

REPORT OF THE COMMITTEE ON ROADSIDE DEVELOPMENT

By

H. J. Neale, Chairman

* * *

After eight years of cooperative study, the work of the Joint Committee on Roadside Development of the American Association of State Highway Officials and the Highway Research Board was concluded last year, and final reports of the project committees were published last March. The findings of these project committees were not considered to be final, as there appear to be many lines of research in the field of roadside development which still need to be explored. The readjustment of the fields of endeavor of the original Joint Committee into two separate committees, one representing the American Association and the other the Highway Research Board, has been effected in the following manner: subjects upon which research is required are being cleared through the Committee of the Highway Research Board while problems of an administrative nature are being handled by the Committee of the American Association of State Highway Officials.

Information, whether research or administrative in character, is obtained through the medium of a coordinator in each of Public Roads Administration Districts. This procedure has eliminated duplication of effort and has been most satisfactory in practice.

At the request of the District coordinators, representatives of the respective State highway departments have met during the past year in Richmond, Virginia (District 14); Ames, Iowa (District 5); Indianapolis, Indiana and Lansing, Michigan (District 7); Boston, Massachusetts (District 9); Gulfport, Mississippi (District 8); Fort Worth, Texas (District 6); Preston, Idaho (District 12); St. Paul, Minnesota (District 4); and in Denver, Colorado (District 3).

These group District meetings discussed technical and administrative landscape subjects of interest and value, not only to the landscape engineers, but also to chief engineers, construction, maintenance, and design engineers in attendance at these meetings.

A summarization of these District conferences appears on pages 41 and 48 of this report.

The Committee is vitally interested in making the National Defense Highway System serve the emergent traffic needs of our armed forces as well as those of the civilian population.

By the integration of accepted roadside development practices with the construction of the Defense Highway System, the scars of new construction will be obliterated, maintenance costs reduced, and general traffic safety will be increased.

The finished highway will thereby serve defense requirements and will contribute permanent economic, social and recreational values to the National Highway System.

During the coming year the Committee on Roadside Development proposes to concentrate its attention on the problem of integrating the simplest and most basic principles of roadside development with regular highway construction in all regions. All project committees will combine in developing a simple method of classifying roadside "soils and site conditions" which determine the ease or difficulty with which vegetation can be established and grown.

The following paragraphs contain a brief review of the reports of the six project committees.

Highway Types and Roadside Areas

1. The report of the project committee on Highway Types and Roadside Areas reviews the general relationship of right-of-way to construction from the point of view of highway landscape design.

2. Experience in highway development has proven that rural conditions and traffic requirements are essentially different from urban conditions and traffic needs. Therefore, as respects roadside treatment there are two general types of highway construction: The urban or formal type and the rural or informal type.

In the pioneer period of road building, the rigid regularity of the city tended to be superimposed upon the country; in the more scientific application of design principles to highway construction, the natural informality of the countryside is in turn influencing the development in urban areas. Instead of forcing the road design upon the country through the use of fixed standards, the road construction is more carefully adapted and fitted into the country.

The disadvantages of the practice of trying to place a flexible type of highway cross-section design upon a standard narrow right-of-way of fixed width instead of an adequately designed right-of-way of varying width are self-evident.

The need for a more flexible and broader policy for the design and acquisition of right-of-way for primary rural highways is emphasized in the report because the right-of-way is the most permanent part of any highway investment, and also because the studies covering the five-year period from 1935 to 1940 indicate that less than 5 per cent of the total annual capital investment on the State highway systems was expended for rights-of-way and approximately 95 per cent was expended for road and bridge construction. Highway rights-of-way should be acquired to meet varying requirements the same as any other element of the highway construction program.

Likewise, roadside development and control are becoming recognized as dependent upon the right-of-way problem.

Right-of-Way and Roadside Control (Zoning)

The emergence of roadside control as a distinct application of zoning is pointed out in the report of the project committee. Roadside zoning is regarded as lying somewhat between urban and suburban zoning on the one hand and non-urban or rural zoning on the other. The possibility of roadside zoning directly by the State and the relation between zoning regulations thus applied and zoning regulations adopted by local governmental jurisdictions is presented.

It has come to be recognized that there are three major things which should be accomplished by roadside zoning in non-urban areas. These are:

1. Confinement of roadside commercial uses to designated commercial districts, leaving the remainder of the highway frontage for the uses which are characteristic of the general area through which the highway passes (e.g., agriculture or forestry).
2. Encouragement of the set-back of roadside buildings from right-of-way lines.
3. Regulation of the appearance of roadside commercial buildings, including limitation of their display of signs.

The report emphasizes the distinction that should be made between roadside zoning, and roadside regulations which are applied to specific uses, and shows that zoning does not replace, but supplements the regulation of specific uses.

This is in line with the 1940 report of the Committee on Roadside Development and Control of the American Automobile Association which was adopted at the recent annual meeting of the Association. This action constitutes a notable contribution in the field of roadside control. It places the American Automobile Association as the sponsor of a comprehensive presentation of the principles of roadside zoning.

The usual farming or similar operations fundamental to the economy of a rural area are made more permanent in the application of such principles. This private effort to protect the large public investment in highways is being carried on voluntarily in certain parts of the country. For instance, the organization of soil conservation districts as local self-governing bodies formed to control erosion on farm lands offers an exceptional opportunity for correlation of highway design and roadside erosion control along highways. A continua-

tion and extension of the close working relationship existing between these districts and highway agencies will help to insure better highways in the future.

Erosion

The erosion committee's report deals with the findings from demonstration projects in five regions covering south Atlantic, upper Ohio River, semi-arid sections, and northern Great Plains. It should be of particular interest that vegetative check dams in ditches are proving very effective; that mulches are proving more beneficial under most conditions than fertilizers.

There appears to be increased interest on the part of the personnel of various highway departments in the value of seeding grass and legumes at the proper season and according to the best prescribed methods. It has been observed in some instances that seeding during the wrong season might have been the cause of failure.

Plant Ecology

The Project Committee on Plant Ecology has made a study of recorded past experience of the State highway departments, Park Commissions and other organizations in roadside tree planting, and in the conservation of existing trees on highways, with particular reference to the Northeastern and Middle Atlantic regions.

Certain broad ecologic principles have been evolved which appear to control successful establishment and growth of trees on roadside areas. Factors are listed which should be considered of primary importance in selecting trees of various types and species for specific roadside planting purposes. Deciduous and evergreen trees are rated as to their value under usual roadside conditions.

Roadside Economics

During the year this project committee has attempted to secure relative annual maintenance cost figures and safety or accident record data for (1) representative highway mileage on which no comprehensive improvement has been performed, (2) representative mileage in which roadside development has been carried out. Because of variations in methods of recording accident statistics and in cost accounting practices among the various State highway departments further data will be required before the study can be completed.

Education and Public Relations

During the past year this committee has collected and published excerpts from reports and articles on highway construction and roadside development received from 25 States. Some 29 States have also contributed the slides and photographs shown at the annual meeting. These records are conclusive evidence of higher standards of highway landscape development work in all regions.

Conferences on roadside development held at the University of Wisconsin and at Iowa State College were well attended by highway and landscape engineers from nearby States - and by representatives of civic groups interested in highways.

A number of books and pamphlets of importance have been issued during 1940 or are now in preparation. Among these special mention should be made of the "Roadside Zoning Guide" issued by the American Automobile Association - and of the bulletin on "Roadside Control" published by the Maryland Legislative Council.

The committee urges and recommends that the American Association of State Highway Officials follow up its excellent booklet "A Policy on Highway Types" (Geometric) by a similar statement of accepted policies concerning roadside development.

The Soil Conservation Service of the U. S. Department of Agriculture deserves special commendation for its work in educating the public regarding the value of, and need for, soil erosion control on lands immediately adjacent to public highways. A motion picture describing cooperative highway soil erosion control work now under way or completed in several regions of the country will be a most valuable source of information. A bulletin on "Soil Erosion Control as related to Highways" is also being prepared by the Soil Conservation Service.

The project committee makes the following suggestions:

(1) That all available published sources of information on roadside development be reviewed and assembled as a bibliography with appropriate comments.

(2) That a joint research study be made with the American Institute of Planners of the economic effects of zoning along improved highways, on property values.

(3) That wherever possible the State highway departments take advantage of the authority granted under the September 5th amendment in the Federal Highway Act of 1940. This provides that 3 per cent of regular Federal aid highway apportionments may be used for purchase of special areas of additional adjoining land - where the conservation, protection, and use, of scenic values is desirable in the public interest. This amendment makes it possible to save and develop selected wayside areas of immediate value in the present defense highway planning program, and in the long term planning for traffic service on the National Highway System.

APPENDIX I

ORGANIZATION OF ROADSIDE DEVELOPMENT COMMITTEES

(A) HIGHWAY RESEARCH BOARD
1941Committee

H. J. Neale, Chairman

Franz A. Aust
 Frank H. Brant
 Frederic E. Clements
 Arnold Davis
 P. H. Elwood
 George B. Gordon

John Monteith Jr.,
 A. R. Nichols
 Hugh R. Pomeroy
 Henry J. Schnitzius
 Wilbur H. Simonson
 John L. Wright

Subcommittees

Highway Types and Roadside Areas - Wilbur H. Simonson, Chairman

George J. Albrecht
 Thomas E. Carpenter
 John V. McManmon

A. R. Nichols
 George H. Otten
 Torbert Slack

Philip Troeger

Right-of-Way and Roadside Control (Zoning) - Hugh R. Pomeroy, Chairman

George J. Albrecht

H. D. Bowers

Franklin T. Rose

Erosion - Franz A. Aust and Frank H. Brant, Chairmen

C. A. Betts
 Thomas E. Carpenter
 Arnold Davis
 C. R. Hursh

Carl F. Izzard
 D. W. Levandowsky
 R. L. Williams
 John L. Wright

Plant Ecology - George B. Gordon, Chairman

Grant R. Bowen
 Kenneth T. Brown
 G. G. Holley

C. R. Hursh
 John Monteith Jr.,
 Walter Pesman

Sidney J. Walsh

Roadside Development Economics - Henry J. Schnitzius, Chairman

Maurice J. Day
F. M. Guirey

J. M. Hall
Maurice A. Mendel

Education and Public Relation - P. H. Elwood, Chairman

R. D. Bonnet
F. A. Gardiner

Albin Gries
Jac L. Gubbels

Flavel Shurtleff

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(B) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

Chairman, John L. Wright, Connecticut

G. R. Bowen, Utah

F. M. Guirey, Arizona

H. Dana Bowers, California

J. V. Mc Manmon, Massachusetts

F. H. Brant, North Carolina

H. J. Neale, Virginia

P. H. Daniells, Missouri

H. E. Olson, Minnesota

Dallas Dupre, Ohio

G. H. Otten, Oregon

F. A. Gardner, New Hampshire

Walter Pesman, Colorado

Jac L. Gubbels, Texas

O. T. Ray, Georgia

Philip Troeger, Michigan

APPENDIX II

Coordinating Committee on Roadside Development
of the
Highway Research Board
and the
American Association of State Highway Officials

* * *

In order that the work of these two committees may be better coordinated, and a clearing house established for the program of both committees, it has been mutually agreed by Mr. H. J. Neale, Chairman of the Committee on Roadside Development of the Highway Research Board, and Mr. John L. Wright, Chairman of the Committee on Roadside Development of the American Association of State Highway Officials, that all correspondence with various States from these committees or their subcommittees shall be cleared through the following executive committee:

H. J. Neale and John L. Wright, Co-chairmen
W. H. Simonson, Secretary
J. V. McManmon --- Frank H. Brant

Correspondence pertaining to committee or subcommittee activities of interest to both committees, therefore should be sent to the chairman of the general committee - either Mr. Neale or Mr. Wright - who will upon approval submit the same to the Secretary, and he in turn will send the request to the coordinators who officially represent the two committees in the various Public Roads Administration districts, as listed herewith.

<u>District Number</u>	<u>Coordinator</u>	<u>States</u>
1	Mr. George H. Otten Landscape Engineer Oregon State Highway Commission Salem, Oregon	Washington, Oregon Montana
2	Mr. H. Dana Bowers Landscape Engineer Division of Highways Department of Public Works Sacramento, California	California, Nevada, Arizona
3	Mr. M. Walter Pesman Landscape Architect Colorado State Highways 372 So. Humboldt Denver, Colorado	Wyoming, Colorado, New Mexico

<u>District Number</u>	<u>Coordinator</u>	<u>States</u>
4	Mr. Harold E. Olson Landscape Engineer Department of Highways 1246 University Avenue St. Paul, Minnesota	North Dakota, South Dakota, Minnesota, Wisconsin
5	Mr. P. H. Daniells Engineer of Surveys and Plans State Highway Department Jefferson City, Missouri	Kansas, Iowa, Missouri, Nebraska
6	Mr. Jac L. Gubbels Head, Roadside Development State Highway Department Austin, Texas	Texas, Oklahoma, Arkansas, Louisiana
7	Mr. Philip Troeger Landscape Architect Michigan State Highway Depart- ment Lansing, Michigan	Indiana, Illinois, Michigan, Kentucky
8	Mr. R. V. Glenn, Director, Division of Highway Planning State Highway Board of Georgia Atlanta, Georgia	Tennessee, Mississippi, Alabama, Georgia, Florida
9	Mr. John V. McMannon Director of Roadside Develop- ment Department of Public Works 100 Nashua Street Boston, Massachusetts	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey
10	Mr. Dallas D. Dupre, Jr., Landscape Architect Department of Highways Columbus, Ohio	Delaware, Maryland, Pennsylvania, Ohio
12	Mr. Grant R. Bowen Landscape Engineer State Road Commission Salt Lake City, Utah	Idaho, Utah
14	Mr. Frank H. Brant Landscape Engineer State Highway & Public Works Commission Raleigh, North Carolina	North Carolina, South Carolina, Virginia, West Virginia

The Coordinating Problem for 1941

During the coming year the American Association of State Highway Officials and the Highway Research Board Committees on Roadside Development will carry out a joint study program through the coordinators in the various Public Roads Administration districts.

By means of an outline distributed to the coordinating officials a survey will be made of roadside development progress to date. This survey will determine:

1. What the State highway departments are doing and have done in regard to roadside development.
2. What results have followed roadside development practices to date.
3. Reasons for success or failure with suggested recommendations for improved practice.

The typical outline attempts to present a unified, orderly method by which basic cross-section grading and drainage design, soil preparation, mulching, seeding, sodding, and ground cover planting problems, as worked out by the several State highway departments, may be recorded and reported for all districts. The use of this outline as a convenient basis for discussion during group meetings should facilitate uniform conclusions regarding the various practices in each district under given local field conditions. The cooperation of the coordinating officers in all districts is sought in order to obtain comparable information from each State highway department directly for analysis in the respective administrative district.

It is suggested that this outline be presented to the landscape engineers of the various States sufficiently in advance of the meetings called by the District Coordinators so that the State representatives may attend the group sessions well prepared for constructive discussion of the problem. Such preparation might include a careful review by each State of typical cross-section designs for different soils in the three classes of topography (i.e. - easy, moderate, or rough). Analysis of roadside development specifications and methods in advance of the meeting will facilitate the discussion-survey and save much time in making conclusions.

A report with recommendations by the coordinating State representatives will be added to the outline by each coordinating officer at the close of each district group meeting. The report will deal with the district or region as a whole. Individual State contributions to the successful solution of these basic roadside development problems will be of value as they apply to the whole district or region.

When the outlines have been systematically filled in and returned to the Secretary, complete with the recommendations of each Coordinator, the Coordinating Executive Committee expects to have available a composite survey of the nation as a whole, covering the following information:

1. A record-summary by districts of the experience to date of the States in establishing grasses, vines, and other ground covers on varying soils and types of topography in different climatic regions, and on various parts of the highway cross-section where bare soil requires protection from erosion. (Shoulders, gutters, cut and fill slopes, etc.)
2. A concensus of qualified landscape engineers in each district concerning methods of coordinating and improving basic highway construction and landscape practices such as grading and drainage, soil preparation, mulching, fertilizing, seeding, sodding, and other related field operations designed to control erosion and to improve highway appearance, with added safety to traffic and with reduced maintenance costs.
3. Proposals by the State highway departments outlining specific roadside problems requiring further field study for their solution. During the group meetings of State representatives, types of field demonstration may be discussed and outlined. These field demonstrations will be set up in each State as a part of future roadside improvement programs. It is expected that each State will set up one or more series of test projects to demonstrate suggested methods of improvement in some particular phase of the roadside problem, such as treatment on road shoulders, in drainage areas, or on cut and fill slopes; treatment for different texture-types of soils (sandy, loamy, clay, etc.), in easy, moderate or rough topography, and in relation to rainfall and temperature (in cool- or warm-humid, or dry climates).

FLOW-DIAGRAM FOR 1941 PROGRAM OF ROADSIDE RESEARCH AND ADMINISTRATION

COMMITTEE ON
ROADSIDE DEVELOPMENT
HIGHWAY RESEARCH BOARD

RESEARCH
PROBLEMS

PROJECT
COMMITTEES

COORDINATING
EXECUTIVE COMMITTEE
H. R. B. AND A. A. S. H. O.
H. J. NEALE JOHN L. WRIGHT
CO-CHAIRMEN
F. BRANT J. V. MC. MANMON
MEMBERS
WILBUR H. SIMMONSON
SECRETARY

ADMINISTRATIVE
PROBLEMS

COMMITTEE ON
ROADSIDE DEVELOPMENT
AMERICAN ASSO. STATE
HIGHWAY OFFICIALS

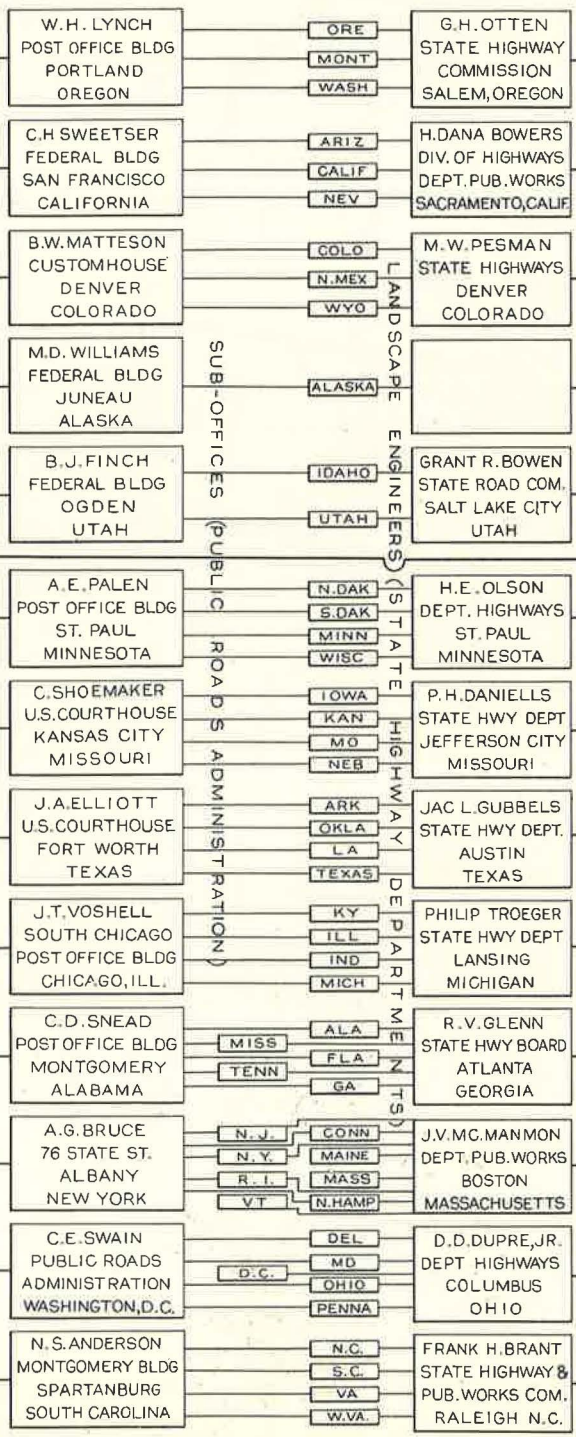
SUB
COMMITTEES

WESTERN DISTRICTS EASTERN DISTRICTS

LANDSCAPE ENGINEERS (STATE HIGHWAY DEPARTMENTS)

SUB-OFFICES (PUBLIC ROADS ADMINISTRATION)

DISTRICT ENGINEERS



P. W. A.

P. B. A.

PUBLIC ROADS
ADMINISTRATION
(WASHINGTON, D.C.)
* THROUGH REGIONAL OFFICE
SAN FRANCISCO, CALIF.

FEDERAL WORKS
AGENCY

U. S. H. A.

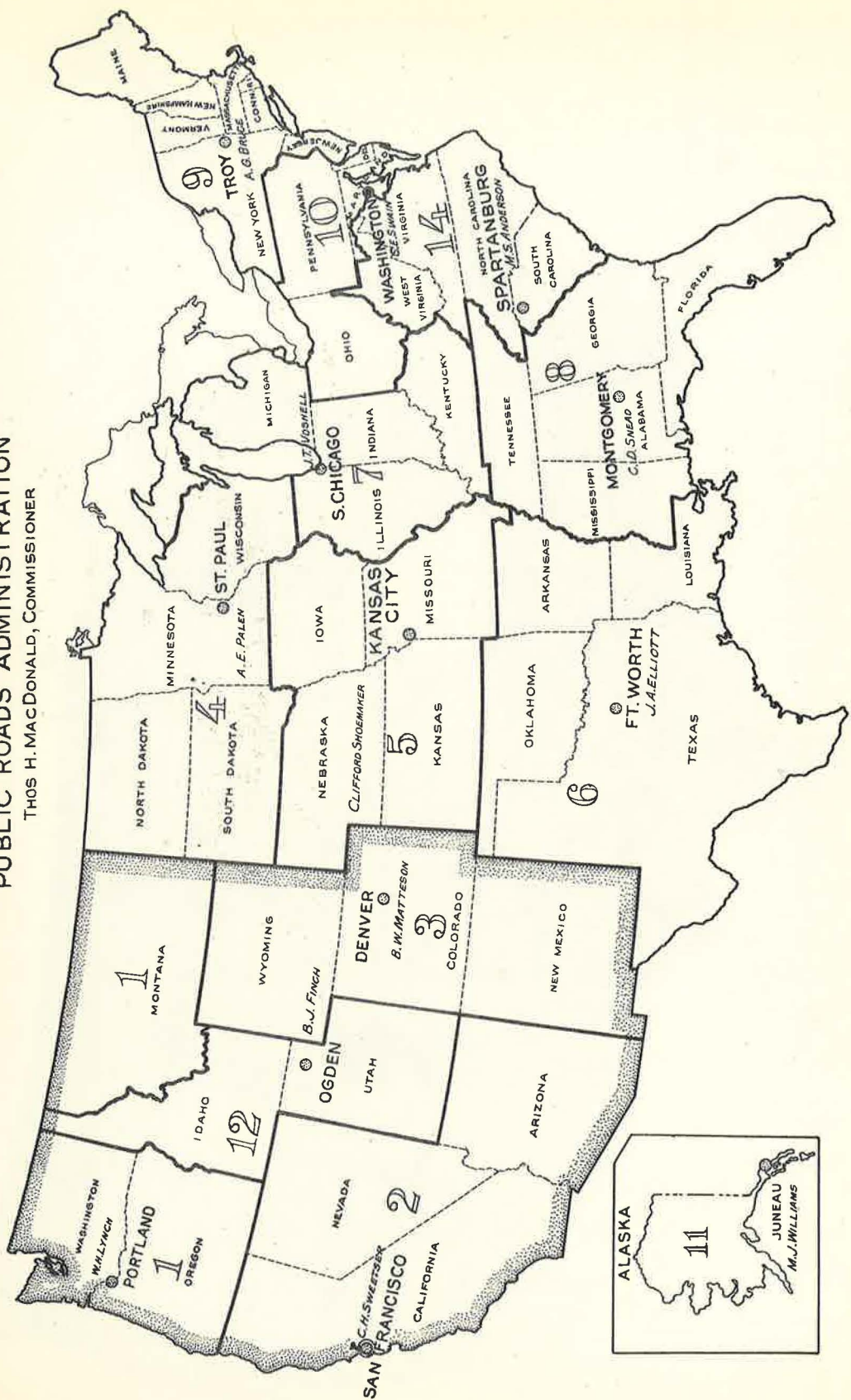
W. P. A.

* HAWAII - (THROUGH REGIONAL OFFICE)

PUERTO RICO - (THROUGH WASHINGTON OFFICE)

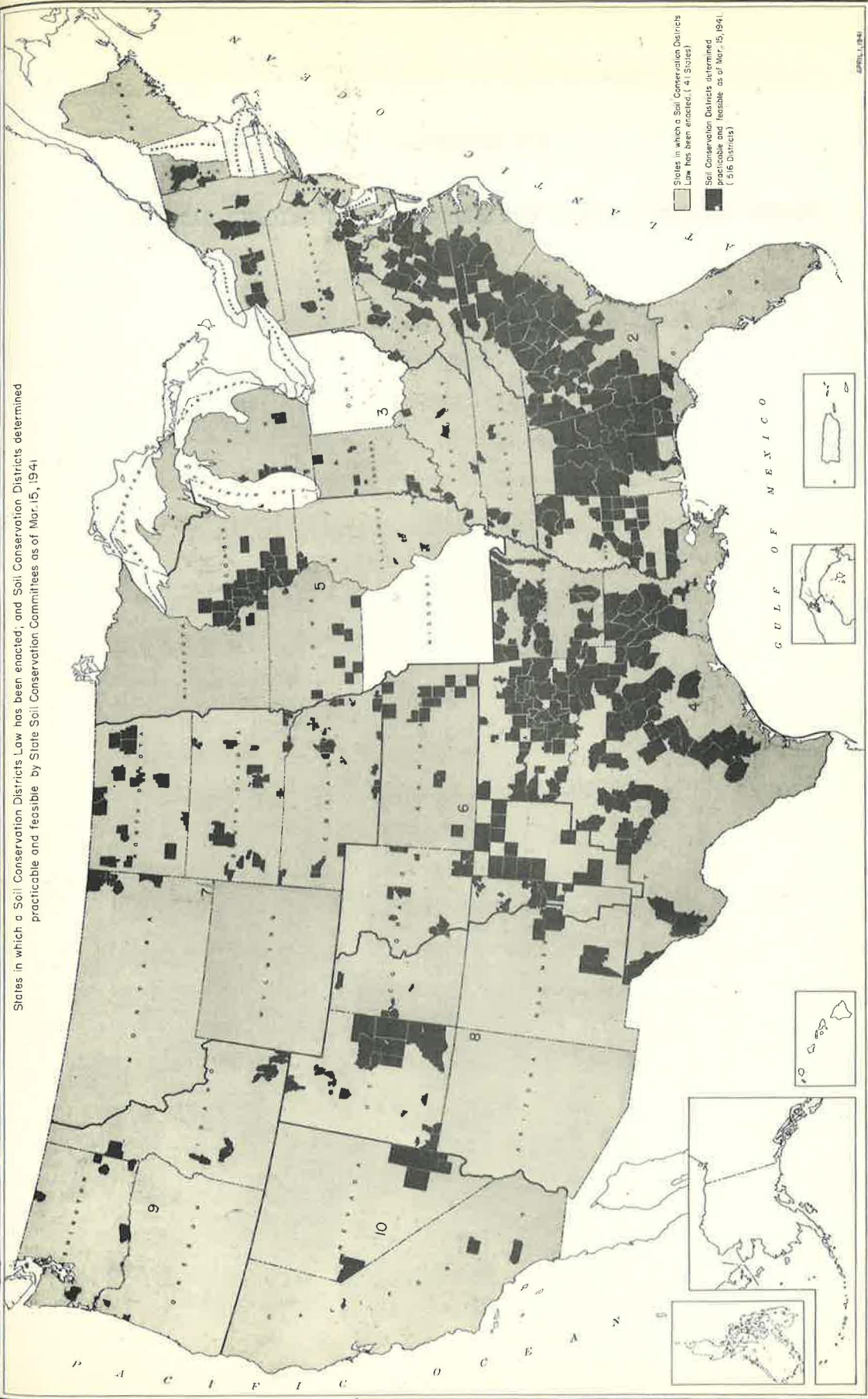
DISTRICT BOUNDARIES AND DISTRICT HEADQUARTERS

OF
PUBLIC ROADS ADMINISTRATION
THOS H. MACDONALD, COMMISSIONER



REGIONAL OFFICE
 L.I. HEWES, CHIEF, WESTERN REGION
 SAN FRANCISCO, CALIFORNIA

States in which a Soil Conservation Districts Law has been enacted, and Soil Conservation Districts determined practicable and feasible by State Soil Conservation Committees as of Mar. 15, 1941



APRIL, 1941

G U L F O F M E X I C O



Prepared by Cartographic Division

APPENDIX III

TYPICAL GRADING CROSS-SECTION FOR HIGHWAY EROSION CONTROL

INDICATE DEGREE OR RATIO OF
GROUND SURFACE AS + ON
1 ON 3, OR LEVEL, ETC.

INDICATE TYPES OF
DITCHES, ETC.

CONSERVATION NOTE
ALL TYPICAL ROUNDED SHAPES
INDICATED IN THESE DIAGRAMS ARE TO BE ADJUSTED
TO FIT LOCAL CONDITIONS. THE PRESENCE OF
ROCKS, TREE ROOTS, ETC., IS TO BE CONSIDERED IN THE
DESIGN OF SUCH MODIFICATIONS. SUCH
MODIFICATIONS WILL BE BENEFICIAL TO PLANT
GROWTH.

INDICATE TYPE OF
ROADWAY

INDICATE TYPICAL
SLOPE

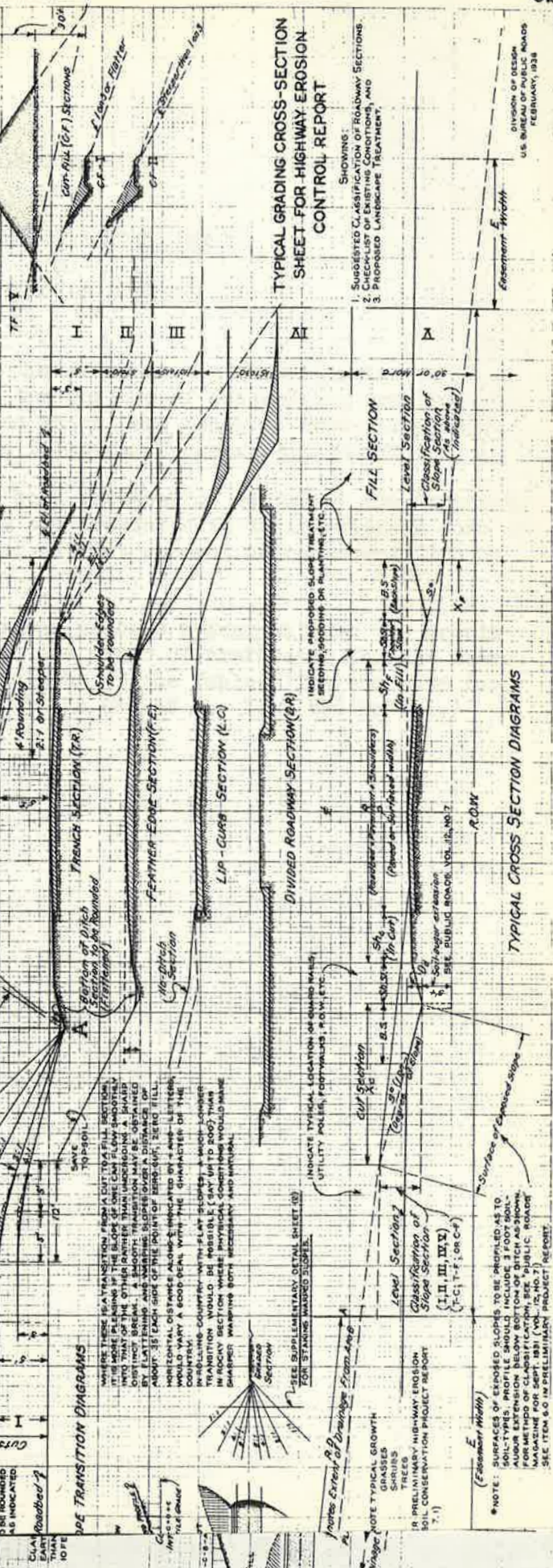
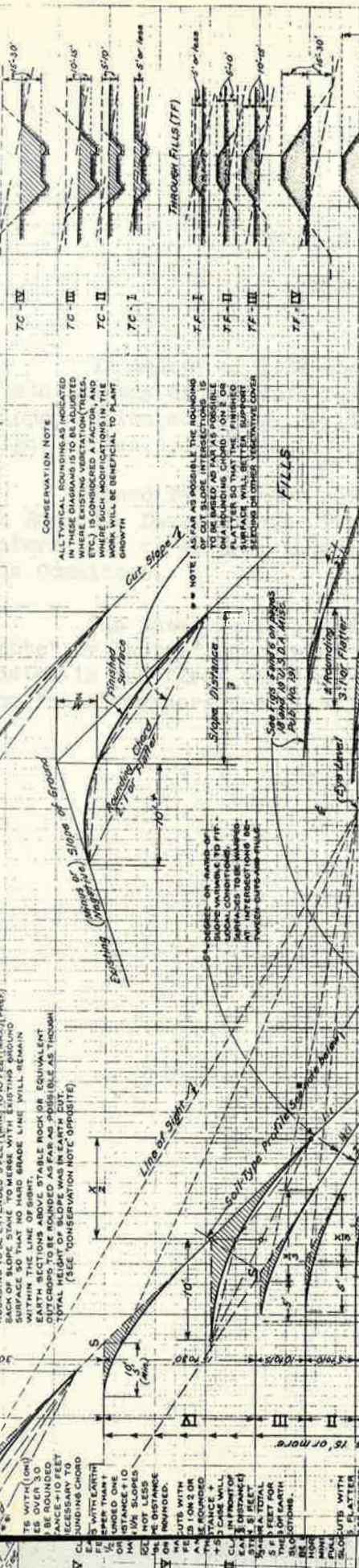
INDICATE TYPE OF
DITCH

INDICATE TYPICAL
SLOPE

INDICATE TYPE OF
DITCH

INDICATE TYPICAL
SLOPE

INDICATE TYPE OF
DITCH



NOTE: SURFACES OF EXPOSED SLOPES TO BE PROVIDED TO
RESIST EROSION BY PLANTING GRASSES
OR OTHER VEGETATION. GRADES
SHOULD BE MAINTAINED BELOW BOTTOM OF DITCH AS SHOWN.
FOR METHOD OF CLASSIFICATION, SEE "PUBLIC ROADS"
MANUAL FOR SEP. 1931 (VOL. 12, NO. 7).
SECTION 6.0 IN PRELIMINARY PROJECT REPORT.

NOTE: SURFACES OF EXPOSED SLOPES TO BE PROVIDED TO
RESIST EROSION BY PLANTING GRASSES
OR OTHER VEGETATION. GRADES
SHOULD BE MAINTAINED BELOW BOTTOM OF DITCH AS SHOWN.
FOR METHOD OF CLASSIFICATION, SEE "PUBLIC ROADS"
MANUAL FOR SEP. 1931 (VOL. 12, NO. 7).
SECTION 6.0 IN PRELIMINARY PROJECT REPORT.

INDICATE TYPICAL LOCATION OF CHAIN MARKS,
UTILITY POLES, FOOTWALKS, P.O.V., ETC.

INDICATE PROPOSED SLOPE TREATMENT
METHODS, SLOPING OR PLANTING, ETC.

INDICATE CLASSIFICATION OF ROADWAY SECTIONS.
CHECKLIST OF EXISTING CONDITIONS, AND
PROPOSED LANDSCAPE TREATMENT.

INDICATE TYPICAL GROWTH
GRASSES
SHRUBS
TREES

INDICATE PRELIMINARY HIGHWAY EROSION
SOIL CONSERVATION PROJECT REPORT
(I, II, III, IV, V, VI, VII, VIII, IX, X)
(TC I, II, III, IV, V, VI)
(TF I, II, III, IV, V, VI)

INDICATE CLASSIFICATION OF ROADWAY SECTIONS.
CHECKLIST OF EXISTING CONDITIONS, AND
PROPOSED LANDSCAPE TREATMENT.

INDICATE TYPICAL GROWTH
GRASSES
SHRUBS
TREES

INDICATE PRELIMINARY HIGHWAY EROSION
SOIL CONSERVATION PROJECT REPORT
(I, II, III, IV, V, VI, VII, VIII, IX, X)
(TC I, II, III, IV, V, VI)
(TF I, II, III, IV, V, VI)

APPENDIX IV

RESULTS OF QUESTIONNAIRE
ON
SLOPE EROSION CONTROL

In August of 1939 the Committee sent a questionnaire to all State highway departments for the purpose of determining practices of slope erosion control. Replies which were received from all except eight States are listed in the following Tables. (pp. 64-69).

These Tables have not been reviewed or edited by the Committee on Roadside Development. They are presented in their original form as information of general interest without comment or recommendation by the Committee.

(In these Tables, wherever numbers appear without the prefix "note" or "notes" they refer to the order of preference for the items listed in the first vertical columns of the Table. The comments for the "note" numbers are listed at the end of the last two Tables.)

F. R. A. DISTRICT		7	8	9	10	11	12	13	14														
		Illinois	Indiana	Kentucky	Miss.	Alabama	Georgia	Florida	New York	Maine	N. H.	Vermont	Mass.	R. I.	Conn.	New Jersey	Ohio	Maryland	Delaware	Virginia	S. C.		
D. MULCHING																							
1. Type of material																							
a. Grain straw																							
b. Hay																							
c. Past																							
d. Pine needles and litter																							
e. Harvested wood litter																							
f. Wild grass and weeds																							
g. Other materials																							
2. Thickness of application																							
3. Methods used to hold mulch on steep slopes																							
a. stakes																							
b. Chicken wire or hog wire																							
c. Stakes and poles																							
d. Brush																							
e. Soil covering																							
f. Other methods																							
4. Do you consider mulched slopes steep slopes																							
a. Yes																							
b. No																							
c. Sometimes																							
d. Other types																							
e. Berm ditches																							
f. Strip sodding																							
g. Sod mulch																							
h. Other types																							
i. Berm ditches																							
j. Is topsoil used under sod																							
k. Is sod cut thick and placed on subsoil																							
l. Is sod fertilized at time of installation																							
m. If so is fertilizer placed under sod																							
n. If so is fertilizer placed on top																							
o. Is sodded area also seeded																							
p. Lightly																							
q. Not used																							
F. FERTILIZING																							
1. Types most frequently used																							
a. Commercial																							
b. Special mix																							
c. Manure																							
2. Analysis of most frequently used mixtures																							
3. Rate of application																							
4. Time of application																							
a. Mixed with seed																							
b. At seeding time - applied separately																							
c. Topdressing after seed germination																							

Public Roads Administration District	Oregon	Washington	Montana	Idaho	Arizona	Wyoming	Colorado	Nebraska	Minnesota	North Dakota	South Dakota	Kentucky	Missouri	Texas	Arkansas	Louisiana	
G. Planting 1. Species of trees found useful a. Water erosion b. Wind erosion	Native Willow Poplars	Native Fir Douglas Fir Sage	Not surfl. Native Fir Douglas Fir Sage	Willow Cotton-wood Abetal outtings	Not used	Not being used on beautifi- cation projects	Chinese Elm Pines Honey Locust	Willow Black Cherry Wild Plum	Willow Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum
2. Species of shrubs found useful In checking erosion a. Water erosion b. Wind erosion	Native Willow Poplars	Native Fir Douglas Fir Sage	Not surfl. Native Fir Douglas Fir Sage	Willow Cotton-wood Abetal outtings	Not used	Not being used on beautifi- cation projects	Chinese Elm Pines Honey Locust	Willow Black Cherry Wild Plum	Willow Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum
3. Species of vines found useful In checking a. Water erosion b. Wind erosion	Native Willow Poplars	Native Fir Douglas Fir Sage	Not surfl. Native Fir Douglas Fir Sage	Willow Cotton-wood Abetal outtings	Not used	Not being used on beautifi- cation projects	Chinese Elm Pines Honey Locust	Willow Black Cherry Wild Plum	Willow Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum
4. Planting methods a. Species of individual holes b. Plant beds - larger areas c. Trench planting	Native Willow Poplars	Native Fir Douglas Fir Sage	Not surfl. Native Fir Douglas Fir Sage	Willow Cotton-wood Abetal outtings	Not used	Not being used on beautifi- cation projects	Chinese Elm Pines Honey Locust	Willow Black Cherry Wild Plum	Willow Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum
5. Topsoil & fertilizer for plant- ing a. Do you always use topsoil b. If not, what plants do best in poor subsoil	Native Willow Poplars	Native Fir Douglas Fir Sage	Not surfl. Native Fir Douglas Fir Sage	Willow Cotton-wood Abetal outtings	Not used	Not being used on beautifi- cation projects	Chinese Elm Pines Honey Locust	Willow Black Cherry Wild Plum	Willow Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum
6. What fertilizers are most satisfactory at this stage of planting	Native Willow Poplars	Native Fir Douglas Fir Sage	Not surfl. Native Fir Douglas Fir Sage	Willow Cotton-wood Abetal outtings	Not used	Not being used on beautifi- cation projects	Chinese Elm Pines Honey Locust	Willow Black Cherry Wild Plum	Willow Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum
7. Mowing 1. If stand is good a. Mow regularly & remove cuttings b. Mow regularly & leave cuttings c. Leave unmown until matura- tion then cut d. Leave unmown until matura- tion then cut & leave cuttings as mulch 2. If stand is poor a. Mow regularly & remove cuttings b. Mow regularly & leave cuttings c. Leave unmown until matura- tion then cut & remove cuttings d. Leave unmown until matura- tion then cut & leave cuttings	Native Willow Poplars	Native Fir Douglas Fir Sage	Not surfl. Native Fir Douglas Fir Sage	Willow Cotton-wood Abetal outtings	Not used	Not being used on beautifi- cation projects	Chinese Elm Pines Honey Locust	Willow Black Cherry Wild Plum	Willow Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	Willow Cotton-wood Black Cherry Wild Plum	

1/ Created Wheat Grass 15% / Acre.
 2/ Created Wheat, Slender Wheat, Western Wheat & Brown Grasses, Canadian Wild Eye 15% / Acre.
 3/ Kentucky Blue Grass, Redtop, Timothy, Italian Eye, White Clover 15% / Acre.
 4/ Winter Eye 50% / Acre.
 5/ East. Ky. Blue Grass, Domestic Eye & Brown Redtop, Dutch White Clover, Korean Leppodesa, Mixed Native Grasses, Alfalfa.
 6/ Central. Domestic Eye Grass, Korean Leppodesa, Mixed Native Grasses, Western Mixed Native Grasses, Western Wheat Grass, Wheat (used alone).
 7/ North & West Section: Domestic Eye, Kentucky Blue, Timothy, Alsike Clover, Brown Grass, S. & E. Section: Domestic Eye, Ky. Blue, Redtop, Timothy, Alsike Clover.
 8/ Created field rock ditch lining where ditch flow line is raised and percentage of flow line grade is great. Also backlogs.
 9/ Ky. Blue Grass, Redtop, Timothy, White Dutch Clover, Farn Eye in fall, or Oats in spring.
 10/ Leppodesa used alone.
 11/ Blue Grass Redtop, Redtop on acid sands, Korean Leppodesa on acid city. Timothy, Alsike, Eye Grasses.

P. A. DISTRICT	Illinois	Indiana	Kentucky	Miss.	Alabama	Georgia	Florida	New York	Maine	N. H.	Vermont	R. I.	Conn.	New Jersey	Ohio	Maryland	Idaho	Virginia	N. C.	S. C.	
G. PLANTING	1. Species of trees found useful in checking erosion a. Water erosion b. Wind erosion	Black Locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
		Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
2. Species of shrubs found useful in checking erosion a. Water erosion b. Wind erosion	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	
	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
3. Species of vines found useful in checking erosion a. Water erosion b. Wind erosion	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	
	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
4. Planting methods a. Spot planting b. Plant beds - larger areas c. French planting	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	
	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
5. Topsoil and fertilizer for planting a. Soil in plant holes b. If not, what plants do best in poor soil c. That fertilizers are used d. Time of planting	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	
	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
6. That fertilizers are used a. Soil in plant holes b. If not, what plants do best in poor soil c. That fertilizers are used d. Time of planting	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	
	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
7. During first growing season a. If seed is good b. How regularly and how often cut c. Leave uncut until d. Leave uncut until e. Leave uncut until f. Leave uncut until	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	
	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak
8. That fertilizers are used a. Soil in plant holes b. If not, what plants do best in poor soil c. That fertilizers are used d. Time of planting	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	
	Black locust Honey Suckle Strawberry Prunus Prunus Elm Black locust	Willows var. alba Carolina Yellow Prunus Prunus Elm Black locust	Locust var. alba Carolina Yellow Prunus Prunus Elm Black locust	Willow Orange Black locust	For appearance	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak	Maple Elm Oak

16/ On roadside, Canadian Blue, Orchard Grass, Sheep's Fescue, Redtop, Timothy, Ailsie Clover.
 17/ In parks only; Ky. Blue Grass, Redtop, New Zealand Chewings Fescue, White Dutch Clover.
 18/ For slopes: Sheep's Fescue, Canadian Blue, Eye Grass, Redtop, Ailsie or White Clover.
 19/ For grass plots: Red Fescue, Redtop, Kentucky Blue.
 20/ Ky. Blue, Canadian Blue, Redtop, Ailsie Clover, N.Z. Chewings Fescue, Domestic Eye Grass.
 21/ Standard mixture: Ky. Blue, Redtop, Colonial Bent, Imported Perennial Ryegrass, White Clover.
 22/ For terraces: Redtop, Chewings Fescue, Ky. Blue, Colonial Bent, Imported Perennial Ryegrass.
 23/ On slopes less than 2 to 1: Kentucky Blue, Domestic Eye Grass, Redtop.
 24/ Slopes over 2 to 1: Timothy, Red Clover, English Perennial Ryegrass.
 25/ Corrugating is first choice.
 26/ On flat areas, Ailsie Clover, Redtop, Italian Ryegrass, Blue, Chewings Fescue.
 27/ For slopes: Sheep's Fescue, Canadian Blue, Kentucky Blue, Redtop, Hard Fescue.