

March 18, 1942

MEMORANDUM TO: District Coordinators

FROM: The Secretary, Coordinating Committee on Roadside Development

SUBJECT: Meeting of Coordinators, Public Roads Administration, District 10 at Columbus, Ohio, February 25 and 26, 1942, emphasizes incorporation of basic roadside improvement in wartime construction specifications.

The two-day meeting of State Highway and Public Roads Administration representatives led by Dallas M. Dupre, Coordinator of Public Roads Administration, District 10, emphasized the fundamental relationship between basic roadside improvement and the War Highway Construction Program.

Our mutual purpose now is to integrate with the War Construction Program tested principles and methods of highway landscape development which will aid toward more effective highway operation at the lowest possible costs for original construction as balanced against future maintenance. Economy in use of labor and equipment for highway maintenance should be a main consideration in the construction of highways designed to meet wartime needs.

ROADSIDE IMPROVEMENT IN WARTIME PROJECTS - In accordance with the memorandum of February 7, 1942, from the Commissioner of Public Roads, original contracts for highway improvements to be constructed as essential to national defense will incorporate the project plans and specifications:

1. Adequate shoulders and gutters with well-flattened, well-rounded slopes as controlled by limits of existing topography and climate and adjacent private land use.
2. Necessary measures to establish ground cover on earth shoulders, gutters, and cut and fill slopes, as governed by the State landscape engineer's analysis of existing conditions on each road. Such measures to include:
 - (a) Rounded earth slope grading, soil preparation and fertilizing (including salvage and replacement of topsoil where practicable).
 - (b) Mulching with hay, straw, brush, woods litter, or other available local materials, either alone or in combination with seeding, sodding, or ground cover planting.

- (c) Seeding, sodding, or ground cover planting as determined by analysis of ground conditions and existing grasses and other vegetation near the work.

The State landscape engineers should cooperate with other members of the highway department in measures which will contribute toward lower costs of construction, safer and more effective traffic service, and lower costs of future maintenance of wartime projects.

Joint inspection during construction may well consider:

1. Salvage or preservation of topsoil, trees, springs, shore lines, and other natural features or landscape materials.
2. Restoration of topsoil, or modification of existing soils (particularly those available for shoulder and gutter grading) with the intent of improving soil texture and fertility. Such soil modification, especially on shoulders, will be designed to increase porosity and thus increase load-bearing capacity during wet weather and ability of soil to support active grass growth. Soils and landscape engineers, in particular, will work together to improve growing conditions on critical areas of the highway section where vegetative growth is an important factor.
3. Flattening and rounding of cut and fill slopes to: (a) eliminate the need for guardrail, (b) facilitate machine mowing, rolling, and other maintenance; and (c) prevent snowdrift formation within roadbed limits, in regions where drifting snow is a factor in maintenance.

As a general rule it has been found that on high slopes steeper than about 3:1 power mowing equipment cannot be operated to advantage. Fill slopes of a 4:1 or flatter ratio are required for safe elimination of guardrail. During the past years the excavation cost involved in flattening slopes of fills higher than 7 or 8 feet tended to favor use of steel guardrail in the higher fills. Because of the present cessation of manufacture of all types of metal guardrail, however, it is believed that relatively higher fills can now be economically flattened to the 4:1 ratio.

ROADSIDE DEVELOPMENT IN THE POST-WAR PERIOD - It was emphasized that under present war conditions separate Federal-aid roadside projects will not be submitted and no roadside development work could be done which did not contribute directly to either more effective traffic service or to decreased maintenance costs. As previously outlined, all basic landscape measures required by conditions in each particular road will be incorporated in regular new strategic highway construction. In this way the foundation will be laid for the final stages of landscape development after the war. The following types of work

usually included in roadside development in the past will now be largely eliminated from the present highway program and kept in reserve for execution after the war.

1. Extensive shade or flowering trees and evergreen shrub planting designed for other than slope protection purposes.
2. Tree trimming and pruning except in cases where traffic operation safety and sight clearances are involved.
3. Selective cutting, except work within the limits of new construction where, as always, fine trees will be protected as far as practicable.

During highway construction, the need for occasional access to areas reserved for off-road parking should be considered particularly in rough topography. Adequate space should be available for emergency storage and repair of wartime vehicles. Provision therefore should be made for safe turn-out construction to supplement shoulder parking. The development of the usual roadside parks or waysides at historic or scenic areas will not be carried beyond the plan stage until after the war.

Essentials in strategic highway construction were discussed.

MAINTENANCE AS A FACTOR IN CROSS-SECTION DESIGN - The need for adequate right-of-way for proper slope flattening and rounding was emphasized. Under war conditions it is essential that machine mowing, snow removal, and other maintenance be encouraged by a broad, well-rounded earth cross section installed during original construction. Labor for hand mowing and similar hand work may not be available in the future.

TOPOGRAPHY AS A FACTOR IN RIGHT-OF-WAY DESIGN - Logical relationships between earth cross-section design and existing topography were outlined. Thus for example, typical State highway cross-section design now tends to install relatively steep cut and fill slopes in broken or mountainous topography, more moderate slope ratios in moderately rough topography, and a very flat, broad, rounded cross section in level or rolling topography. Every consideration of effective highway operation and of economical maintenance after construction, points to the need for design of right-of-way to fit the desired cross section in contrast to the too common conception of forcing the cross section to fit an inadequate right-of-way.

MULCHING AS A FACTOR IN SLOPE PROTECTION - Various types of mulches, used by the States alone or in connection with seeding or planting, were outlined by those present. Among these methods were:

1. Baled or loose straw.
2. Hay or weed cuttings from highway mowing operations.
3. Woods litter, leaves, twigs, and pine needles.
4. Peat moss - decomposed sawdust and the like.

These mulching materials have been used to good advantage in the following ways:

1. As a light mulch cover over seeded slopes, gutters, and shoulders. Ohio, Pennsylvania, and other States of various districts use from 1 to 2 inches of hay or straw mulch in this way.
2. In a heavy 3- to 6-inch layer over slopes planted with running vines in trenches or pockets.
3. In a heavy 3- to 8-inch layer over existing slopes followed by placing 1 to 2 inches of earth over the mulch followed by seeding.

Problems encountered with mulching methods are such as the following:

1. Mulches on shoulders must be wired, tied, or staked in place as wind from passing vehicles tends to remove such materials. Discing-in of mulch, or covering with light earth cover may be the answer here.
2. Mulches in slopes and shoulders tend to be fired by matches thrown from cars. A light covering with earth may be the answer here. The thinner the mulch the less the fire hazard was said to be.
3. Mulches over new seeded areas or young grass must be well loosened up when placed. As a general rule the ground surface beneath such light mulches over seeding should be partly visible.

SOIL PREPARATION AS A FACTOR IN ESTABLISHING GROUND COVER - It was emphasized that success of seeding operations often depends largely upon proper soil preparation and fertilizing before seed is placed.

A well drained site with a porous type of soil is required for good grass growth. A fertile sandy loam represents the ideal soil for most turf forming grasses.

The need for collaboration between soils engineers and landscape engineers prior to, and during highway construction, was stressed. In regions of predominantly clay soils existing deposits of sand or fine gravel, within the limits of construction, should be segregated as far as possible and mixed with clayey soils on shoulders and gutters which are to be grassed. Each existing soil is a separate problem but as a rule fifty percent or more of sand is necessary in soil surfaces which are to grow grass for occasional shoulder traffic use.

SEEDING - Seed formulas and rates of seeding were discussed in a general way. Emphasis was made on the point that most of Ohio is in the bluegrass zone and that Kentucky bluegrass is thus the main part of any regular turf grass formula. In certain relatively acid and sandy types of soils in the northern part of the State red fescue may be desirable as a substitute for the bluegrass.

It was stated that the mulch of about two inches of loose straw, commonly used in Ohio, in connection with regular seeding operations was very satisfactory. Mulches of hay and other local materials were at least equal to clean straw which tends to decay at a somewhat slower rate than other mulching materials.

SODDING - Solid sodding in most States of District 10 and adjacent areas is confined mainly to slopes adjacent to culvert and bridge head walls or similar special areas. Sodding of certain types of gutters under favorable soil conditions may possibly be used to advantage to a greater extent than in the past.

MULCHING - Slope mulching with native grasses such as Indian grass or broom sedge cut when seed is nearly ripe, was discussed as a possible substitute for seeding or sodding on steep cuts and fills. Such coarse grasses are not advantageous on shoulders and gutters. The common orchard grass frequently included in seed mixtures with fine turf grasses such as bluegrass, is another coarse bunch grass valuable for protection of steeper slopes but not desirable in seeding mixtures for shoulder areas.

PLANTING - Planting was not stressed at this meeting. It was thought that vine and native low shrub planting may occasionally be called for on slopes too steep for grass cover, that is, on slopes steeper than about 2:1 which cannot be mowed except by costly hand methods.

Halls honeysuckle and trumpet vine (*Bignonia*) were used on many steep slopes in Ohio. Halls honeysuckle was found to grow with difficulty on dry hot slopes facing south or west, particularly where mulching was not combined with planting.

Mention was made of experiences by the States in collecting seed of shrub ground covers such as the common sumacs, or wild rose types. Seeding of appropriate drought resistant shrub ground covers may eventually solve the problem of protecting extended high steep cuts and fills. More knowledge is needed of correct methods of storing, stratifying and planting seeds of these woody plants.

PRACTICAL RESULTS - A MORE EASILY MAINTAINED ROAD - The present relationships between construction and landscape engineers, together with constructive comments on landscape development now being done in Ohio, were outlined by W. V. Buck, State representative of the Public Roads Administration.

The roadside coverage program in Ohio is real evidence of the practical result that has come through roadside development effort, in effecting a real finished road, as 50 percent of the jobs are in grass when the contractor finishes his work. Seeding and mulching of backslopes has a very definite place in the picture. Construction contractors are benefited through stopping of washing of soil in highway operations. We now need to follow-up same advantages in maintenance.

Wesley S. Hottenstein, Landscape Forester, of the Pennsylvania State Highway Department outlined the various advantages and disadvantages of a State-owned nursery. Pennsylvania has operated a highway nursery for many years.

SUMMARY AND CONCLUSIONS

1. Lay foundation now in basic earth grading and protection operations as stage construction in wartime for follow-up later with final planting treatment as a post-war operation.
2. War limitations on guardrail suggest greater use of 4:1 or flatter slopes.
3. Maintenance is a major consideration in wartime construction. A deficiency in widths of right-of-way and of roadway section may result in lack of protection of bare soil. This is bound to result in increased maintenance costs and decreased safety and operating efficiency. Only by adequate design and construction will maintenance be reduced to a minimum.

It was brought out that State experience in grading, and seeding slopes, gutters, and shoulder areas represented a direct contribution to the general war effort. Seeding and sodding will be required on an immense acreage of airfields and cantonment and other defense areas during coming years. Experience of State landscape engineers has in many cases determined the best seed mixtures and seeding methods to be used in large-scale grassing operations in each particular region. The knowledge so gained is being placed at the disposal of War Department authorities through data accumulated by the Highway Research Board and other agencies, from State experience.

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TURF GRASSES FOR WAR AND POST-WAR NEEDS

A group of national organizations, including the Committee on Roadside Development of the Highway Research Board and the American Association of State Highway Officials, the National Aeronautic Association, the American Civic Association, the American Institute of Park Executives, the American Seed Trade Association, the National Fertilizer Association, the Association of American Cemetery Superintendents, the National Association of Gardeners, the National Recreation Association, and others, for several years have been vitally interested in promoting field investigations of turf grasses and their culture. Several of these organizations have adopted resolutions urging the Congress to make adequate appropriations for such a program.

As a result of the Nation's war activities, the Federal Government is faced with the problem of establishing and maintaining turf on airfields, roadsides, defense housing projects, Army, Navy, and Marine Corps bases, camps, forts, maneuver areas, cantonments, munition storage sites, recreational fields, etc. These existing areas involve thousands of acres now bare of any grass or ground cover.

Airfields: One of the most urgent, immediate needs is for turf for airfields. A grass cover on these fields, as protection against dust and mud, not only would help to safeguard the health of thousands of personnel but also would greatly increase the life of motors and mechanized equipment.

Need for technical data: Many of the organizations listed in the first paragraph have been consulted recently by various branches of the Army, Navy, and Marine Corps for information and advice concerning turf culture. Similar requests have come also from the Civil Aeronautics Administration, the Federal Works Agency involving roads, housing projects, and public buildings, the Defense Housing, the National Park Service, the Veterans' Administration, and other Federal agencies.

The information given has been limited chiefly to practical experience, as an insignificant amount of research or technical data is available on this subject. In order to avoid unnecessary delay and waste of funds in planting and maintaining turf for war purposes, a plan should be developed immediately to make possible a better use of what information is available along these lines and to develop improved methods as rapidly as feasible.

Field investigation needed: The production of field crops such as tobacco, cotton, and citrus fruit, is limited to certain regions. Turf, however, is needed in every State in the Union. Therefore, wide-scale field investigations are needed over the entire country.

The extensive planting of turf by various war agencies offers a definite opportunity to obtain field records of grass seeding and sodding in all climatic regions. Such records should make possible continuous improvement in field methods of establishing and maintaining turf.

New varieties and substitutes: A survey made recently showed that over two million pounds of grass seed were purchased last year by the several States for roadside work alone. Only about 30 kinds of grass of several hundred native species were used. Here is a wide opportunity for the selection and use of new kinds and strains of grasses. Methods of improving existing soils with use of fertilizers to reduce the need for topsoil are essential in the turf production program.

Organization of program: A plan is obviously needed to avoid unnecessary duplication of effort among the many Federal agencies vitally interested in turf grasses. The services of existing Federal personnel with long experience in growing turf grasses should be used to the fullest extent in organizing a plan of action in cooperation with the State experimental stations and other public agencies.

The program should include:

1. A survey of methods now in use for establishing and maintaining turf on military and civil airfields, roadsides, and other turfed areas that have a bearing on the war program.
2. Recommendations for seeding, fertilizing, and other treatments based on examination of soil, climatic conditions, traffic and other factors affecting the establishment and maintenance of turf on each area.
3. Tests and records of field practices to determine best methods for the establishment, maintenance, and renovation of turf. These tests should include different grasses, fertilizers, methods of seeding, and other cultural practices.
4. Development through selection and improvement of grasses that appear to have particular promise for the special uses outlined above.
5. Building up stocks of seed and sod material of most suitable grasses (where commercial supplies are not yet available) for subsequent use on airfields, roadsides, housing projects, Army camps, etc.

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The vegetation of the United States may be broadly divided into forest, grassland, and desert types, according to the moisture requirements of each. In other words, the type and selection of ground cover depends primarily on annual and seasonal rate of rainfall. Temperature controls the length of the growing season and determines the best periods for seeding and planting. Humidity, closely related to precipitation and temperature, determines the rate of evaporation of moisture from the soil and from plant foliage. As evaporation increases in a dry, hot area, the difficulty of establishing plants becomes greater.