REPORT OF SUB-COMMITTEE ON EROSION

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During 1936 progress was made in cooperative erosion control research by the State highway departments in collaboration with the Soil Conservation Service, the U. S. Bureau of Public Roads, the Tennessee Valley Authority, and the Highway Research Board. By October first 71 highway erosion control research projects had been set up in 11 States. These added to regular roadside development work(with erosion control a primary purpose) form a series of demonstration projects now going forward in all regions of the country.

Research Project Set-Up

A review of these special research projects brings out the following points:

1. Erosion control research projects are located primarily where the Soil Conservation Service has most of its C.C.C. camps. The greater part of the work to date has been done in the Mississippi Valley and Middle West.

2. A joint agreement between the Service and the State highway departments involved, clearly delineating the responsibilities of each party, is drawn up.

3. Plans are prepared by the Soil Conservation Service and the highway department, based upon standards already set by the States in their regular roadside development work. These consist of typical cross section, estimate and layout sheets based upon regular construction blue prints in highway department files.

Methods Used In Carrying Out Research Projects

While the methods used in erosion control projects differ to meet regional climatic and soil conditions, all projects agree in their essential approach to the problem:

1. Rounding and flattening of existing highway cross sections form the base for all following stages of erosion control work.

2. Slopes are flattened to meet existing soil conditions and the best available types of vegetative ground cover materials.

3. Ditch cross sections are rounded and flattened to reduce the abrasive force of surface water per square inch of surface*.

4. Topsoil is restored on seed beds or planting areas, or existing soils are treated with manures or fertilizers.

5. Ditches are surfaced with sod or masonry, ditch checks are installed, culverts are extended or modified, rip rap is placed, and concrete or other types of check dams are constructed to meet the requirements of each project where vegetative control methods alone are not effective**.

6. Solid sodding, strip sodding, sprigging, seeding and combinations of these methods are used to establish grass as a ground cover.

7. Spreading vines or low woody shrubs are planted on slopes too steep for effective grass establishment.

8. To a limited extent black locust and other tree seedlings are planted in highway areas to control erosion.

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* The Soil Conservation Service recommends that the ditch section be designed for a velocity which will not cause scouring and at the same time will minimize silting when the road ditch is intercepting outside water. It has been demonstrated in the south and southwest that Bermuda grass will carry water at a velocity of 8 ft. per sec. without causing scour.

** Special attention should be given to improving the designs of culvert cross drains. Drop inlet or head spillways should be designed that will not only prevent erosion but will not prove hazardous to drivers. The outlet end of the culvert should be designed to reduce the velocity of water after it has passed through the culvert, either by flaring the end or by making use of de-energizers. A solution to the latter problem will prevent damage to adjacent agricultural land. In numerous cases side drains have been eliminated and driveway ramps constructed. These ramps are not only economical, but are more effective in preventing erosion.

9. In all cases native grasses, vines, shrubs and other plants are featured as far as supplies of such materials are commercially available.

Summary and Recommendations

Factors Affecting Erosion Control

In all erosion control projects, emphasis is being placed on analysis of existing vegetation, soil and drainage on the roadsides and adjacent lands. Methods applied are based upon such conditions.

The factors which appear to be most important in soil erosion control research on highway areas are:

1. The erodibility of existing soils.
2. The dimensions and degree of slope of bare soil areas.
3. The velocity and volume of surface water which reaches the highway from adjoining lands, depending upon land use.
4. The design of highway slope and ditch sections and of highway drainage structures.
5. Types of ground covers existing off the highway and existing or established upon erodible areas within highway limits.

In general all methods of erosion control must be adjusted to meet the erodibility of the soils on highway areas as affected by these combined factors. Proper design of the highway cross section plus establishment of well selected native plant materials will remain the backbone of successful erosion control work.

Factors Contributing To Soil Erosion

The following factors have contributed to highway erosion in the past:

1. Highway slopes have been too steep for stabilization of existing soils and have thus prevented ready establishment of vegetative ground cover.

2. Highway cross sections have featured steep slopes with flat plane surfaces which have tended to encourage erosion.

3. Highway slopes and shoulder areas have not been provided with proper sub-surface drainage. Earth slumpage and slides have resulted.

4. Topsoil has not been conserved during construction operations and sterile soil surfaces have been left upon which vegetation cannot be established until fertility is restored.

5. Ditch section, culvert, and inlet and outlet design have in some cases favored surface soil erosion on highway lands.

Basic objectives of both highway erosion control and roadside development are:

1. The demonstration of:

a. Improved rounded and streamlined earth cross sections which will resist erosion, make possible the establishment of vegetative ground covers and which can be incorporated with new highway construction at reasonable cost. These streamlined cross sections should not be standardized, but varied to meet the needs of existing soil and topography.

b. Effective and economic methods of topsoil conservation and restoration and successful experimentation with chemical and organic combinations of fertilizers with existing soils where topsoil cannot be restored or, being restored, is found to be of poor quality.

c. Effective methods of control of excess water before it reaches the highway. Such control may be secured by establishment of vegetative ground cover, by the use of baffles, or check dams in drainage channels, by diversion ditches, or by terracing or under-drainage to direct water away from the roadway.

2. The determination of:

a. The relation between the physical character (erodibility) of existing soils, degree of slope and the factor of site aspect, and the selection of types of vegetative ground cover.

b. Best methods of establishing grasses, legumes and herbaceous plants by means of seeding, sprigging and chunk, strip or solid sodding, or combinations of these, under various roadside conditions.

c. Best methods of establishing woody vines or low woody shrubs by planting collected or nursery-grown materials selected to meet various roadside conditions.

d. Best type of structures to prevent erosion in ditches, on slopes, or on other highway areas under extreme conditions where vegetative methods alone are not effective.

CONCLUSIONS

Purpose of Highway Erosion Control

The Committee recommends that the following points be kept in mind in all future erosion control research:

1. A primary purpose of the work is the improvement of highway construction and maintenance methods leading toward future highways which will be free from the costly and damaging effects of soil erosion.

2. The first need in highway erosion control is to provide a reasonably fertile soil surface on a degree of rounded earth slope favorable to the establishment of common and existing available types of native or naturalized vegetation.

3. Special erosion control highway research projects should provide demonstrated facts upon which improved roadside development and eventually improved highway design will be based.

4. Erosion control research and demonstration projects must be selected as to site and planned as to methods used, with the object of solving existing highway design, construction and maintenance problems.

5. The determination of most effective methods alone, will not solve the problem. Methods must be determined which can be coordinated with customary highway engineering practice, using mass production methods which feature the use of common and readily secured seeds and plants to bind the soil, as far as possible without masonry or other artificial structures.