only when the trees appear to be suffering from a lack of plant food.

Immediately after transplanting in the spring, deciduous trees and shrubs may be given a fertilizer having a formula of 6-8-6, 8-6-6, 5-8-6 or the like to stimulate a normal growth under ordinary conditions. For trees the amount of each application should be about two pounds per each one inch of trunk diameter. For shrubs it should be applied at

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the rate of two pounds for each one hundred square feet or about nine hundred pounds per acre.

Evergreens should be fertilized in the same manner, except that the formula for the spring application should be 10-6-4, 8-6-4, or similar, having a high nitrogen content. The formula for the early summer application should be 4-12-4, 5-10-5, or similar, having a relatively high phosphorus content. These fertilizers may be applied at the rate of from one-half to four or five pounds for evergreens under six feet in height, depending upon the exact height and spread.

As fertilizers are necessary as plant foods, moisture is also necessary to dissolve the nutrients and render them available to the roots. The soil is usually more or less damp during the spring and fall planting seasons, but frequently droughts occur during mid-summer which result in the death of trees and shrubs, particularly those which are newly planted and not yet positively established.

The watering of roadside plantings through the country is a costly and not altogether satisfactory procedure. The water must be hauled on trucks in large tanks or barrels, and this is a slow process. The most generous supply given each tree is usually not sufficient and if the drought is prolonged and the territory to be covered very extensive, watering cannot be practiced sufficiently often. One application of water may stimulate a tender root growth which will not survive until another can be made. Watering in
this manner does more harm than good. Watering to any great extent can be recommended only where the planting is sufficiently important to warrant the use of trucks, provided applications can be made at proper intervals, the use of temporary pipe lines with pumps located in ditches, streams or other bodies of water or the use of fire hydrants in the vicinity of towns and cities or wherever they may be available.

The public is very often critical of the fact that roadside trees are allowed to die during dry weather. Such criticism in some instances may be justified, but in general if the exorbitant costs and frequent ill effects of watering were realized, a more favorable opinion would result. Replacing trees at the next planting season is very often more economical than watering.

In direct contrast to the evident effects of drought or watering, the very important work of pruning and shaping young trees or the need for this frequently passes more or less unnoticed. Trees are necessarily pruned to some extent when they are planted, in order that the limited root system obtained in digging will not be overtaxed or the tops left with more branches than the roots can support.

The exact amount to be removed at that time cannot be determined with absolute accuracy, since individual trees differ from one another with respect to vitality and vigor. The extent of such pruning is, therefore, based upon standard practices which have
been proven best through experience. There is also a difference in the manner and rapidity of their recovery from the shock of transplanting and original pruning because there is a physiological difference in the constitution of individual trees.

Many abnormal branches frequently develop or unnatural shapes are assumed which may or may not be desirable or typical of the species. Although trees often seem to pass through an adolescent stage of ungainliness from which they eventually recover, this period is the time when useless branches should be removed and the framework of their future form properly moulded. This is not only necessary from the standpoint of appearance, but also to prevent the development of weak branches which may be easily broken and to prevent limbs becoming established in positions from which they must be later removed because of interference with traffic.

The correct shaping or the maintenance pruning of young trees should begin, if necessary, one year after planting and continue annually as long as required. This type of pruning also includes the removal of dead or broken branches. The work of shaping, as the trees reach mature size, gradually diminishes to a matter of eliminating dead, broken or damaged limbs until eventually the trees succumb from old age and have to be entirely removed. Normally, this complete schedule will occupy a space of time equivalent to the natural life of the trees, which, although varying with the species, is of a
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great many years’ duration. Shrubs require similar treatment, to a much lesser degree, but the objects of preserving normal and natural forms are the same.

Pruning is essential in preserving the natural forms of trees, yet the control of insects and diseases is at times of even greater importance. The normal health of trees and shrubs must be properly preserved if they are to survive, and preventative measures exerted within reasonable limits are always advisable. The spraying of all the trees and shrubs along the roadsides each year as a preventative is impractical and nearly impossible. If all trees and shrubs are thoroughly inspected and sprayed with a dormant application at some central point before they are transported and planted, they need not be given further attention in this respect unless their condition is questionable or unless evidence of insects or diseases is found. Those employed in cultivating, mulching, fertilizing, watering and pruning may also serve as inspectors for dangerous pests of this nature, thus preventing their sudden spread over any great area. Remedial measures, however, should be adopted as soon as a need for them is discovered.

Insects affecting trees and shrubs may be divided into three general groups for the purpose of briefly explaining their methods of control. These groups are chewing insects, which actually devour the foliage; sucking insects, which insert their proboscides or snouts into the tissues of the leaves and tender
Trimming is hazardous work and can only be efficiently done by experts.
bark for the purpose of extracting juices, and boring insects, which feed on the woody tissues underneath the bark, often excavating extensive galleries in the wood.

Chewing insects may be controlled by spraying the foliage with a stomach poison. A number of materials are available, although the most satisfactory and the one most generally used for this purpose is arsensate of lead.

This material is formed by oxidizing arsenious oxid to arsenic oxid, which is then combined with lead acetate. It is obtainable in the form of a paste or powder, although the latter is most convenient to use. There is a wide variation in the various commercial brands of the powdered types and they should be purchased only from reliable dealers or manufacturers on the basis of a proper analysis, with consideration given to suspension and spreading qualities. The powdered form should be thoroughly mixed with water at the rate of from five to ten pounds of arsensate of lead to one hundred gallons of water. Since it is insoluble in water, it must be constantly agitated when being used. Arsenate of lead is poisonous to humans as well as to insects and extreme care should be exercised in its use.

Sucking insects do not feed on the external parts of plants and can, therefore, only be controlled by a contact insecticide, or one which kills these pests by being applied directly upon them. The most practical materials recommended for this purpose on road-
side trees and shrubs are miscible oils and lime sulphur.

Miscible oils are usually prepared from a combination of vegetable and paraffin oils. They contain an emulsifier which makes possible their dilution with water. There are many brands available which vary somewhat as to analysis and quality. There is also some difference of opinion as to those which produce the best results. The purchase of reliable types, together with experience in their use, will aid to a great extent in determining the one most satisfactory.

Miscible oils must be carefully applied in order to avoid damaging plants. A dormant spray of this material is formed by mixing the oil with water at the rate of one gallon of oil to from ten to twenty gallons of water. There is a variation in the proportions of oil and water recommended for different brands, and the directions on the containers should be followed in each case.

A dormant spray of miscible oil for scale insects should be applied in the early spring before the buds swell and when the temperature is above forty degrees Fahrenheit. All evergreens and some deciduous trees are damaged by miscible oils at dormant strength and these should, therefore, not be sprayed with the more concentrated mixtures. A much weaker solution of miscible oil and water may be used on evergreens with safety if applied before growth starts in early spring, and successful applica-
tions have been made on some deciduous trees in full leaf. Favorable results are also being obtained by the use of miscible oil as a dormant spray in the fall.

Concentrated lime sulphur is formed by boiling together two parts of commercial sulphur flour and one part of burned lime until the proper polysulphids are formed. It may be purchased by the barrel or in smaller quantities. This material is widely used as a scalecide and is also valuable as a fungicide. It may be mixed with water for dormant purposes at the rate of one gallon of liquid to about ten gallons of water and its strength is reduced to one gallon of liquid to about fifty gallons of water when used during the summer. Concentrated lime sulphur is objectionable because it is corrosive to the skin, it discolors painted surfaces and it has a repulsive odor.

Boring insects are the most difficult to control because in their destructive stage they burrow underneath the bark and within the wood. No reliable method is known of completely preventing their attacks, although they are seldom fatal to healthy and vigorous trees. They may, however, be removed with the aid of a knife or wire, although this is a rather tedious operation; calcium cyanide or carbon bisulphide may be inserted in the galleries and the openings sealed with putty, or the infested parts of the trunks and branches may be painted with a mixture of one pound paradichlorobenzine and two quarts raw cottonseed oil. This should be applied
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only on suspicious places, since it is unnecessary and harmful to cover the entire trunk. It should not be used during June, July and August because of the danger of absorption caused by high temperatures. The best time for application is when the midday temperature is between fifty and eighty degrees Fahrenheit. This remedy will not restore the health of trees or bring them back to life, but it will kill the borers and end the damage which those present have inflicted.

The wrapping of the trunks of newly planted trees with building paper in the spring before the adults of borers fly, helps to prevent these insects from depositing their eggs on the bark. The spraying of young trees with a newly developed preparation containing wax promises to be cheaper and more effective in this respect as well as to prevent sun scald and losses due to excessive transpiration.

There are a great many different commercial brands of insecticides, but those mentioned are as practical and effective as any where rather extensive operations are necessary. Other materials, however, may be equal in every way for a local infestation of shrubs. Only the best materials, secured from reliable dealers, should be considered.

The control measures adopted in each case must be given intelligent consideration in order to successfully prevent the ravages of insects or to lessen the damage done by these pests. The habits and life cycles of the insects must be known in order to prop-
erly combat them. A difference of but a few days in the time of spraying is frequently responsible for the success or failure of such effort. The presence of dangerous insects should be promptly reported to the proper authorities and those of lesser consequence dealt with according to their degree of importance. The Federal Government and the governments of many states have enacted laws and appropriated large funds to cope with many dangerous insects, and co-operation with these agencies should be practiced at all times.

Fungus diseases of plants may be prevented or more or less controlled by spraying with Bordeaux mixture or lime sulphur. Plants infected with bacterial diseases may be stimulated by proper cultivation and fertilization to outgrow their affliction or they may be removed and burned to prevent the spread of the trouble.

Bordeaux mixture is prepared by mixing copper sulphate with lime water in the proper proportions. Dry Bordeaux powder with full directions may be purchased in packages ready to mix with water. The contained copper in this material prevents the germination of spores and checks the growth of germ tubes. It is most effective when applied as a preventative, since it does not arrest the growth of fungi within plant tissues.

Sulphur is the toxic agent in lime-sulphur, and the disease spores contacted with this material are either killed outright or soon after they germinate. Lime-
sulphur of the proper concentration may be used as a dormant or summer spray. Bordeaux mixture may be used at the proper strength throughout the growing season.

A proper diagnosis of the trouble, whether it is caused by insects or diseases, is of first importance, since this is necessary before a remedy can be applied intelligently. The proper authorities should always be notified when necessary or when in doubt. There are Federal and state laws restricting the moving of nursery stock due to certain insects and diseases, and these should be observed. Likewise, much public money is spent annually in the eradication of serious plant pests, and full co-operation should be given to all government authorities in this respect.

A number of newly planted trees are lost each year due to one or a number of causes, such as insects, diseases, mechanical injuries, low vitality, drought, poor soil, lack of care and the like. A permanent planting can only be established by replacing such losses annually as they occur. This is an important part of maintenance and will continue to be as long as roadside trees are considered in the light of permanency.

The size of trees used for replacement in most instances need not exceed the standard size of those originally planted. If an attempt is made to replace trees with those of equal size, the cost would ultimately become prohibitive. A variation in the size of roadside trees is desirable, except in a relatively
few cases, and this variation may be obtained by considering only the most economical sizes when making replacements.

The percentage of replacements normally made each year, however, is relatively small and the bulk of trees planted are constantly growing to larger sizes. The maintenance of young trees and shrubs which are planted, therefore, gradually becomes greater in scope, until it includes the care of those which have matured as well.

The maintenance of full-grown trees and shrubs, however, should not be confined to planted material which finally reaches this stage, but existing plants of these types of all sizes and ages should be given immediate attention. In other words, the maintenance of trees and shrubs should not be confined only to those which have been planted, but to all such plants existing naturally or planted by others along the highways. In fact, the care and preservation of existing trees is as important as the planting of new ones.

Existing trees are trimmed for the purpose of removing dead, dangerous and interfering branches, to prevent obstructing the safe view of motorists, to improve their form and to invigorate them by promoting new growth. The proper trimming of trees is a practice in which only the well trained can excel. It requires a thorough knowledge of the habits, physiology and method of growth of the various species, together with experience in the actual perform-
ance of the work. Tree trimming improperly done is not only unattractive but it is actually harmful. Stubs left when removing limbs, improper cuts and the failure to use a dressing on wounds or the use of inferior material for this purpose results in decay and disease and hastens the death of trees.

Tree trimming may be practiced at any season of the year, although the best time for this is from the first of July until the leaves drop in the fall. All branches removed should be cut flush with the adjacent branch or trunk and in such a manner as to prevent the stripping of the bark on the remaining part. All cuts should be immediately treated with an approved and inconspicuous brand of pruning compound. Trees should never be topped without a necessary and practical reason, since this ruins their natural form.

Implements for tree trimming are many and varied, and although only proper tools should be permitted, to prevent mutilation and to efficiently perform the work, there is some variation in the choice of these by different experts. All such tools should be daily inspected and constantly maintained in proper condition as a matter of safety and efficiency.

The pruning of shrubs is an operation of sufficient importance to deserve mention. Shrubs appear at their best when allowed to grow in a natural manner and should only be pruned for the purpose of removing dead, diseased, insect-infested or damaged wood,
Each trimmer should be properly and safely equipped.
or for the purpose of invigorating the plants or promoting new growth. Their natural forms may be preserved by proper pruning. Pruning to artificial shapes or topping to even heights should never be practiced except with formal hedges. Periodic pruning for no good reason is harmful, useless and a waste of money. The general maintenance of shrubs in other respects is about the same as that of trees, although if not carefully executed, the tendency may be to exceed the practical limits for such work.

The maintenance of herbaceous plants varies according to the objective desired and the types used. The planting may be naturalized or arranged in cultivated beds. Large numbers in the former case are massed along the roadsides in the manner of wild flowers and left to survive with little or no maintenance, except to protect from mowing machines, while in the latter instance they are planted in carefully arranged groups in the parkways of boulevards, in the vicinity of structures which require such treatment or at intensively developed intersections or other roadside areas.

Such groups of herbaceous plants must be cultivated, watered and kept free from weeds throughout the season. If annuals are used, new plants are placed or seeds are sown each year. If perennials are used they must be renewed or divided and transplanted periodically, depending upon the species. Many must be protected during the winter with a mulch, and with both annuals and perennials the soil
should be properly conditioned and fertilized each year.

If commercial fertilizers are used, one rather high in phosphorus should be selected for average conditions, as a 4-12-4, 5-10-5, or one having a similar formula. This should be applied at the rate of about four pounds per one hundred square feet. Herba-
ceous plants are extremely sensitive to most commercial fertilizers and these materials must be carefully used to avoid damage. Well-rotted cow manure is the best general soil conditioner for these plants.

The maintenance of grass is an operation of varying intensiveness, depending in a large measure upon the type of road considered. The parkways of boulev-
dards and well-developed areas should be kept mowed throughout the season with power or hand lawn mowers. This practice may also be desirable at other locations, depending entirely upon condi-
tions.

The grass on extensive slopes through cuts and fills and at the approaches to bridges and grade separations may be cut less frequently but more so than the ordinary grass areas along the usual coun-
try roadside. The more often grass is cut, the stronger will be the root system, and this condition is highly desirable on slopes in order to hold the soil in place and to prevent erosion. When grass is per-
mitted to go to seed before it is cut, the root system is weakened and failures are more apt to occur dur-
ing heavy rains and spring thawing.
The Ever Present Upkeep

The grass on more or less level areas or on gentle slopes along highways through the open country is usually cut with tractors having mower attachments or ordinary farm mowing machines. Men with scythes do the work where machines cannot be operated. This mowing is done only a few times each season, the main purpose being to prevent the weeds, of which there is usually a great number, from going to seed. This sort of mowing constitutes the bulk of such work along the highways where the use of lawn mowers and more frequent cutting would be impractical.

The time of mowing depends entirely upon weather conditions and the resultant growth of the grass. The height to which grass should be cut depends upon location, kind and quality of grass, soil and weather conditions. Lawn mowers are adjustable and may be varied according to these conditions. In general, the grass on roadside lawn areas should be cut to a height of about one inch, the grass on slopes may be cut to four or six inches in height, while the ordinary roadside areas may be mowed after the grass has reached six inches or more in height, but before it goes to seed. The removal of grass clippings from properly maintained lawn areas or slopes in connection with this sort of work is in most instances unnecessary and impractical. The same is also true of the grass and weeds which make up the bulk of highway mowing, except where a fire hazard or obstruction to drainage is created.
Areas maintained as lawns and sodded slopes may be given one or two applications of commercial fertilizer each year and a top dressing of suitable material when needed. A fertilizer having a high nitrogen content applied in the spring stimulates a top growth and aids in preventing weeds. Such a fertilizer may have a formula of 10-6-4, 8-6-4 or similar. It should be evenly applied when the grass is dry at the rate of about one pound per one hundred square feet or approximately four hundred and fifty pounds per acre. Applications should be made just before a rain or the fertilizer should be immediately washed in artificially. If the first application is made in April, a second may be made in June with a fertilizer containing relatively more phosphorus and potash.

The fertilizing and top dressing of grass should be confined to only those areas which require such treatment because of their location, from the standpoint of appearance, and because of the necessity for maintaining a strong root growth in order to preserve slopes. The extensive use of fertilizers is expensive and, although money is saved by their judicious use, the practice must be kept within reasonable and practical limits.

The care of roadside trees, shrubs, flowers, and grass is frequently closely related to the maintenance of other services, the equipment of which occupies the highway right-of-way. In this instance, public utilities are mainly considered, since, in order to
maintain their plants, more or less damage results to the natural landscape. The companies in all such cases should be required to repair the damage or pay for the cost of such work. This necessitates competent supervision and inspection on the part of the road authorities as well as the adoption and enforcement of adequate regulations.

The maintenance of highway lights is likewise the function of a public utility or a division of local government. If the highway authorities are responsible for the cost of electricity used, then they should receive in return efficient service and maintenance. These arrangements are usually covered by contracts which state definitely and in detail all the terms to be observed.

In considering the maintenance of roadside structures, comfort stations should not be overlooked. From the standpoint of service and public health they cannot be neglected in any degree and unless proper and constant attention is given to buildings they will rapidly deteriorate, especially if the building materials used are not of a permanent nature. Among the ordinary items of upkeep are painting, repointing stone and brickwork, replacing eaves pipes and downspouts, reshingling, repairing miscellaneous damages from various causes, including broken or altered stones and bricks, broken doors, windows and shingles, maintenance of plumbing and plumbing fixtures, maintenance of heating plants and mechanical appliances, refinishing and
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decorating, and the daily cleaning and sterilizing of all interior surfaces and fixtures subject to public use. The detailed items and materials used in connection with this may vary according to the type of buildings, facilities available and extent of use. Usually a caretaker should be on duty constantly to preserve order, enforce regulations, assume the responsibility for cleanliness, sanitation and minor repairs or, in short, to properly operate the buildings in the best interests of the public.

Comfort stations require constant attention if they are to adequately serve the public in a sanitary manner. Cleaning is a continuous and important operation, especially during periods of intensive use, and unless this phase of maintenance is properly observed, the very purpose of comfort stations is largely defeated. A woman attendant is frequently necessary in addition to the regular caretaker. The number of employees required, however, depends upon the type of buildings, extent of use and the schedule of working hours adopted.

The maintenance of road signs is also a continuous operation throughout the year. This work largely includes repainting, repairing, and replacing. Weatherbeaten and unreadable or broken signs are of little use to motorists. They indicate an inefficient attempt at maintenance and serve to invite public criticism. Neglect in many instances results in public inconvenience, while in others it leads to serious accidents and loss of life. The care of such signs is an
important part of highway service and should be
given daily attention by some designated unit of
every road organization.

There is usually more or less variation in the
method of organizing for roadside maintenance as
practiced by different highway authorities. The
highway laws of various states differ and the admin-
istration of highway affairs is not always vested in
the same relative authority. Also the plans for a
complete road organization frequently vary with the
ideas of different highway executives. Consequently,
the logical arrangement for executing the work in
each instance depends a great deal upon the estab-
lished order of the existing organization.

However, the complete annual maintenance of
trees, shrubs, flowers, grass, lights, comfort stations
and signs involves a multitude of details which have
not been mentioned. Only a general outline of the
most important operations has been considered with
the object of briefly illustrating the necessity for
proper care and the necessity of entrusting such care
only to those who are fully qualified.
CHAPTER XII
Intrinsic Worth

AS YET the mind of man has not been able to express the worth of all things in dollars and cents. Price is not an absolute yardstick for value. The judgment of people concerning the worth of things depends upon the feelings which the things excite. Judgment may be based upon an idea, but an idea is born of feeling and constantly associated with it.

Every individual is more or less practical and each individual’s association with things is also more or less limited. Everyone, therefore, feels intensely the significance and importance of his own associations much more than those of others. All are too much absorbed with their own independent associations to extend their full sympathy to each other in a like degree.

Because of this, an individual opinion as to the worth of things cannot be taken as a standard, and with the present form of government in the United States an accepted standard of public service is one adopted by the majority. In many instances, the rule of the majority may not be the best although it may be the most popular. This fact, while it may retard the progress of many essential things, also serves to curb the execution of fanatical ideas. Therefore, the
intrinsic worth

development of many much-needed public services is a slow and cumbersome process, yet all the more substantial and sound because of this.

To institute a service in advance of favorable public opinion is likely to result in its becoming unpopular and in its immediate or ultimate failure. If, however, it follows its natural, slow course of development it can be gradually altered, modified and improved until it properly and completely serves its purpose. The safest methods of hastening the adoption of such a service is by public education, favorable influence and a willingness to place all the cards upon the table.

Roadside development is a most outstanding example of this type of service, and its worth to the public is not only evident in monetary terms, but to a greater degree in abstract, yet necessary values. These are little understood and appreciated by the majority. A frank and complete explanation of honest and sincere efforts to institute a worth-while public service, increases favorable appreciation and tends toward a more common realization of its desirability and necessity. If the true value of roadside development were generally known it would become much more desirable and its necessity would be much more evident.

Man's limited knowledge of soils, the growth of plants and weather conditions prevents an accurate and complete appraisal of roadside development in terms of money at the present time. There is much
to be learned which would explain and clarify these evident values, but until this is done they must be accepted without a concrete comparison.

Roadside development is valuable in varying degrees to motorists, abutting property owners, the community at large, and future generations. For the sake of analysis and to arrive at a logical conclusion, its total import as it affects these may be expressed by practical value, theoretical or speculative value, aesthetic value and sentimental value.

The practical value of roadside development may be considered as a measure of its concrete or physical usefulness and can in many instances be directly expressed in dollars and cents. Shaded highways are of untold value to motorists during the hot months of summer and at such times physical comfort is often of far more practical importance than the appearance of the landscape.

In addition to their direct effect upon human beings, plants are also useful in maintaining the roadsides, roadbed and drainage structures in a proper condition. Trees and shrubs by their countless hair-like feeding roots increase the absorption and retention of rain water in the soil. Roots absorb water as well as the soil and they also aid in holding the soil particles together.

A soil having no vegetation absorbs a much smaller amount of water from rains than one which supports plant growth. The more varied and dense the vegetation, the more water will be taken into the
soil and the less allowed to escape over the surface. Moving water, especially that resulting from a sudden downpour of rain, carries with it many particles of soil. Barren land or other soil which is exposed to rains in this manner is eroded or washed and if left unprotected will continue to lose its finer soil particles until the area becomes broken and rough from many washouts and incapable of supporting plant life.

The damage does not end here, but continues as the soil is carried to open ditches, tile drains, and culverts, where it is deposited as an obstruction to the flow of water. Such obstructions cause small floods which frequently damage the road surface, shoulders and structures. In the case of large streams and heavy or persistent rains, the destruction from this cause may be unlimited.

The clearing of ditches and drainage structures along highways is a part of each annual road maintenance program, and in some localities this work has to be done after every major rain. This procedure is costly and it does not correct the cause of the trouble. Surface water can be most easily controlled at its source, and the planting of areas affected is the most logical method. Planting not only serves to control surface water, but it aids in maintaining a normal water table in the soil or, in reality, it creates a natural reservoir of soil water which may be gradually released over a period of time. This retards and regulates the flow of water into ditches and drains.
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This regulation of soil moisture, which is made more effective by a normal shading of the roadbed, also aids in preventing damage due to sudden and severe temperature changes. Dry and unshaded soils, particularly those of a heavy nature, when subjected to rains, freezing and thawing, will heave, expand, contract or alter in mass, which results in a rough and insecure foundation. A normally shaded and moist soil will react much more slowly to rains and temperature changes without approaching the extremes resulting from the opposite condition.

This is true in varying degrees of all types of soils. The planting of light or sandy soils, however, may be less necessary from the standpoint of the reasons given, yet more necessary to prevent erosion. Considered from all angles, road surfaces built upon soils which are protected by roadside plantings actually cost much less to maintain.

Herbaceous plants and grass, in addition to trees and shrubs, aid materially in preventing erosion. The filling of washouts along road shoulders, ditch slopes, the banks of cuts and fills or uneven ground along the roadsides with fresh soil, rocks, broken concrete or refuse is only a temporary remedy and must be continually repeated. This costs more money annually than the growing of grass on such slopes and it can be accomplished best by sodding. Grass forms a natural and unbroken ground cover which spreads over the surface of the soil as a vast protective blanket and, when established, it confines the soil in a permanently fixed position.
INTRINSIC WORTH

The actual saving in money resulting from roadside development is not due to planting alone. Economy can be practiced in the regulation of public utilities. Although the pole lines of these companies are undesirable from the standpoint of appearance and although they seriously interfere with trees, they cannot be completely removed from the highways in a short time. This of necessity must be a gradual process.

The first step in this regard, however, is joint construction, which reduces the number of poles to a minimum, thereby conserving timber and resulting in a direct economic saving. The term "joint construction," as used here, means the carrying of two or more lines belonging to the same or different companies upon one line of poles. Wherever one pole can serve in the place of two or more, the saving becomes a concrete item and the appearance and usefulness of the highways is materially improved. Joint construction is possible in a great many instances, the most important limiting factor being that of safety.

All phases of roadside development, including the construction and maintenance of comfort stations, the removal of advertising signs and other undesirable encroachments and the general maintenance of the roadsides in a presentable condition, serve to attract people to the community so improved and also results in a direct increase of adjacent property values. The tendency of a civilized people is always
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toward better living conditions, and everything which favorably influences this either on public or private lands is a benefit both in actual money and otherwise.

The theoretical or speculative value of roadside development has to do with results which are known to be beneficial but which cannot be positively or completely defined or described. Much of this mystery is to be found in soils. The subject of soils has been the object of a great deal of research and study, and volumes of authentic information have been written, but many questions still remain unanswered.

The soil is the basic support of life on earth and its variations and reactions are apparently unlimited. Even the poorest soils in many instances provide life to plants of some description and the multitude of soil organisms are constantly at work everywhere. Various soils are subject to chemical and physical changes which are due to both natural and artificial changing conditions. The effect in many cases is obvious but the exact cause and result is not always fully understood.

Except as they interfere with the progress of man, plants growing on soils provide a more healthy condition than barren land. Theoretically, such plants are more beneficial than they actually seem to be, especially with respect to their effect on soil, water and the attendant reactions due to weather conditions.

Ultimately, all the facts regarding soils and plant life will be known, but only by intensive study and
Trees need not be made unsightly to provide wire clearance.
experiment through generations of plants from the herbaceous types to the largest trees, under all conditions and in all kinds of soils. Nature reveals her secrets slowly even to the most diligent scientists.

Such questions of science with respect to roadside development do not alone remain unsolved. There are those of psychology to be considered or the effect of various things upon the human mind. Theoretically, at least, the improved appearance of the roadsides exercises a quieting or soothing effect upon the mind and lessens the possibility of distraction. Since there are as many opinions as there are people, the questions naturally arise as to what constitutes proper appearance and what standard of mind can be accepted. Without careful reasoning, this subject may fall into the same abstract category of sanity or insanity, one being but a degree of the other. To avoid this, a standard must be taken.

Insofar as the planting of roadsides is concerned, the object is to imitate the natural arrangement of plants in a manner modified to suit the situation at hand the best. Since improved roads which are to be benefited by planting are purely artificial, their effect upon the arrangement of the adjacent landscape cannot be avoided. Also, if a roadside planting is to fully serve the public it must be more or less altered from that existing in remote and unpopulated regions.

The accepted standard of appearance in this respect varies with individuals, since there are those who apparently see little or no value in any land-
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scape planting, while others of the opposite extreme place a planted landscape far above its necessary, useful and practical worth. The standard or quality of roadside planting varies with the community, the type of road, the various uses to which the road and adjacent land is put and to the amount of money available for such purposes. The best standard attainable, with consideration given to these practical limits, should be followed, since the value of such a standard, insofar as appearance is concerned, is most beneficial to the public. The theory of this may be based somewhat upon the law of averages, although the actual effect, according to observations over a period of years, has a decided concrete value.

Not all people are similarly influenced by the same thing, but in general the soothing or quieting effect of reasonable landscape treatment is distinctly felt by the majority. At least, the feeling is in sharp contrast to the distracting effect of glaring signs, a maze of public utility poles and otherwise cluttered roadsides. There is also the danger that an elaborate or too intensive landscape planting might appear so far out of place along the roads that it would have the same undesirable effect as such condemned encroachments.

Many may become so accustomed to viewing neglected roadsides that such conditions are apparently passed unnoticed, yet the distracting influence is there and is distinctly manifested to a more or less degree upon the nervous system and subconscious
mind of every individual. It increases bodily fatigue and adds to the risk of driving an automobile, especially when unexpected situations arise.

The theoretical and speculative value of roadside development with respect to plants, soils and the effect of the improvement upon those using the highways is decidedly evident, although the process by which this value is produced and the results cannot be altogether clearly explained in every case. So far, very little of this value has been expressed in dollars and cents, but continual investigation and education may bring this about in the future.

The æsthetic value of roadside development concerns appearance only, and while it means much to some people, it is of little or no importance to others. The word "æsthetic" means appreciative of the beautiful in Nature or art, and there is a great variation of this ability in individuals. The lack of it is not always due to a limited education, since many of the most intelligent people are apparently without those finer qualities of consideration which recognize the beauty of appearance.

In contrast to this, there are also many people who are overæsthetically inclined or who make too much of beauty alone. Either extreme does not represent a normal or desirable viewpoint and cannot be successfully followed in roadside development. Since æsthetics, however, have to do with the theory or philosophy of the beautiful and since proper appearance is directly dependent upon this, the æsthetic
value of improved roadsides must be logically considered as important. Should roadside development fail in this one respect, its desirability would be decreased to a considerable degree.

The æsthetic value of roadside development cannot at the present time be expressed in money, except as it affects adjacent private property or as it attracts financial support to the community. Its worth to the human mind is one of satisfaction in a varying degree and upon which a standard monetary value cannot be placed. Its worth to an individual, however, may be definitely established, as, for example, a single tree may have no value to one, while to another it may be worth several hundred or more dollars.

From a public viewpoint, however, a single tree or an entire planting along the roadside cannot be construed as being worth actual money to any one person alone. From an individual viewpoint, only the market value of the wood, lumber or fruit produced determines its actual worth in money, and this can only be legally realized by the abutting property owner, provided he has title to the center of the road and provided the proper public authorities decide it has more value to him as wood, lumber or fruit than to the public as a roadside improvement. If a price is to be placed upon æsthetic value it should be based upon its worth to the public and not to an individual alone, and it should be fixed by the public authority responsible for such tree or planting.

What the future may bring forth regarding the
monetary value of æsthetics is a question. Epistemology may do much to classify, limit and value knowledge, for, although civilized people have progressed a long way in the material sciences, the surface of metaphysics and philosophy has barely been scratched.

The sentimental value of roadside development closely borders that of the æsthetic, although it is much more abstract and has to do only with individuals, groups of individuals or incidents. For example, trees planted in memory of departed heroes or in honor of some event or accomplishment have a sentimental value for some but not for others.

A money value from the viewpoint of the general public is impossible to fix in such cases, since the sentimental value represents individual or group feeling. Also, it is not a dependable or permanent value, since it frequently passes with a single generation.

This brief analysis of roadside development, with respect to its intrinsic value, indicates that it is worth a great deal both in actual money and in a social sense. It is unique in that it embraces both to a proper degree, representing a public benefit that is useful as well as ornamental. It is a striking example of that too often forgotten Biblical truth that man cannot live by bread alone.
CHAPTER XIII

The Proverbial Road

The well-known proverb which suggests that the straight and narrow path is the best road to success can be appropriately applied to roadside development. The innumerable ramifications of the work and the vast number of varying influences which affect it, form difficulties which must be overcome in holding to a proper objective. The objective is plainly evident in the definition of roadside development, which may be concisely expressed as the practical improvement of the roadsides for the best use and benefit of the public. This, accomplished without lavish exemplification of the beautiful and also without a neglect of undesirable features, is the ideal. To arrive at this, a considerate, yet restraining ear must be lent to overenthusiasm and an educational, yet firm attitude must be displayed toward indifference and criticism.

A clear-cut picture of exactly what constitutes roadside development must be had before it can be actually realized. First, the term roadsides as used in this connection applies to all public highways, streets or boulevards which are used as such, but particularly to the first named or to those passing through rural districts which are designed to accom-
modate both recreational and commercial traffic. Roadside development is frequently confused with freeway or parkway development, from which, in the main, it is distinctly different, all three being alike only in some respects.

According to Edward M. Bassett, formerly president of the National Conference on City Planning, the following definitions distinguish between these three types of motor ways:

“A highway is a strip of public land devoted to movement over which the abutting property owners have the right of light, air and access.

“A freeway is a strip of public land devoted to movement over which the abutting property owners have no right of light, air or access.

“A parkway is a strip of public land devoted to recreation over which the abutting property owners have no right of light, air or access.”

The American Civic Association defines a parkway as a connecting highway between parks which in itself extends some definite recreational facility in addition to its connectional value.

Parkways are more park-like in appearance and use than other routes of travel, and in order to gain a clearer conception of these various terms a park must be defined.

According to English law (Mortmain Act, 1888), the term “public park” is defined as including “any
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park, garden, or other land dedicated to the recreation of the people.” In the United States, according to the Playground and Recreation Association of America, the American Institute of Park Executives and the National Conference on Outdoor Recreation, the term public park is now generally considered to refer to any area of land or water set aside for outdoor recreational purposes, whether it be recreation of a passive or active nature, or any of the degrees between these two extremes, and that the recreation is expected to come, in part at least, from beauty of appearance.

From these definitions the terms given may be arranged as follows, in the order of their importance from the standpoint of appearance and recreational service: Parks, parkways, freeways, boulevards, streets and highways. From the standpoint of their importance in accommodating automobile traffic, the order may be roughly reversed.

Highways, streets and boulevards may be grouped under the more general term of roads, which in reality they are. Roads in this sense are not freeways, parkways or parks and they must be developed correspondingly less for appearance and recreation and more for the accommodation of traffic alone. Thus, roadside development is definitely limited to roads and any attempt to exceed such limitations or to impose a freeway or parkway development on roads without first establishing them as freeways or parkways is impractical and undesirable. If, however,
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roads are established as freeways or parkways, roadside development then becomes freeway development or parkway development.

A clear and correct conception of roadside development, together with a complete knowledge of its scope and object, is necessary in order to properly and efficiently administer the work. The extent of accomplishments in each case depends upon the will of the community involved and the action of the governing body of the county, state or Nation in appropriating sufficient funds for such a purpose.

Many organizations, such as luncheon clubs, garden clubs, chambers of commerce, the American Legion and a number of others having a civic pride in their community, have become seriously interested in roadside development in its entirety or in one or more phases of the work. The interest of local organizations has spread to many state and national organizations and much is being accomplished through their influence. With their help, billboards have been removed, roadsides cleared of junk and refuse, hot-dog stands and other undesirable encroachments forced from the highways, filling stations improved and many unattractive areas well landscaped. Highway officials have been persuaded to budget money for the work and the public has been favorably educated by untiring and persistent efforts.

This enthusiasm is worthy of more than recognition by the road authorities. It is entitled to a most
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welcome reception and a guarantee of full co-operation to attain the proper and desired results. The proper relation between public-spirited groups or individuals and the road authorities concerning roadside development, however, suggests several rather important considerations.

Frequently a plan for roadside development may be financed and executed by an interested club or group, the highway department or road commission participating only to the extent of being informed or granting such permission. Perhaps in such a case the highway authorities have neither the funds nor the organization for such work and the course taken seems logical. It is, however, an unsound and impractical policy for a number of reasons.

Unless close co-operation is effected between the road officials and the sponsors, there is danger that the plan in many instances may not conform to the highway plan for the future development of the road and the work may ultimately be destroyed by road widening, a change in alignment or other necessary improvements. The cost of the actual work in the field may be defrayed by the sponsors, but unless a sufficient amount of money is set aside each year thereafter for maintenance, the original expenditure is largely wasted. Few groups are in a position to guarantee the necessary annual funds for an indefinite period and as a result the improvement becomes neglected, falls into the discard and is forgotten.

Many concrete examples of erroneous roadside
development as sponsored and carried out by unofficial groups may be found. Some advocate the planting of annuals and herbaceous perennials where trees and shrubs would be more servicable and appropriate. Others wish to make a spectacular show by planting tremendous quantities of a single type of plant, such as irises or roses, where a few trees would be far more desirable and useful.

Examples exist of elaborate plantings which have been made without money provided for future maintenance and many of the plants have been damaged, the dead ones still stand and all are overgrown with weeds. Entrances to communities have been decorated with small and cheap trees, such as poplars and soft maples. These have been badly trimmed and left to whip about in the wind hardly distinguishable from the surrounding tall grass and weeds. Also, the overenthusiastic or inexperienced in authority may elaborately design a roadside in a manner befitting the garden of an estate, which in many instances would be completely out of place along the highway. Many of the plants used might not even be hardy or appropriate in such a situation. The attitude behind these endeavors is admirable and could be used to good advantage if properly directed, but the results of such work are anything but a credit to roadside development or the community and they serve to unfavorably influence even the most ardent sympathizers.

Logically, the plans for roadside development
should be made and the work executed by the highway organization having jurisdiction, because this is a part of its function. Other agencies may exercise a helpful influence or render direct aid, but the responsibility should be kept where it belongs. A greater public service could be rendered by these groups if they would strive to bring about the adoption of a definite annual public program with the creation of a qualified department to carry on the work and an annual appropriation of sufficient funds. Much could also be done toward obtaining helpful legislation.

If the matter of landscaping or planting roadsides is left to unofficial groups there is quite likely to be a variety of ideas realized. As previously mentioned, these ideas are too often incorrect and impractical unless they are planned by one experienced in the work. Few small clubs are qualified to assume such responsibility, and the evident undesirable results serve to create an unfavorable public opinion against roadside development which may postpone the inauguration of a worthy and worth-while program or curtail one already adopted.

For the most part the enthusiasm shown for roadside development by various clubs, groups and individuals should be directed by the road authorities, where it will be most productive of sound results. It should not in any case, however, be ignored or treated with indifference. On the other hand, those interested should willingly look to the highway department as the proper authority for directing the
work, and their wholehearted support should be given in every way possible. Overenthusiasm is a desirable condition if properly controlled and directed, for it represents a full store of potential energy which is needed in every worth-while endeavor. It is often a great help in arriving at the object of roadside development, provided it is handled properly.

In addition to this, another consideration must be taken into account if the desired objective is to be reached. Logically, roadside development should be carried on as a division of the state or county highway department or commission. A qualified highway engineer must of necessity be at the head of every reliable road organization and, therefore, he should serve as a superior to the head of the roadside development division. This places roadside development as subordinate to highway construction and maintenance, which is as it should be, yet being a function of a highway organization, much more can be intelligently accomplished because of economy and cooperation than if it were included in another governmental department or established as a separate unit.

The actual work of roadside development is being launched under the general supervision of engineers, since, of necessity, highways are built and maintained by engineers. The engineers, in charge, therefore, should be sufficiently broadminded to fully appreciate the real importance of professional work with regard to roadside development. To those who
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have given the matter little thought, the securing of trees and shrubs of various kinds and the planting of them along the road seems relatively simple. Little or no significance may be attached to the species used or their relation to one another. A great many mistakes, however, have been made by planting too hastily, without plans and without consideration given to the importance of standards which Nature has set up over thousands of years.

The matter of properly landscaping the highways is in no way mysterious, but it is sometimes complicated and difficult. To plant a barren strip of roadside, may seem trifling as compared to other highway work, and in many cases perhaps it is. On the other hand, not even the simplest case should be treated without professional advice or assistance. An engineer would not think of building a road without a plan; in fact, this would be practically impossible. Every road engineer is anxious to take advantage of research laboratories, the practical experience of others, and various specifications covering the use of road materials and methods of construction. These things have been gone into at great length and they are proportionally important with respect to roadside development, which cannot properly proceed, as many may suppose, merely by a wave of the hand.

Much remains to be learned concerning the improvement of roadsides, yet those in authority should keep both feet on the ground and not spend
their time visualizing beautiful roadsides which would possibly never be a success. A great deal of vision of the proper sort, however, is necessary, but this should be kept within the realm of practical accomplishments. Trees and shrubs grow over a period of years to various ultimate heights and shapes, and at the time the planting is done they must be so arranged that they will fit properly into the future picture. Theoretical planting beyond the point of practicability is a waste of time and money, and if roadside development is to be successful this must be realized sooner or later.

The best procedure at the present time appears to be the employment of landscape foresters or men who not only have training and experience in landscape design, but who also have training and experience of a more practical nature involving the actual planting and maintenance of trees. The success of roadside development in any state or county is not dependent upon an elaborate landscape design, but upon the actual execution of all phases of the work in an efficient and practical manner, including a workable plan when needed. It requires the directing force of a landscape forester with years of training and experience, who knows landscape design, all plants and their requirements, soils, fertilizers, trimming and repair practices, planting methods, highway engineering and construction methods, building methods, something of the transmission of electricity and the operation of communication lines.
and all detailed items of maintenance. He should be an executive with organizing ability, he should know human nature and be able to deal intelligently with all individuals and the public at large and he should have a keen appreciation for natural things and a deep and honest interest in the service he is rendering.

Opinions as to the qualifications of those best suited to direct roadside development may change in the future. The work may be retarded in some localities and accelerated in others, but in general it will progress. It may be modified or altered to suit changing conditions, but at least trees will continue to grow in the future much the same as they have in the past, and as long as highways exist they will be planted with trees. The following of a consistent and uninterrupted program of tree planting year after year is the surest method of providing this needed public improvement which requires generations to complete and which serves for centuries. A long road, indeed, yet the only one which will bring a true realization of this worth-while work.
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is not based on theory, but on eighteen years of actual experience and observations in many parts of the United States and Canada. As much of the historic background of the work as possible is given to strengthen its importance, to add interest and to broaden its field of usefulness.

It is instructive to everyone; the methods and policies outlined have proven unquestionably successful for fifteen years. The chapter on trees alone which outlines their history is sufficient to warrant its being placed in every home.

Everyone who has a garden, an interest in trees and shrubs or a desire to improve the roadsides or streets in his community would find the book extremely useful. It should help every home owner to become more conscious of his surroundings, of the condition of the roadsides or streets in front of his property and of the usefulness and appearance of all roadsides. It should help everyone to realize the importance of roadside development as it affects the individual, the community and the country at large, for it also increases the value of abutting property and improves the appearance of the community. It should encourage everyone to consider roadsides in their true light, that of the nation's front yard.
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