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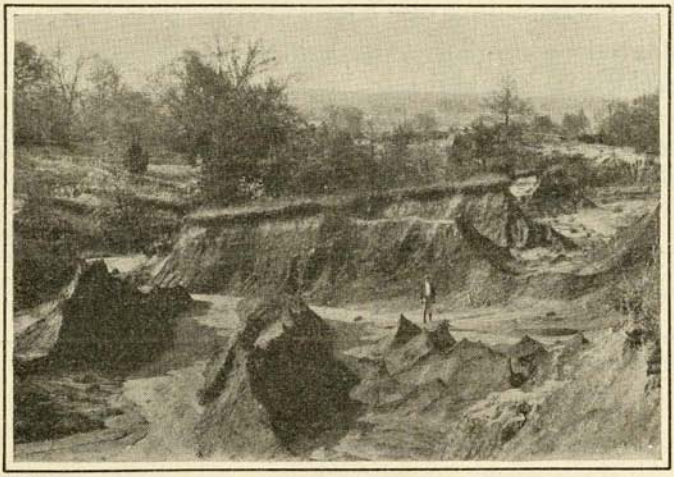
USING SOIL-BINDING PLANTS TO RECLAIM GULLIES IN THE SOUTH



MILLIONS OF ACRES on abandoned farm and other land are eroding at an appalling rate throughout the uplands of the South. This erosion not only causes financial loss to the landowners—it also menaces cultivated fields and other property.

Soil-binding vegetation, often employed in connection with small brush dams, affords a cheap and effective means of controlling the spread of large gullies and washes. Although, because of the unproductive soils exposed in gullies, relatively few plant species can be grown on such sites, certain trees, vines, and grasses have been successfully planted on eroded lands and have not only proved effective in reclaiming the soil but have produced returns in wood products or forage. This bulletin describes these species and recommends their use for gully reclamation.

Washington, D. C. Issued January, 1933

USING SOIL-BINDING PLANTS TO RECLAIM GULLIES IN THE SOUTH

By H. G. MEGINNIS, *Junior Forester, Southern Forest Experiment Station, Forest Service*

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GULLIES THAT have destroyed or are destroying the productive value of millions of acres of eroded and abandoned farm land in Southern States can be stopped and the land reclaimed by proper control measures. Planting natural soil binders such as trees, shrubs, vines, and grasses, which are at the same time agencies for building and restoring fertile soil, is one of these measures. It is cheaper than the construction of dams and dikes,[1] and the effectiveness of plants in obstructing rapid run-off, holding topsoil, and permitting rapid absorption of water can be seen wherever forests, brush, and grasses are growing.

Owners might at one time have prevented the beginning of such deep gullying as is pictured on the cover of this bulletin. By contour plowing, proper terracing, and the use of winter cover crops they could have checked, in its early stages, the washing away of the fertile topsoil from sloping lands. Once such land is abandoned, perhaps burned over repeatedly, or overgrazed, gullying is speeded up beyond the possibility of any such control. Owners are inclined to forget, not only that they are paying taxes on this waste land, but also that small gullies on abandoned fields can, within a few years, develop into huge washes that eat back into the uplands to encroach on areas still cultivated and to menace buildings and other property. Owners may overlook, too, the fact that outwash from such gullies may ruin alluvial farm lands by depositing on them a layer of infertile sand and gravel.

Gullies are not only an evil in themselves, but frequently a menace to all adjacent productive land, threatening losses likely to be far greater than the cost of prevention.

Most of the studies described in this publication were made on the silt loam uplands of the lower Mississippi Valley (fig. 1), but the

[1] Information on engineering means of gully control is given in Farmers' Bulletin 1234, Gullies: How to Control and Reclaim Them. Further information on this general subject will be found in Department Circular 33, Soil Erosion a National Menace, and Leaflet 82, Controlling Small Gullies by Bluegrass Sod.

results and conclusions obtained there are applicable in many portions of the South where conditions are similar. The first problem has been to determine just what type of vegetation is most effective in holding the soil, particularly on severely eroded and gullied areas. On such areas most if not all of the fertile topsoil and part of the subsoil were washed away before the land was abandoned, and wherever erosion has progressed to any considerable extent, the infertile, underlying materials have been exposed. These are not true soils but rather sands, gravels, and thick, plastic clays that would require ages of weathering to become fertile. The difficulty is that, although vegetation often becomes established naturally in the smaller gullies, very few plants invade these unproductive surface materials in the larger washes.

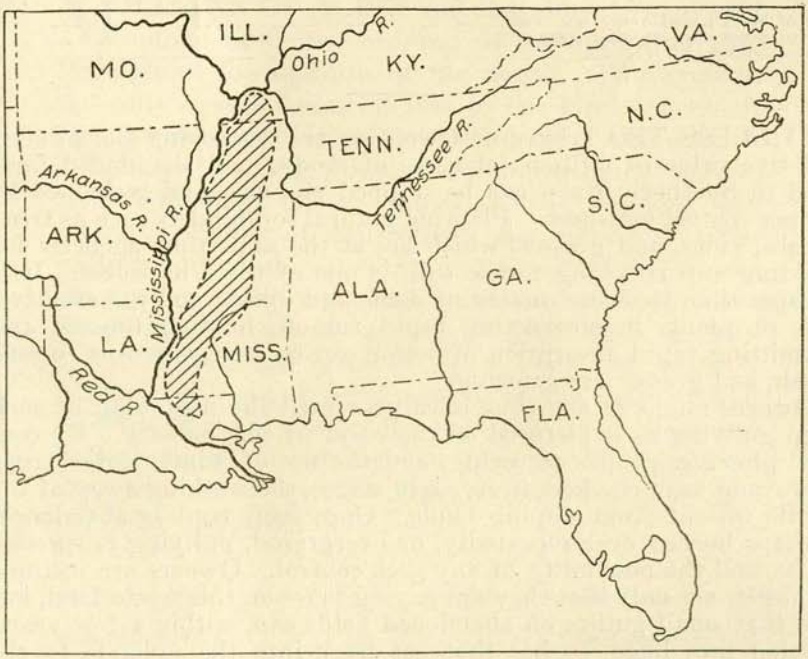

FIGURE 1.—The shaded portion of the map indicates the location of the loess bluffs and silt loam uplands where the studies here described were made

USE OF BLACK LOCUST AND OTHER TREES

One of the best and most widely used soil binders, in this area, is black locust (*Robinia pseudoacacia* L.). With its wide-spreading and interlacing root system this rapid-growing and valuable tree can halt erosion very effectively in a few years, even in such bad washes as that shown in the cover illustration. It is not only particularly well adapted for growth on most eroded sites and exposed clay subsoils much too poor for agricultural use, but, like most legumes, it also builds up the soil by contributing nitrogen. Many huge washes, some as deep as 30 feet and covering several acres, have been reclaimed by using this tree under the direction of the Tennessee

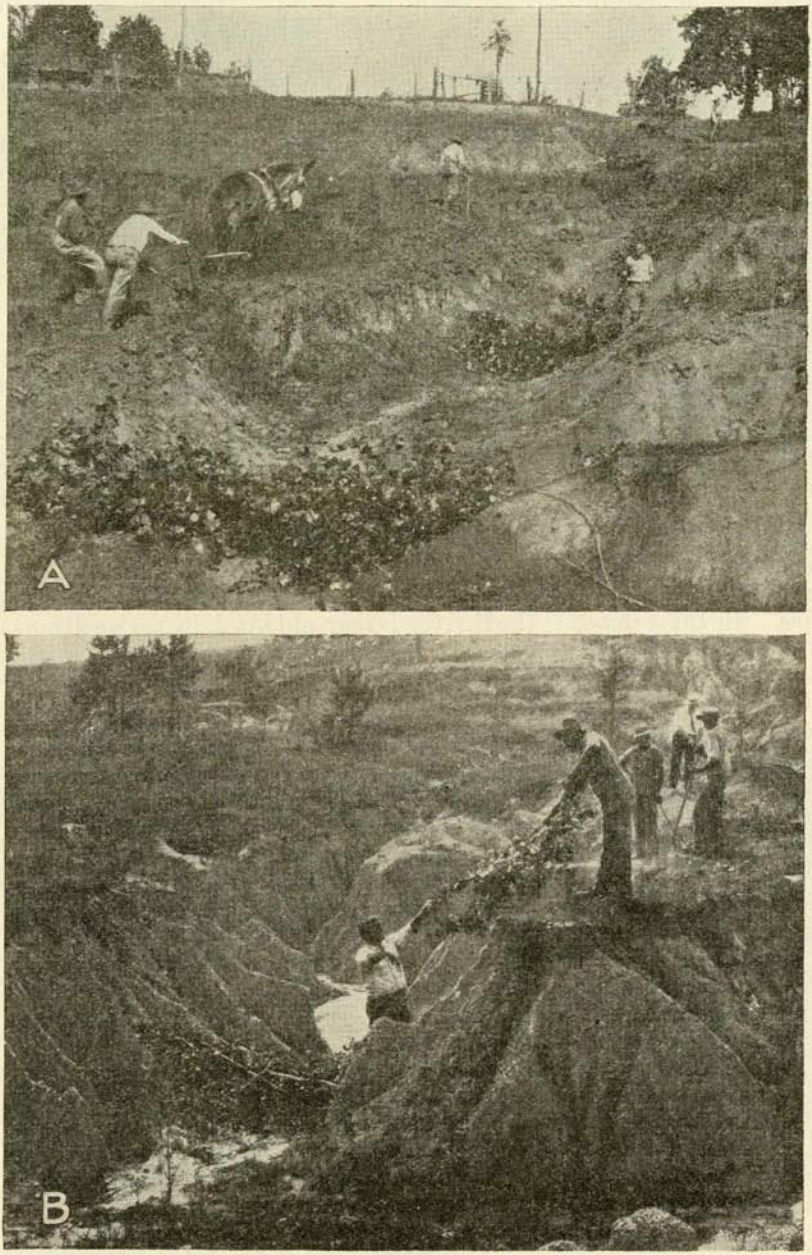

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FIGURE 2.—Treatment given a gully preparatory to planting black locust or other vegetation: A, Plowing in the gully edges. Intervening areas between the gullies should also be deeply plowed. B, Constructing the proper type of dam

State Forest Service. Furthermore, excellent fence-post material can be cut from plantations 10 years or so old. If the posts are not desired, the locust can with good effect be cut back after the first year and a plow furrow run between the rows. This will cause the broken roots to sprout and form a dense thicket still more effective than the rows of trees in checking erosion.

The method of establishing black locust on gullied lands can, with some slight modifications, be used with any other desirable tree species. Some preparatory work is necessary. In the early fall the edges of gully banks should be plowed in. (Fig. 2, A.) At the same time brush dams or barriers should be built about 12 to 24 inches high and near enough together so that the outwash held by any one dam will extend up the gully to the base of the dam immediately above. (Fig. 2 B.) Dams are constructed of bushes, limbs, or small trees laid compactly across the gully bottom and weighted down with logs, stones, or other heavy material. The ends of such brush barriers should extend well into the gully banks to prevent side cutting. The upper side should be thatched with straw, corn stover, pine tops, or similar material that will filter out and hold the soil, but the dams should not be made water-tight, since the purpose is to hold soil, not water.

By March or April such dams will have caught a great deal of the loose soil carried off by the winter rains. Much of the topsoil will also have been deposited over the less productive soils of the gully sides. In these deposits the thrifty 1-year-old black locust seedlings to be set out on the area can then be planted. (Fig. 3.) Nursery stock 18 inches high is best for this purpose. Larger seedlings will survive no better and will be more difficult to plant. Such stock can be bought for a few dollars a thousand, and 1,200 seedlings are sufficient to plant 1 acre of land. They should be set out 6 feet apart in evenly spaced rows. Where portions of the planting site are unstable or subject to later deposits of soil, regular spacing is less essential than planting the seedlings in the more favorable spots. The young trees should be protected from fire and grazing for several years and should be pruned during the second summer in order to increase growth and improve form.

Stands so established will often produce 1,000 or more posts on an acre within 10 or 12 years, the posts having a market value of 20 to 25 cents each. Since the total expense of growing 1,000 black locust posts, including planting costs, and investment in land and taxes at 6 per cent compound interest, need not exceed $50, profits from reclaimed gullies are possible.

In gully-control work, however, the merits of black locust in reclaiming and enriching soil should receive first consideration, particularly on less productive sites where monetary returns from wood production may not be so satisfactory. A heavy sod of bluegrass (*Poa* sp.) and other palatable pasture grasses has repeatedly been observed in locust plantations on gullied lands formerly too impoverished to support any vegetation. (Fig. 4.)

Another tree species promising for planting gullied lands in the South is shortleaf pine (*Pinus echinata* Mill.). Though the species lacks the rapid growth and aggressively spreading root system of black locust, it grows better on pure sands. Shortleaf pine, like

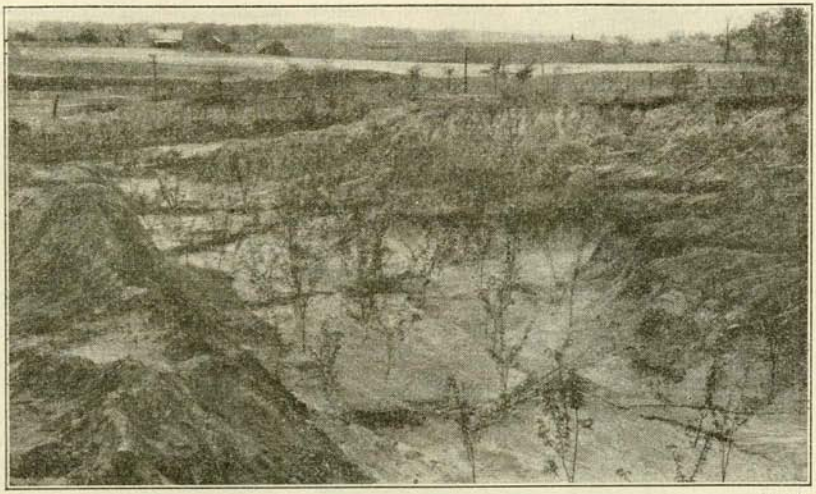

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FIGURE 3.—Large wash on a western Tennessee farm, similar to that shown on cover, one year after the construction of brush dams and the planting of black locust. The dams have been almost entirely covered with soil outwash. Given proper protection, this gully will in a few years be as completely reclaimed as that shown in Figure 4

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FIGURE 4.—This 10-year-old black locust plantation has completely reclaimed the once-eroded waste. The original wash, the contours of which can still be seen, was entirely barren. Note present crop of thrifty black locust trees of fence-post size and the ground cover of pasture grasses

black locust, is especially able to grow on inferior, depleted soils. (Fig. 5, A.) On badly denuded washes on which only the most sterile subsoils are exposed, shortleaf pine seedlings are frequently the only native vegetation. In the territory within the natural range of the species, examples of how it has controlled erosion can be seen

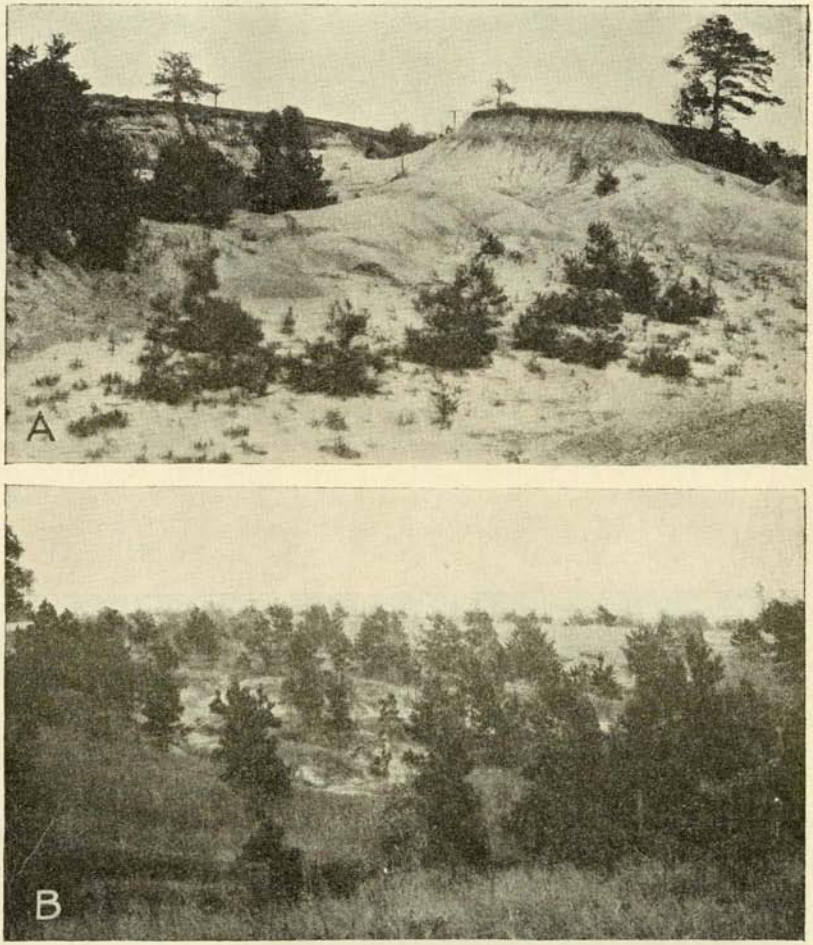

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FIGURE 5.—Gullied land being reclaimed by shortleaf pine: A, Shortleaf pine seedlings coming in on an eroded clay too poor to support most other vegetation. Although giving evidence of having been injured by fires, the young pines are growing more vigorously than the stunted grasses. B, Shortleaf pine reproduction becoming established in the gullies of an abandoned field

in practically every abandoned field where shortleaf pine has become established in the gullies. (Fig. 5, B.) The manner in which shortleaf pine seedlings come in on the rapidly eroding surfaces of the larger washes and cling tenaciously to the unstable soils indicates that this species should find wide use in erosion control.

When shortleaf pine is planted in a large wash, the trees can be planted in pure stands on the more sandy exposures or in alternate

rows with black locust on the loams and clays. Nothing but the best nursery-grown stock should be used. Short, stocky seedlings with vigorous, well-developed roots will not only have a higher percentage of survival but will grow more rapidly than the tall spindling seedlings commonly produced in overcrowded nursery beds. One-year-old seedlings of shortleaf pine can usually be purchased from commercial nurseries for about $2 per thousand. Before being planted the long straggling tips of the roots should be cut off (fig. 6), since this will facilitate planting and will result in better subsequent root growth.

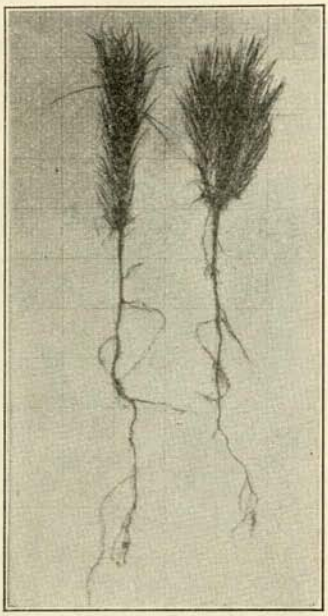

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FIGURE 6.—One-year-old nursery seedlings of shortleaf pine suitable for gully-control planting. The long straggling roots should be pruned before being planted. One-inch squares in background

In the South the standard practice of planting pine seedlings consists of (1) making a hole or slit in the ground with a dibble, planting bar, or spade; (2) placing the seedling in the cavity thus made at the same depth at which it grew in the nursery bed; and (3) closing the slit by thrusting the planting tool into the soil several inches behind the opening and forcing the soil around the tree. During planting operations great care should be taken to keep the roots of the seedlings moist. Pine seedlings can easily be killed by exposure of the roots to the drying effects of wind and sunlight for only a few minutes.

In addition to its use as a gully reclaimer, shortleaf pine is a valuable timber tree. Although owners in the past have considered second-growth pines as weeds to be kept from field and pasture, such trees have actually added to the operating life of many southern sawmills. There is at least a possibility that this tree will become increasingly valuable as the paper industry and other industrial uses develop. Planting shortleaf pine seedlings on unproductive, eroded soils might give only a slow rate of growth during the years of establishment, but observations indicate that their growth rate in deep gullies does not differ appreciably from that on adjacent uneroded soils. Even on gullied areas, shortleaf pine can be grown to merchantable saw-log size in 35 to 40 years.

Loblolly pine (*Pinus taeda* L.) is another southern pine that may be used for gully control, although it is somewhat more exacting in its site requirements than shortleaf pine and has a more restricted natural range. Loblolly pine seeds in abundantly on gullied and abandoned fields in that portion of the silt loam uplands lying south of central Mississippi, and it is in this region that the species should prove most useful for controlling erosion. Loblolly pine will seldom do as well as shortleaf pine on extremely dry sands, outcrops of gravel, or heavy, impervious clays, but because of its more rapid

rate of growth and the greater amount of needles that fall from it, it should be favored for less deeply cut gullies or washes which have not cut completely through the deposits of silt loam or loess. The exposure of sands and other coastal-plain strata in large gullies does not preclude the planting of loblolly pine on such sites if the soil materials are not too much depleted and if they contain ample supplies of moisture. Preparation of the gully before planting is even more important for loblolly than for the other species.

When rain has been plentiful cottonwood (*Populus deltoides virginiana* (Castigl.) Sudw.) and various willows (*Salix* spp.) are easily propagated by planting cuttings from the present or previous year's growth, and these serve admirably in several ways to check the growth of gullies. Closely spaced rows of cottonwood cuttings planted in gullies at right angles to the direction of flow will often

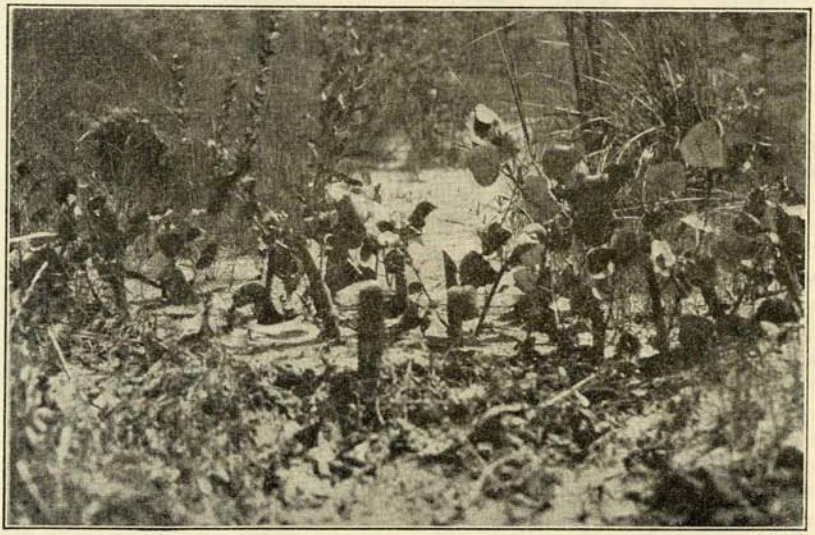

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FIGURE 7.—Cottonwood cuttings planted across a gully bottom. Soil and other eroded material has already been caught and deposited

catch a surprising quantity of soil. (Fig. 7.) Ordinary brush dams can be effectively anchored by pegging down the brush with stakes made from green limbs of cottonwood or willow. As these develop roots the brush will be the more securely anchored. The sprouts that follow will be able to withstand considerable burying by outwash and will tend to increase the effective height of the dam.

The size of the cuttings planted is not particularly important, but the most convenient size is 10 to 12 inches long and one-half to three-quarters inch in diameter. Cuttings should be made after growth ceases in the late fall and should be stored in a cool, moist place until the following spring. Burying the cuttings below the frost line in sand or any other well-drained soil is the usual storage practice.

The seeding in of trees in the gully bottoms is also helpful. Full dependence can not be placed on this process to restore the land to a

productive condition, but such seeding in, in conjunction with the use of brush dams and other soil-catching devices, is a preliminary measure to be followed by other steps in restoring the land to productivity. During the spring germination period, cottonwood and willows frequently seed in, in this way, on the loose sands of gully bottoms that contain sufficient moisture. Once established, these moisture-requiring species will often grow readily on what appear to be very arid sands, because of the ability of their roots to maintain contact with the water table.

Other less important tree species which seed in naturally on eroded areas are persimmon (*Diospyros virginiana* L.), sassafras (*Sassafras variifolium* (Salisb.) Ktze.), eastern red cedar (*Juniperus virginiana* L.), red gum (*Luiquidambar styraciflua* L.), sycamore (*Platanus occidentalis* L.), southern red oak (*Quercus rubra* L.), and Chickasaw plum (*Prunus angustifolia* Marsh.). With the exception of Chickasaw plum, which develops root suckers, thus forming dense thickets, these species are not especially efficient in stopping soil wash but because of their adaptability to the site may prove useful when planted in combination with other vegetation.

USE OF VINES AND CREEPING PLANTS

Vines and creeping plants, because of their habit of growth and the protective mass of vegetation with which they mantle an eroding surface, are especially valuable as a temporary means of stopping erosion. They are of questionable value, however, when used in combination with tree plantings, since it is almost impossible to grow trees to any size if vines are present. The weight of the vines in the branches of the trees is often enough to break out the tops and destroy the timber value of the stand.

Of the several kinds of vines that have proved effective in gully-control work, Japanese honeysuckle (*Lonicera japonica*) is perhaps best known. Although not a native species, this shrubby vine has escaped from cultivation and has become established throughout the loessial region of Mississippi and Tennessee and in other parts of the South. The plant is usually seen covering the sides of road cuts and filling large washes with a dense mat of vines. For some reason it prefers the society of black locust, and wherever black locust occurs naturally Japanese honeysuckle is now nearly always associated with it. In several instances in northern Mississippi this honeysuckle has been planted with black locust in large gullies and has completely stopped soil washing. (Fig. 8.) The common method of propagation is to plant rooted portions of the stem. These grow readily and soon produce a cover.

Perhaps the most promising soil-binding vine for gully control is kudzu (*Pueraria thunbergiana*), a species of legume introduced from China and much planted in this country as an ornamental.[2] This vine occasionally makes a phenomenal growth on loose sands as well as on the heavier clays and loams. (Fig. 9, A.) The vines show a tendency to clamber over trees, tall grass, and other vegetation where these occupy the site. When kudzu is established on barren, eroded soils, however, the vines cling closely to the ground,

[2] See Leaflet 91, Kudzu a Forage Crop for the Southeast.

root deeply at the nodes, growing customarily 25 to 50 feet in a single season. As a legume, kudzu, in addition to enriching the soil, provides large quantities of forage which is eaten avidly by livestock.

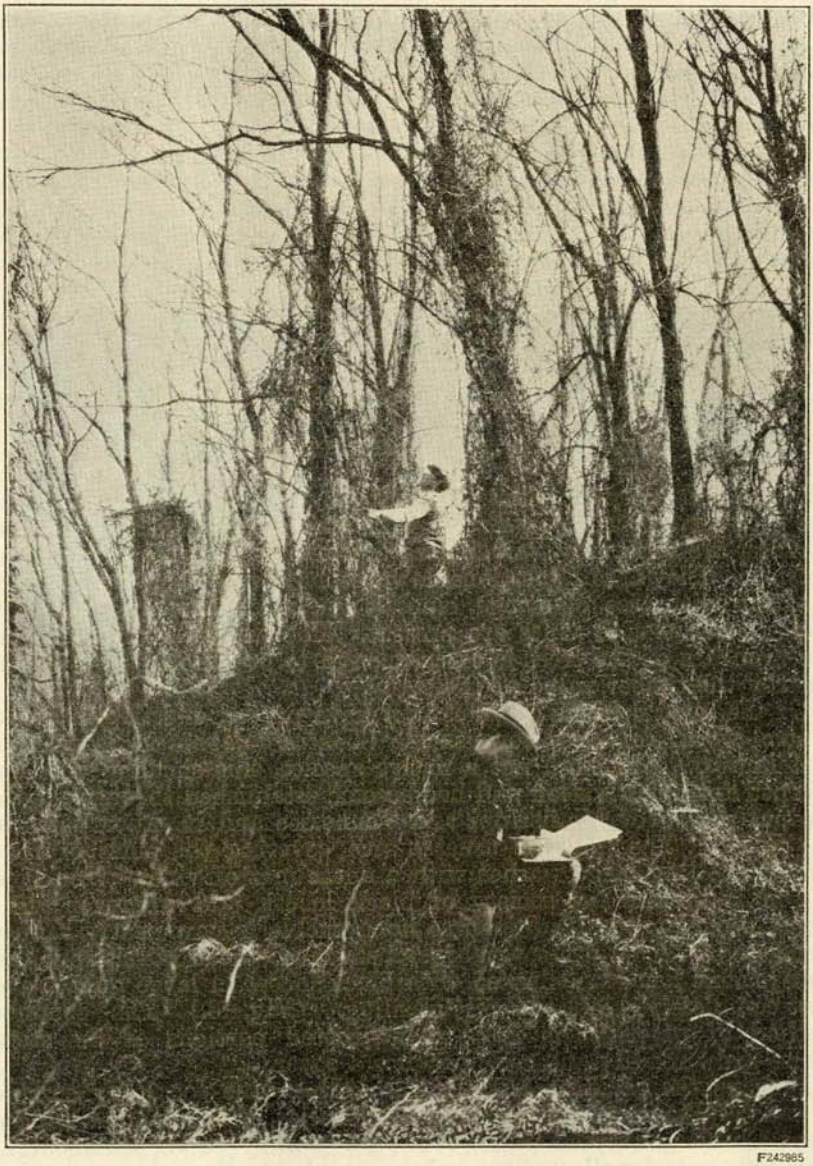

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FIGURE 8.—Japanese honeysuckle and black locust plantings are very effective in erosion control. The appearance of this once actively eroding gully has been completely changed

In several instances kudzu has completely checked the growth of large gullies. In 1926 a landowner near Canton, Miss., planted kudzu in some huge washes on his farm. By 1930 the vines had

spread to adjoining gullies and had covered several acres with a dense carpet of vines. (Fig. 9, B.) All active erosion had been stopped. Several gullies had been filled with soil 10 feet deep as the vines caught and held the soil washed from the gully banks. While at first the sandy outwash was of sufficient volume to bury the

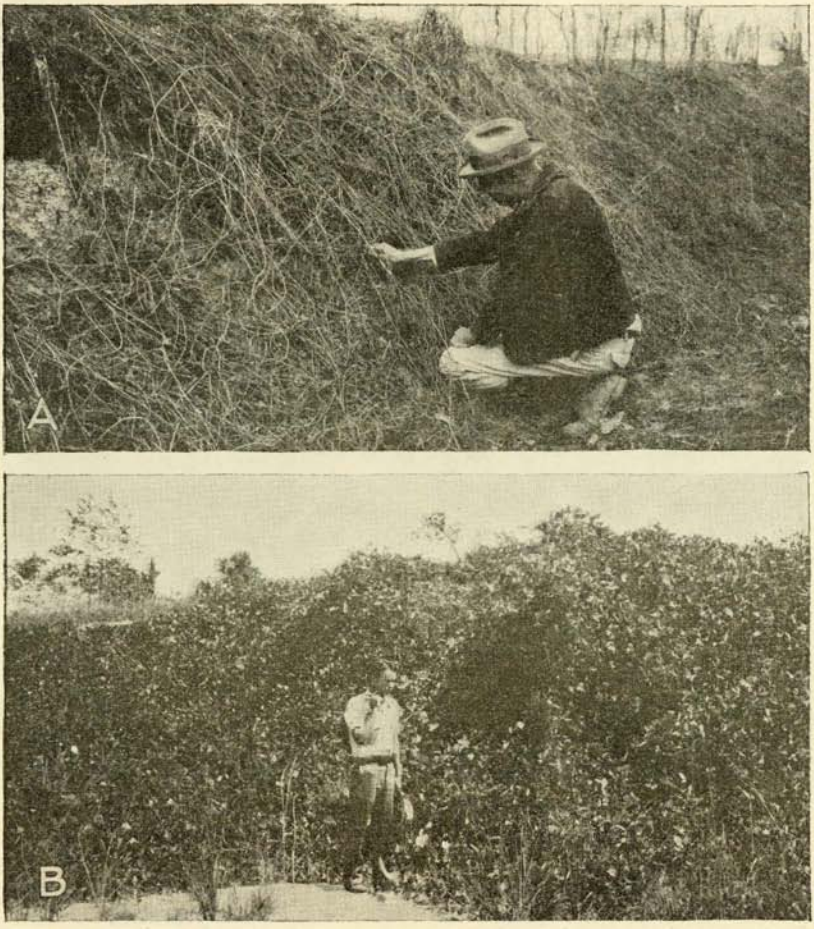

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FIGURE 9.—Kudzu vines have proved very effective on barren, eroded soils where a tree crop is not wanted: A, Kudzu vine carpeting the sandy banks of a reclaimed gully, affording soil protection even during the winter months; B, this dense mat of kudzu vines has, in four years, transformed the eroding gully banks into a stable soil capable of supporting a valuable forage crop

kudzu, this did not check the growth of the plant. The submerged vines immediately put out new shoots, which in turn caught and held more outwash material. This process occurred repeatedly until the soil became stable through the filling of the gully and the establishment of the protective carpet of vines.

Kudzu produces little if any seed and must be grown from plants, commonly termed " roots " (or " crowns "). On favorable sites, kudzu

will, in two or more years, produce large fleshy roots. Only roots having well-developed buds and thickened, perennial branches should be used for gully plantings. Kudzu roots suitable for planting are usually high in price, but if a few are started on a fertile soil in good physical tilth a plentiful supply of plants will be available after several years. In recent years the species has been introduced into many communities, and frequently there exists a local source of planting stock where the only cost is that of digging the plants. Kudzu roots should be set out during March. If a stand is to be obtained quickly—and this is especially desirable in erosion control—plants should be spaced about 8 feet apart. This spacing will require about 700 roots to the acre of gullies. Some farmers have experienced difficulty in getting the plant established. During the first year or two after being set the kudzu may be damaged by livestock and rodents. Winterkilling has also been reported. However, careful planting of healthy, 2-year-old plants, occasional cultivation to

FIGURE 10.—Vines of trailing wild bean (*Strophostyles helvola*) covering an eroding bank. Promising species such as this native legume should be tested for effectiveness in controlling erosion

remove competing vegetation, and some protection from grazing will do much to insure good survival and a healthy stand.

Several other species of vines possess habits of growth which should make them of some use in gully plantings. One of these is the common ornamental wisteria (*Kraunhia frutescens*). In Marshall County, Miss., wisteria has escaped from cultivation and is growing vigorously in the loose sands of a large wash. The vines spread rapidly and soon cover the barren surfaces. Trumpetcreeper (*Bignonia radicans*), another well-known and commonly cultivated vine, frequently spreads profusely over the denuded surfaces of large gullies. In northern Mississippi, a promising native legume, trailing wild bean (*Strophostyles helvola*), has been observed growing in the clay loam soils of many roadside gullies. This wild bean produces vinelike runners which soon cover an eroded area (fig. 10), and

considerable foliage which should make good forage. Although the species is an annual, it apparently is a prolific seeder and reproduces abundantly.

In the South many native legumes of creeping or prostrate forms become established naturally on impoverished eroded soils, but rarely occur in sufficient density to halt erosion. Those most commonly observed are piedmont butterfly-pea (*Bradburya virginiana*) and porcelain butterfly-pea (*Clitoria mariana*), tickclovers (*Meibomia* spp.), partridge pea (*Cassia fasciculata*), rattlebox (*Crotalaria* sp.), vetches (*Vicia* sp.), and various Lespedezas (*Lespedeza* spp.).

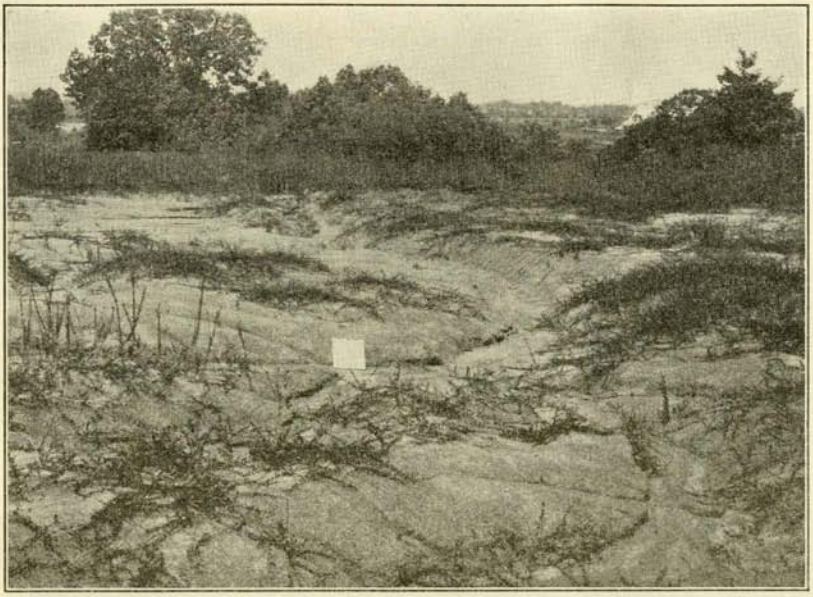

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FIGURE 11.—Several native species of Lespedeza becoming established on the eroding soils of an abandoned field. The prostrate form is *Lespedeza repens*. Gullies at this stage will support a fair growth of vegetation and hence may be easily controlled and reclaimed

(Fig. 11.) Although these legumes could no doubt be easily propagated, their use for gully plantings seems questionable.

The well-known common Lespedeza (*Lespedeza striata*)[3] is very effective in controlling soil wash. Its effectiveness apparently lies not so much in the soil-binding power of the roots as in the production of a mat of protective foliage which clings closely to the soil. (Fig. 12.) Few plants can grow on a greater variety of soils than can this legume. Lespedeza seems particularly able to grow on heavy clays and other soils in poor physical condition. At the Mississippi Branch Experiment Station at Holly Springs, Miss., repeated attempts have been made to establish various grasses and forage plants on unproductive, barren areas resulting from the filling and leveling of large gullies. While Lespedeza failed to make

[3] For further information, see Farmers' Bulletin 1143, Lespedeza as a Forage Crop.

a vigorous growth, it established itself more readily on these unfavorable sites than did the other plants, many of which could not be grown at all. It is a prolific seeder and during a normal year a good stand commonly produces 100 to 200 pounds of seed per acre. A few plants, comprising only a partial stand of Lespedeza, will usually provide abundant seed for seeding in surrounding unvegetated areas. A stand is usually obtained by preparing the soil and sowing in late winter from 20 to 25 pounds of fresh seed per acre.

USE OF GRASSES

Among the grasses effective in stopping soil loss, two are outstanding for use in the Gulf States. These are Bermuda grass (*Capriola dactylon*) and centipede grass (*Eremochloa ophiuroides*).

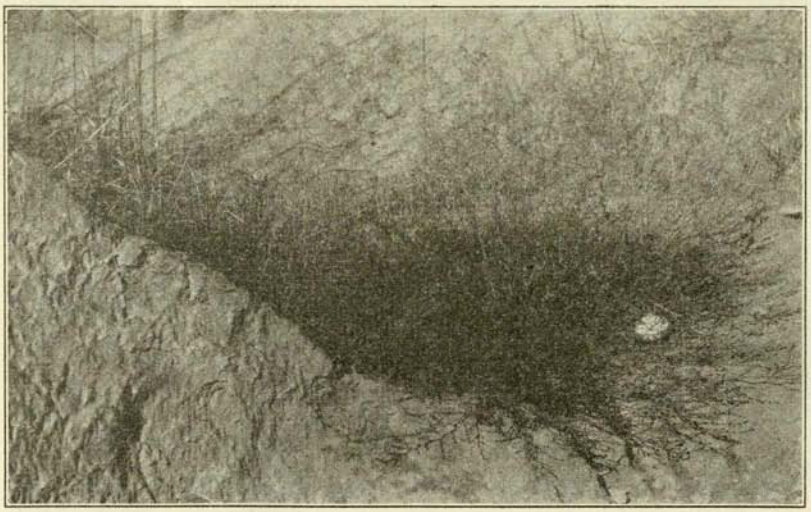

FIGURE 12.—Common Lespedeza (*Lespedeza striata*) growing in a wash. This species constitutes a valuable hay and forage crop in the Southern States and has become naturalized on gullied lands and waste areas

The soil-binding powers of Bermuda grass are too well known to need much discussion. This valuable forage plant has been much used in the South in maintaining levees and highway fills and slopes. Its rapid growth and the manner in which its interlocking rootstocks and runners encroach upon and soon cover an eroding spot render it an admirable grass for gully planting. (Fig. 13.) Many farmers report gradual filling of gullies in abandoned fields through the action of Bermuda grass in catching outwash. Although this plant will not grow on the more arid sites, it has been observed growing vigorously on deep sands as well as on refractory clay soils. It grows especially well on silt loams of loessial origin, and little difficulty should be experienced in securing a vigorous growth in gullies and washes in which loess soils are exposed.

Farmers have often looked with disfavor upon Bermuda grass because of its aggressive spread and the difficulty of eradicating it from fields in which it has become established. Most southern

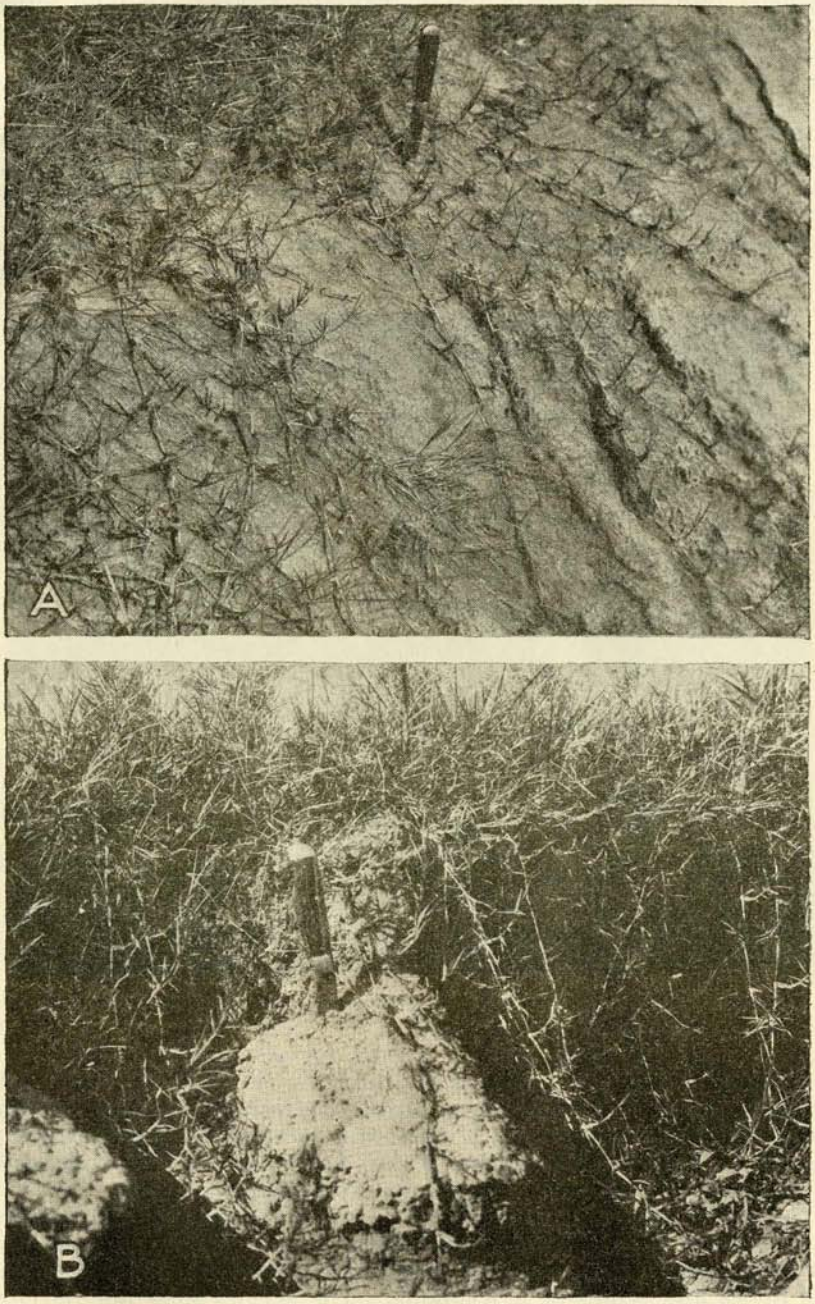

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FIGURE 13.—Views of Bermuda grass showing growth habits and effectiveness as a soil binder: A, Bermuda-grass stolons invading an eroding slope. In only a few weeks a dense sod will be formed. B, Bermuda grass checking active erosion in gully formed by the washing out of an old terrace

farmers, however, are becoming increasingly aware of its high forage value and its palatability during the late summer and in periods of drought when native vegetation furnishes little feed. Equally evident is its ability to reclaim soil through decay of its underground rootstocks and action of the stolons in checking surface flow of soil. Proper recognition has not been given to the advantages in converting worn-out fields to Bermuda-grass pasture rather than permitting them to erode or, at best, to become revegetated with innutritious and unpalatable native grasses.

Bermuda grass is easily propagated either by seed or by cuttings. About 5 pounds of seed per acre is the usual sowing rate. The

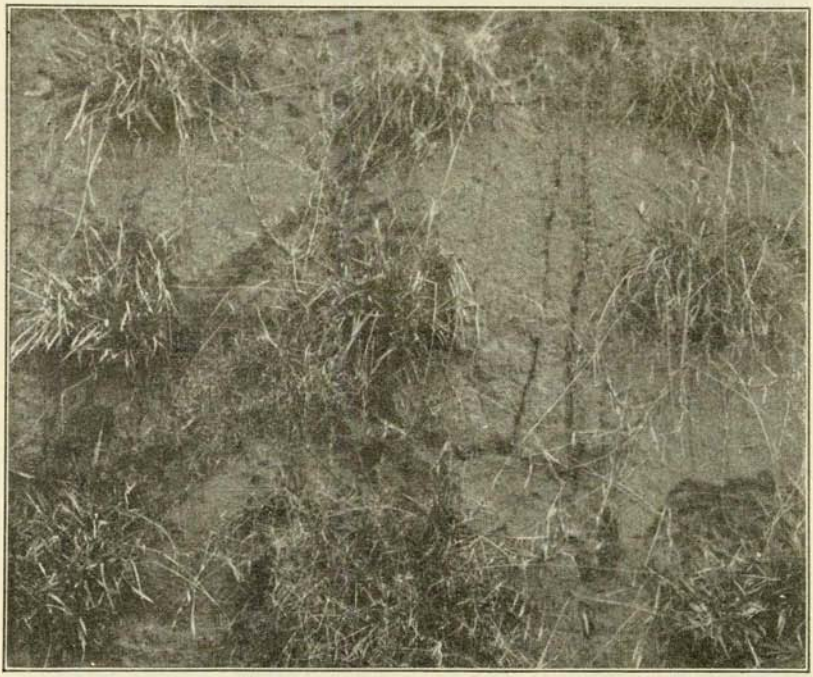

FIGURE 14.—Method of protecting road embankments from soil washing by planting Bermuda-grass turf or Johnson grass in pockets dug into the bank. A complete grass sod soon covers the slope

commonest method of propagation, however, is to plant either cuttings made from the stolons or pieces of fresh Bermuda grass sod about 1 inch in thickness. If these are planted during the spring from 2 to 3 feet apart in rows 4 to 6 feet apart, the eroding soils, if not too unstable, should be well sodded by midsummer.

Centipede grass was introduced into this country in 1918 from the Province of Hunan, China, where it is a favorite lawn and pasture grass. It spreads by surface runners which take root at the nodes and send out new plants. The species does not develop underground rootstocks as does Bermuda grass, but it is equally effective in stopping soil movement and has the added advantage of being able to grow on extremely dry soils and thus to withstand droughts. At the McNeill branch of the Mississippi experiment

station centipede grass has been grown successfully on an eroding, gravelly hillside which had repeatedly failed to support a growth of Bermuda or native grasses. This grass withstood the severe droughts of 1924 and 1925 and has since spread rapidly. Stolons have been known to make a growth of as much as 8 feet during a growing season. Although centipede grass is reported to have withstood winter temperatures of 12° F. in Georgia, it is perennial only in the Gulf States and may not prove winter hardy in latitudes north of northern Mississippi.

Centipede grass produces little seed and must be propagated vegetatively, and because the species has been so recently introduced into this country a supply of stolons and turf may not be readily available. However, certain commercial nurseries should be able to supply the demand for these materials until the species becomes better known and well established.

Many other grasses common in the South possess characteristics that should make them useful in controlling erosion. A few of these are carpet grass (*Axonopus compressus*), crabgrass (*Syntherisma sanguinale*), Dallis grass (*Paspalum dilatatum*), bents and redtop (*Agrostis* spp.), and Johnson grass (*Holcus halepensis*). All of these are hardy and have creeping or turf-forming habits of growth, and all except carpet grass, which requires a rather moist soil, are able to grow on dry, eroded situations. Of these, Johnson grass is the only one used to any extent for erosion control. This species is commonly used, either alone or in combination with Bermuda grass, for controlling erosion on the steep slopes of high road fills and embankments. (Fig. 14.) Because of its strong creeping rootstocks and rank growth, Johnson grass is an excellent soil binder as well as a good hay and soiling crop, although it becomes a weed in many cultivated fields in the South and is eradicated with difficulty.

Restoring the forests is probably the final means of reclaiming most of the areas denuded by gullying. Tree growth, once established, seems to afford the maximum soil protection under southern conditions. Initial tree plantings may be unsuccessful in rapidly eroding gullies and on unusually poor soils. In such cases soil-binding vines and grasses may be useful in stabilizing or building up the soil so that it will support the most effective soil-binding trees. The first problem in reclaiming large gullies is to check soil movement in the shortest possible time. Once the erosion is controlled other factors will determine the productive uses to which the land will be put.

Plants other than those mentioned in this bulletin—perhaps some exotic plants—may prove suitable for erosion-control plantings. However, the list given here should be helpful to the farmer or other landowner concerned with stopping the growth of large gullies and interested in experimenting with plantings and methods of control.[4]

[4] Persons in the South interested in planting gullied lands can obtain information on the sources and cost of planting stock and can get other advice from their State forestry departments, their agricultural extension services, or their county agents, or by writing the Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, New Orleans, La.

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