



One of the first motorists to use Iowa's new HELP system was Ruth Ann Hash of Lebanon, Missouri.



Signs like this are placed at regular intervals along main highways in the state.

The new system provides a relatively low-cost solution to the need in Iowa, as well as throughout the United States, for an organized means of assisting motorists involved in emergency situations on the highway. Such emergencies may vary from the relatively common matter of an empty gas tank to the urgent need of someone suddenly faced with the responsibility for obtaining prompt assistance for victims of a serious highway accident.

In addition to signs placed along the highway informing motorists of the HELP number to call, the number will be available in all highway-oriented telephone booths, placed on Iowa highway maps, and disseminated to the public in all other appropriate manners.

The new HELP program will operate initially for 2 years on a trial basis beginning sometime this summer. The highway commission will fund approximately \$30,000 for the research project of which \$20,000 is for telephone line charges and \$10,000 for installation of signs and other advertising devices to alert the public of the service. During the research phase of the project, inquiry cards will be sent to people who have utilized the service requesting comments and suggestions to improve the service.

Results Assessed of Ten-Year Program of Massachusetts Roadside Development

The University of Massachusetts, in cooperation with the Federal Highway Administration and the Massachusetts Department of Public Works, has been involved in a 10-year roadside development research program from 1962 until

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1971. The purpose of this investigation was to aid the Massachusetts Department of Public Works with its highway maintenance problems and to test new methods and materials that might be practical and economical in Massachusetts. The areas of investigation are discussed below.

GRASS SEED

The presence of many deteriorating and eroded slopes that were originally seeded in grass required that the adaptability of certain grass species to the environment and also the rate of seeding be investigated. Researchers found that better stabilization was obtained with a larger percentage of basic grasses and a smaller percentage of temporary grasses in the seed mixture. The modified seed mixture and reduced rate of seeding (one-half the Department of Public Works' standard rate of 175 lb/acre) produced good stands of grass and adequately checked soil erosion. Incorporation of these changes into the department's specifications resulted in savings to the department of \$200,000 since the results of this experiment were implemented.

MULCH

Comparing various mulches with hay mulch for grass establishment and erosion control of soil on steep banks revealed that wood chips and excelsior mat gave very good control. Another mulch that gave good erosion control and grass establishment was wood cellulose. Hydroseeding methods with this product were evaluated and later were incorporated into the standard specifications of the Department of Public Works.

FERTILIZATION

Grasses deteriorate over a period of years if they are not limed and fertilized. Good quality turf on median strips where no lime or fertilizer was placed for a period of 5 years continued to produce satisfactory cover but was showing signs of thinning. A program for fertilizing and liming has been established to prevent deterioration of turf on median strips and other critical areas on roadsides.

SEEDING TIME

Quality turf can best be established as shown by the time-of-seeding experiment in the fall and early spring. Weeds and drought are responsible for poor quality sod when seedings are made at other times of the year. Summer seedings are not recommended in the department's specifications.

MALEIC HYDRAZIDE

Mowing costs have increased tremendously because of increased road-building, which in turn has increased the acreage to be mowed. Maleic hydrazide was tested for growth suppression of highway turf, and the results were erratic. The department used MH-30 and found that it worked but was not economically feasible for the cost of the material is as high as the cost of cutting the grass.

CAPE COD DUNES

The results of a project on the control of drifting sand dunes on Cape Cod are a valuable contribution to the state, the department, and the country as a whole. This project was carried out to find a rapid and effective method of controlling moving sand dunes that were depositing some 10,000 ft³ of sand on

Mass-6 on Cape Cod. Sandblasting of cars and pitting of windshields occur during stormy periods when cars travel this route.

Machine-planted beach grass, spaced more widely and fertilized, produced a solid cover the second year and stabilized moving sand. This method reduced the number of beach-grass transplants from 19,360 to 9,680 per acre. Beach grass was planted on several acres in critical areas and given no additional care, and 5 years later these plantings are controlling the moving sand.

Dune-building with the use of snow fences was successful, and several dunes were rebuilt this way. Direct seeding with a grain drill of coastal panic grass, weeping love grass, Kentucky 31 tall fescue, and cereal grasses was successful in stabilizing moving sand in more protected areas. Bayberry and conifers were successfully established as final stabilizers for the Cape area.

Dune stabilization is difficult but critical if the Provincetown area is to be saved. Windstorms of 100 mph are registered at Race Point on Cape Cod.

GRASS-AREA REDUCTION

Grass is the most expensive cover to maintain. Massachusetts spends \$800,000 yearly on mowing and \$200,000 on fertilizing. The areas seeded to grass on both old and new construction must be reduced and other planting and mulching methods substituted in order to reduce mowing costs. Maintenance funds are limited and cannot be stretched further.

WOOD CHIPS

Wood chips are recognized as good mulch and during the 10-year project were used in many experiments for erosion control. Because of a no-burning law in Massachusetts, the Department of Public Works will have available annually 100,000 yd³ of wood chips and has already covered over 500 miles of slopes and other areas successfully. This practice has reduced mowing costs from 25 to 50 percent over all-grass areas on roadsides and along slopes.

The use of wood chips at a 3-in. depth in conjunction with the new environmental approach of covering slopes immediately under the prime contract is a natural and practical solution to the erosion problem. The utilization of wood chips will be the largest single factor in controlling erosion and can save the department \$500,000 a year.

The chips can be spread in a practical manner by slope-cat, grade-all, or crane with a large clamshell bucket. The industry is attempting to develop various types of blowing equipment. An experimental mulcher used and evaluated was too small, did not throw the wood chips high enough on the slope, and was considered inefficient for large-scale work.

SWEET FERN

Pioneer work was started with the planting of sweet fern root cuttings on gravelly roadside slopes that were previously mulched with wood chips. Excellent results were obtained, and further work was carried out in the second 5-year program because it is an excellent plant for dry sites. Extensive laboratory studies indicate that sweet fern is a very difficult plant to establish from seed. Further studies, however, have shown that this plant can become established quite easily by root propagation. Three-inch root cuttings were taken in early spring, placed into the soil, and covered with 2 in. of wood chips on a newly constructed sandy roadbank. Results from this experiment show a high percentage of established sweet fern plants. The planting of sweet fern root cuttings directly onto roadbanks is a tremendous breakthrough and will

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stabilize slopes with a permanent cover within a year or two. Planting procedures have recently been recommended to the department and will be implemented as soon as root cuttings can be obtained commercially. This work can be done under the prime contract and should save the state \$150,000 annually. More work needs to be done on this program.

CROWN VETCH

Crown vetch has been grown successfully in other states for erosion control and reduction of maintenance costs. Failures were encountered in establishing this plant in Massachusetts, and studies were initiated to find methods of establishing it here. Research conducted on different soils in the greenhouse showed that crown vetch would grow and become established if the limestone requirement of the soil was met and the soil was given a supplemental fertilization of 0-20-20 at about 800 lb/acre. Work on deteriorating slopes has shown that a hay mulch on crown-vetch seedings is effective in controlling erosion until the crown-vetch plants are large enough to hold the soil. On newly constructed cut-and-fill slopes, nurse crops seeded with crown vetch were very beneficial in controlling erosion.

The success of the research project in finding methods to make crown vetch grow in Massachusetts has been outstanding. The results of the research to date have been fully implemented in all districts throughout the state by the Maintenance Division of the Department of Public Works. Hundreds of pounds of crown-vetch seed and thousands of plants in peat pots have been used. Once crown vetch is expanded in the department's maintenance program and included in the prime contract, it will save the department a minimum of \$300,000 yearly on erosion repair on slopes and reduce roadside and interchange mowing costs. This program needs more research on the hydraulic seeding of crown vetch and the refinement of present planting methods. Another plant, flat pea, currently being investigated, shows promise and may be as good as crown vetch, but further work is necessary.

BREEDING PROGRAM

Grass is grown along Massachusetts highways from the road's edge to 30 ft from the road and in median strips. To reduce the maintenance costs (principally mowing), a grass breeding program was initiated. Its purposes were to find a variety of Kentucky 31 tall fescue that produces short seed stalks and to increase the seed of such a genetically pure plant. From work thus far completed, we have 350 fourth-generation seedlings that are the progeny of 6 short-stalked third-generation plants. These will be further grown, segregated, and crossed in an attempt to get a genetically pure, short variety of Kentucky 31 tall fescue.

The development of a low-growing grass that needs to be cut only once a year must be fully researched. The success of this research on grass will save Massachusetts \$400,000 yearly and would mean a savings of much more on a national basis, for all states have similar maintenance problems.

SOIL STERILANTS

During the current 5-year contract, new soil sterilants were tested and compared with the chemicals that the state is using. Some of those that worked very well in reducing vegetation under guardrails are Coteran 5G, Pramitol 5P, Tandex 8OW, and Pramitol 25E.

BARE-ROOT SEEDLINGS

Cut-and-fill slopes along roadsides become severely eroded and require expensive reconstruction unless the soil on the slopes is thoroughly anchored. The Department of Public Works has set adapted woody plants on such slopes to stabilize them and to reduce maintenance costs. The choice of plant sizes has been limited to (a) balled and burlapped landscape-sized plants, which are very expensive, or (b) small liner-sized plants or seedlings, which are inexpensive and are set bare-root. The use of small, inexpensive plants would appear to be the most practical way of establishing large numbers of woody plants on the thousands of acres of slopes. However, success with these plants has been erratic. The specific problem was to determine the likely cause of plant losses and to suggest improvements that can be made in methods of handling and planting small plants for better survival and establishment on highway slopes.

Grasses and weeds could be controlled by the use of certain herbicides, but weed competition was found not to be an important factor in the establishment of the plants.

The procedures used in planting bare-root seedlings on slopes mulched with 3 to 4 in. of wood chips have been implemented with great success in all districts of Massachusetts. When the Department of Public Works can supply satisfactory plants that cost 50 cents to \$1 apiece and within a few years have plants that are worth \$5 to \$10, the assets are increased in untold amounts.

CONTAINER-GROWN WOODY PLANTS

In the research with bare-root seedlings, two additional problems became apparent in the course of the investigations:

1. No successful method was available for transplanting sweet fern, a native plant well suited for stabilization of slopes; and
2. There was a need for extending the planting season for small plants because the bare-root plants could be successfully planted only in the early spring.

A method was developed for propagating sweet fern plants from root cuttings and growing them in containers for successful planting on highway slopes. Fourteen species of woody plants have been successfully grown in containers and set on highway slopes during the period of August 15 to September 30. These last two developments are in the feasibility test stage, and further research is needed on several aspects of growing, handling, planting, and care of container-grown plants for stabilization of highway slopes.

The starting of various species of seedlings in containers in the early spring and planting them on roadsides in the fall will greatly extend the planting season in Massachusetts and will also provide plants when needed for erosion repair or for immediate cover under the prime contract. The maintenance section really needs this development and intends to spend an estimated \$50,000 this year on its implementation.

The research projects involving the planting of bare-root seedlings, potted plants of woody species, potted crown-vetch plantings, and seedlings on adapted sites in the Massachusetts environment could save hundreds of thousands of dollars.

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