

1977

AN EXPERIMENTAL PRODUCT EVALUATION  
EROSION CONTROL PRODUCTS

by

Research Div.  
Library

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Prepared in Cooperation with the  
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The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Federal Highway Administration.

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16. Abstract  The products tested herein represent field trails of erosion control methods in certain selected locations in Oklahoma. The products tested include wood cellulose fibers, a paper mulch, a dust palliative, two tackifiers, plastic netting, fiber galss roving, and an excelsior mat.  Statements are made concerning research methods. Performance evaluations and recommendations for use are included, as well as costs.			
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# EROSION CONTROL

## Introduction

The following report is a compilation of ten (10) reports concerning erosion control products. It is an attempt to disclose the performance of ten products tested under Oklahoma conditions. Some of these products were used in several installations throughout the state while others were installed in one area only.

In some cases, time and the small quantities of product available precluded a proper experiment incorporating a formal experiment design. Each of the reports will generally speak for itself concerning the degree of intensity of the experimental procedures. However, in most of the cases, enough information was obtained to determine the products effectiveness under Oklahoma soil and climate conditions. For instance, Weyerhaeuser's, "Silva Fiber", a wood cellulose fiber mulch, works very well in the eastern U.S. where humidities are high, rainfall is evenly distributed, and winds are lower in velocity. But these cellulose fibers are a total failure in western Oklahoma and only conditionally adequate in selected areas of eastern Oklahoma.

Specifications and special provisions have been written for several of the products. This will be noted in each of the reports. This constitutes the status of implementation to date.

Cost estimates will be given for each product but in many cases are approximate.

### E-Z Fabric or "Hold/Gro"

The following is a description of the application of the material, plus a report and recommendation.

A special provision has been written for this material to be used as a ditch liner. The cost of this material is \$100 to \$150/A (\$250 to \$370/ha) in place (1977).



On January 28, 1975 an application of "Hold/Gro" was made. This product (formerly E-Z fabric) is a paper mulch material manufactured by Gulf States Paper Corporation, Box 3199, Tuscaloosa, Alabama 35401.

#### Setting

Location: The experimental plots are located along the north side of S.H. 266, 2.2 miles (3.5km) west of the Mingo Valley Expressway. All plots were placed on a backslope with a cut of about 10 feet (3m). The slopes are 3.5:1.

Geology & Soils: The plots are located in gently rolling terrain. Cuts were made into alluvial terrace materials adjacent to Mingo Creek. These soils are fine sandy in nature, containing 2-4 feet (0.6 - 1.22m) of loose cohesionless fine sand. Without treatment these soils would erode considerably. The soils contain a thin water zone near the base of the cut.

#### Treatment

Mulch material: This material is essentially a paper substance which has been slit into thin ribbons. The material is held together by a polypropylene yarn. The material comes in rolls weighing 40 (18kg) lbs with each roll covering 150 yds<sup>2</sup> (125.3m<sup>2</sup>).

Application: The material was placed up/down the slope. It was lapped about 1½ ins. (38mm) with adjacent layers. Long 6 in. (152mm) steeples hold material in place. Walking on material does not seem to harm it.

The particular type applied here is supposed to last 1 to 1½ years. One man could apply this material with no problems. No ditches were cut to "tuck-in" the material.

Experiment Design: Four inches of sandy loam topsoil (2.5% organic matter) was spread over the entire test area. In the Hold/Gro experiment, three plots were utilized. The west plot is Hold/Gro only, the center plot had no treatment, the east plot was seeded with Plains Bluestem (*Bothriochloa Ischaemum*). The rate of seeding was 10#/Acre (11kg/ha)(PLS).



### Cost

The material itself costs about \$.40/yd<sup>2</sup> (\$.48m<sup>2</sup>). Additional routine cost must include staples. Gulf States claims \$.43/yd<sup>2</sup> (\$.52m<sup>2</sup>) installed but a range of \$.60 - \$.70 yd<sup>2</sup> (\$.72 - .84m<sup>2</sup>) appears more reasonable at this date.

### Coherex

The following is a memo concerning the performance evaluation of coherex.

No specification has been written for this material.

Cost \$.60/gal. (\$.14 liter) Recommended application rate of .5 gal./yd.<sup>2</sup> (2.3 liters/m<sup>2</sup>) brings the price to \$.30/yd.<sup>2</sup> (\$.36/m<sup>2</sup>) (1975).

### Terra Tack II

The attached sheet is a memo demonstrating the performance of Terra Tack II.

No specification has been written for this material.

Cost: Product can be applied for about \$.025/yd<sup>2</sup> (\$.03/m<sup>2</sup>).

### Silva Fiber and Hydro Mulch

The following is a performance evaluation of the products Silva Fiber and Hydro Mulch.

A specification has been written for wood cellulose fiber mulches. These will only be recommended in southeast Oklahoma and special cases.

Cost: Both of these products have similar prices. They cost about \$145/ton (\$160/Ton, metric) (1974) of material. Each ton covers one acre (0.4/ha), which is a recommended rate of application. Cost is \$200 - 300/Acre (\$494 - 741/ha) in place.

Wood Fiber mulches are not suited to dry climates. Several climatic factors work against these materials. High winds disperse the mulches as they are being applied. The same winds serve to "roll-up" the mulches and blow them away after lying only a few days. Mulches used in Oklahoma must be able to withstand the rigors of frequent 30+ mph (48.3km/hr.) winds.

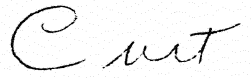
# Oklahoma Dept. of Transportation

Date March 15, 1976

To M. D. Smith, Manager, Engineering Test Branch  
From C. J. Hayes, Project Engineer  
Subject Performance evaluation of HOLD-GRO, Gulf States Paper, P.O. Box 3199  
Tuscaloosa, Alabama 35401.

The product HOLD-GRO (formerly E-Z fabric) is not recommended for use at this time. It is felt that the slope on which this product was used (5:1 to 7:1) did not adequately test this material. Tall growing weeds seemed to lift and disturb this material to a great extent. The material also separated to a considerable degree sometime after installation.

Further testing on a long (50+) and steeper slope (3:1) are recommended. Also, wind got under seams and lifted paper strips.

  
Curtis J. Hayes

CJH:ol

4611

## Oklahoma State Highway Dept.

Date March 15, 1976

To M. D. Smith, Manager, Engineering Test Branch

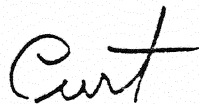
From C. J. Hayes, Project Engineer

Subject Performance evaluation of COHEREX, a product of Witco Chemical, Golden Bear Division, P.O. Box 378, Bakersfield, CA 93302.

The product COHEREX is recommended for approval for use by the Oklahoma Department of Highways. COHEREX is an emulsion of petroleum oils and resins.

This product was applied to an experiment plot in Tulsa on 46th St. just north of the Tulsa airport. While this product is designed primarily as a dust palliative, it did have considerable affect in stabilizing loose fine sandy soil. Without further testing COHEREX should generally be limited to use as a dust palliative. It will have a beneficial effect when used on short, sandy slopes of 3:1 or flatter that do not exceed about 35 ft. or so in length. COHEREX should be very beneficial in temporary erosion control program and under certain conditions its use can be extended to permanent programs.

This product did not seem to inhibit seed germination nor the peg-down of bermuda runners. In fact, it may have enhanced peg-down.



Curtis J. Hayes

CJH:ol



*Handwritten initials*

# Oklahoma Dept. of Transportation

Date June 29, 1977

To Key Boyd, Rural Design Engineer  
From C. Dwight Hixon, Research Engineer  
Subject Terra Tack II, by Grass Growers, Inc.  
Attention Gary Roach

The product "Terra Tack II" of Grass Growers Incorporated is approved for use by the Oklahoma Department of Transportation.

This product, extracted from seaweed, was placed on an experimental plot on 46th Street in Tulsa. The material was used to hold (tackify) wheat straw mulch in place on a three to one slope. This product did exceptionally well, one year after application about 50% of the mulch still remains. The tackifier was very successful during the germination and establishment phase of the permanent erosion control program.

  
C. Dwight Hixon

CDH:ol

cc: Max Hinderliter  
Grass Growers, Inc.

Rainfall is also very damaging to these materials. High intensity, thunderstorm type rains are the rule rather than the exception Oklahoma. Such rains quickly erode multiple channels in the mulches which are then easily picked up by the high winds.

While these materials may work satisfactorily in the eastern Oklahoma they are apparently not suitable for the majority of Oklahoma.

There will be no further evaluation made on these mulches. They are not recommended for general use in Oklahoma.

#### Dow Mulch Binder

The following is a memo describing a detailed application procedure for an experiment on S.H. 11 near Blackwell, Oklahoma.

After one year of observation, zones III and IV looked significantly better than zone I and II. However, it seemed like the distribution of the mulch had as much to do with the results as the efficacy of the tackifier. An even distribution of mulch (hay or straw) is necessary for a good job. In areas where a fairly thick layer (2-3 ins.) (51 - 76mm) of mulch was applied, the tackifier material was still effective after one year of service.

No specification has been written for this material.

Cost: The mulch binder can be applied for about \$50.00 to \$100.00/Acre (\$125 to \$250/ha) (1975).

#### Vexar Netting

This plastic net product has considerable potential as a hold-down material for keeping straw, hay, excelsior, etc. mulches in place. The material, to be more useful, should be provided in bio-degradable and non degradable (ultraviolet resistant) grades. The bio degradable material should be used on less steep slopes where subsequent mowing is anticipated. Steeper, hard to reach slopes should receive the UV resistant netting.

# Oklahoma State Highway Dept.

Date April 29, 1976

*To Smeen  
Good report  
Have you reported?  
to Finn A  
CT*

To C. Dwight Hixon, Research Engineer

From M. D. Smith, Manager, Engineering Test Branch

Subject Evaluation of the performance of Dow Mulch Binder XFS-4163L

April 27, 1976 approximately 230,000 square yards of vegetative mulch (prairie hay) was applied on each side of the roadway of S.H. 11 approximately ten miles east of Blackwell, in Kay County. The test location begins at the east end of Bois d'Arc Creek Bridge, and extends east for 0.31 miles.

Five zones of the test area were established to test various mixtures of the Dow Mulch Binder XFS-4163L. These zones are illustrated on the attached sheet. The various mixture of the Binder are as follows:

Zone I One and two tenths (1.2) acres  
 The hay mulch was applied at a rate of 1½ tons/acre. Dow Mulch Binder mixture sprayed on top of the mulch.  
 480 gallons of water  
 2 pounds of modifier  
 53 gallons of latex

Zone II Eight tenths (.8) of one acre.  
 The hay mulch was applied at a rate of 1½ tons/acre. Dow Mulch Binder mixture sprayed on top of the mulch.  
 480 gallons of water  
 2 pounds of modifier  
 53 gallons of latex  
 200 pounds of Conwed hydromulch

Zone III One and eighteen hundreds (1.18) acres. The hay mulch was applied at a rate of 1½ tons/acre. Dow Mulch Binder mixture was sprayed simultaneously with the mulch.  
 300 gallons of water  
 7/8 pounds of modifier  
 30 gallons of latex  
 The nozzle sizes used on the Finn Mulch spreader were size 1560 on the top and two size 1570 nozzles on the sides.

Zone IV One and Seven tenths (1.7) acre. Hay mulch was applied at a rate of 1½ tons/acre. Dow Mulch Binder mixture sprayed simultaneously with the mulch.  
 184 gallons of water  
 2.5 pounds of modifier  
 66 gallons of latex  
 The nozzle sizes used on the Finn Mulch Spreader were sizes 1510 on the top and two size 1530 nozzles on the side.

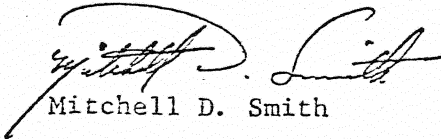


Zone V Sixteen hundreds (.16) of one acre. The hay mulch was applied at a rate of 1½ tons/acre. Vexar netting was placed over the mulch. Hay mulch was applied, with Dow mulch Binder sprayed simultaneously, over the Vexar netting Dow Mulch Binder mixture.  
100 gallons of Water  
5/16 pounds of modifier  
10 gallons of Latex

During the night of April 27, immediately after the application of the mulch, a heavy rain occurred (1.3"). The following day all the mulched zones were in excellent condition.

It was noticed in all applications that the Dow Mulch Binder will foam quiet a bit and special care must be taken to prevent it from foaming, particularly when using the agitator in the hydroseeder.

When mixing the binder, put the water in first. Add the modifier, last add the latex. Do not let the agitators be exposed because this causes most of the foaming problem. The wind was from the south and blew some of the mulch away during application on the south side of the roadway.

  
Mitchell D. Smith

MDS:ol

Mat and Application Ratio  
Evaluation of Dow Mulch Binder  
XFS-4163L

The entire test zone including the control section was disked, seeded and fertilized. All the test zones were hayed at  $1\frac{1}{2}$  tons per acre.

- Zone I The Hydroseeder applied Dow Mulch Binder at a ratio of 480 gallons of water, 2 pounds of modifier and 53 gallons of latex over the hay mulch.
- Zone II The Hydroseeder applied Dow Mulch Binder at a ratio of 480 gallons of water, 2 pounds modifier, 53 gallons of latex and 200 pounds of Conwed Hydromulch over the hay mulch.
- Zone III The Mulch binder was sprayed with the hay mulch at a ratio of 300 gallons of water,  $\frac{7}{8}$  pounds of modifier and 30 gallons of latex.
- Zone IV The mulch binder was sprayed with the hay mulch at a ratio of 184 gallons of water, 2.5 pounds of modifier and 66 gallons of latex.
- Zone V The mulch binder was sprayed with the hay mulch at a ratio of 100 gallons of water,  $\frac{5}{16}$  pounds of modifier and 10 gallons of latex.

No Treatment

CONTROL SECTION  
No Treatment

ZONE I

ZONE IV

0.0

+818.5

ZONE II

yellow dot

+1161.6

ZONE III

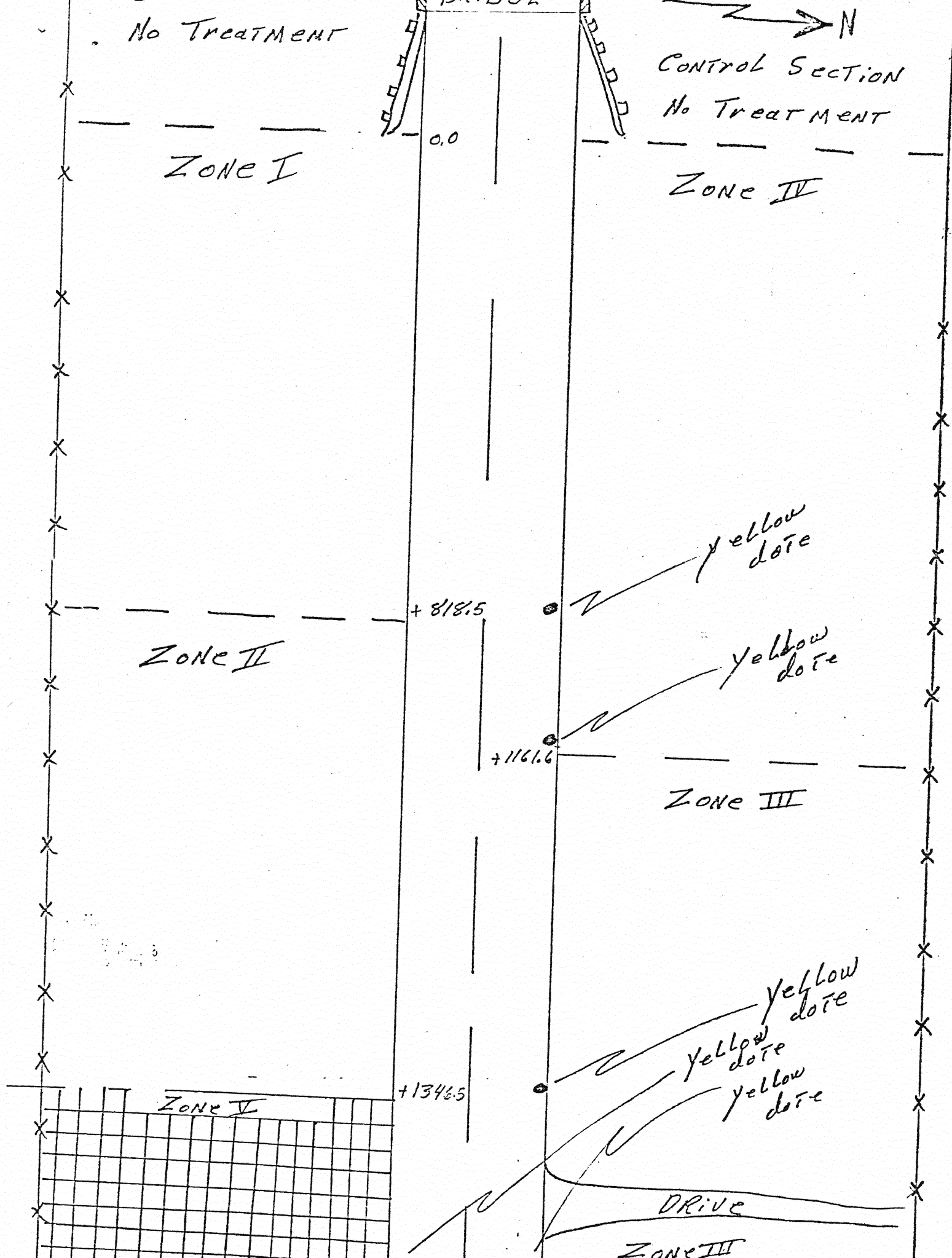
+1346.5

ZONE V

yellow dot  
yellow dot  
yellow dot

DRIVE

ZONE III





This material performs well where adequately held in place. High winds prevalent in Oklahoma tend to lift the netting and roll it. Staple placement and an adequate number of staples per unit area should be provided in any provision or specification.

While Vexar plastic netting does a tolerable job of holding mulches, other materials e.g. SS-1 emulsion, Terra Tack II, and other "Stickers" do a better job of holding mulches in place. A major benefit from plastic netting could be derived if the netting could remain intact for at least three years for most uses in Oklahoma.

No specification has been written for this project but may be recommended for use in urban area projects.

Cost vary from \$.089 to \$.224/ft.<sup>2</sup> (\$.96 - 2.42 m<sup>2</sup>) (1975).

#### Fiberglass Roving

The following is a performance evaluation of glass fiber materials.

A specification has been written for this material.

The cost for fiberglass mulching treatment is about \$150.00 to 200.00/Acre. (\$371.00 - 494.00/ha) (1977).

Three sites were utilized in 1973 for the testing of fiberglass roving erosion control material. These sites are located: 1) on I-40 near the Earlsboro Exit, 2) S.H. 39 5 miles (8 km) east of Lexington and, 3) 1.5 miles (3.7 km) south of the Concho Indian School in Canadian County.

Earlsboro Site: Here the material still had a matted appearance. Weeping Lovegrass was growing well in the study area. The fiberglass material appears to be very effective against sheet erosion on sandy backslopes of about 3:1. A small gully bisected the area. It appears that the fast moving discharge went under the tightly massed fiberglass.

Lexington Site: A good cover of fibers was still effective. A small gully had undermined the fibers in the center of the ditch.

Concho Site: The material has been rolled into two large balls at the side of the ditch. Here the intent was to stop ditch erosion. However, the sandy soil plus the effect of high intensity rainfall in a steep, long, ditch was too much for the fiberglass to cope with.

### Glassroot

On January 30 an application of glassroot was made adjacent to the Hold/Gro experiment plots near the airport in Tulsa. The location, terrain, and soils conditions are the same as for Hold/Gro except that the eastern most glassroot plot does not have the benefit of topsoil. Glassroot is a glass fiber (coarse "angel hair") material which is applied by means of a compressed air nozzle. The application can be made by one man but an air compressor must be provided in order to blow the fiber onto the slopes.

### Treatment

Application: About  $.25 \text{ lb/yd}^2$  ( $0.1 \text{ kg/m}^2$ ) of fiber was the rate applied to the slope. A 0.25 gallon of asphalt per  $\text{yd}^2$  ( $1 \text{ liter/m}^2$ ) is recommended to tack down the glass fibers. It is thought that  $.1 \text{ gal/yd}^2$  ( $0.4 \text{ liter/m}^2$ ) would suffice.

Experiment Design: Two plots were established just to the west of the Hold/Gro plots. The westernmost plot is fiber with no seed. The adjacent easterly plot is fiber plus 10lb./Acre (11kg/ha) (PLS) Plains Bluestem (*Bothriochloa Ischaemum*) Another plot, located just to the east of the eastermost control area contains glass fiber over raw soil (no topsoil), with no seed. Only a weak stand of plains bluestem was noted. The plots were very weedy from the first season and throughout the study period.

The backslope in this area is about 6:1. The adjacent control areas showed very little erosion as did the treated areas. The backslope is not adequate to cause a proper stress of the glass fibers for a good evaluation.

## Costs

Total cost in place (with 0.25 gal. asphalt/yd<sup>2</sup> (0.8 liter/m<sup>2</sup>) is \$.40 - .50 per lb. (\$.90 - \$1.10/kg) in 40 - 50 lb. (18 - 23 kg) quantities.

By comparison, straw with asphalt costs about \$.04/yd<sup>2</sup> (.05/m<sup>2</sup>).

## Curlex Excelsior

The following reports pertain to two installations of an excelsior mat mulch. The mats come in rolls and are protected and held in proper shape by plastic netting.

A specification has been written for this material for use as a ditch liner and as slope protection.

The cost for the excelsior mats are about \$100 to 150/Acre (\$250 to 370/ha) in place (1977).

### Robber's Cave State Park:

During April 1974, 0.76 Acres of 2½:1 fill slope was covered with "curlex". This is a roll of excelsior mat which serves as a mulching material. This area is a repaired landslide. Erosion control seeding program was 20lb. (9 kg) Serecia Lespedeza, 20lb. (9 kg) Kobe, and 5lb. (2.2 kg) of Weeping Lovegrass. Watering was performed the day following the completion of the mulching. Grasses have germinated and are growing well, looks good.

Clem Hamilton State Park: Approximately 0.5 acres (0.2 ha) of backslope was covered. Here an attempt was made to lay the mats perpendicular to the slope. This method did not work well. Much of the material was floated away by runoffwater from a heavy thunderstorm.

Observations three years later show no further deterioration. The general appearance is good. The only disturbed areas are those noted above as being caused by a storm soon after installation.



## Summary

The need for new methods of controlling erosion is evident. While strictly controlled experiment designs can provide the most valuable and worthy information, many small uncontrolled applications can provide enough information to make recommendations. The studies of the products listed herein were produced with this in mind. The following represents the current status of the products tested in this study.

E - Z Fabric or Hold Gro has a specification written for it but is not a good mulch for Oklahoma conditions. Coherex seems to work well as a dust palliative and moderately well for erosion control on sandy 3:1 slopes. Terra Tack II, like Coherex, has no specification written for it but performs very well. Silva Fiber and Hydro mulch, both wood cellulose fiber mulches, which meet ODOT specifications, do not work well and are not recommended for general use. The Dow mulch binder works well. It is recommended even though no specification is written at this time. Excelsior mats do an excellent mulching job in Oklahoma. A specification has been written and the mulch is highly recommended.

We believe that the Oklahoma Department of Transportation has derived considerable benefits from the observation of the materials tested in this project.