THREE IMPORTANT
PERENNIAL WEEDS
of COLORADO

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THREE IMPORTANT PERENNIAL WEEDS OF COLORADO

By Charles F. Rogers*, L. W. Durrell
and
Leslie B. Daniels

The common wild morning glory, also known as bindweed, and the two poverty weeds are three of the most important perennial weeds of Colorado. They are found in varying abundance throughout the state, and are most difficult weeds to control.

The problems of weed control may be divided into two classes, determined by the life history of the plants. Annual weeds, those which mature seeds in a single season or within a year from the time they come up, are easily controlled, for once the ground is free from seed, there will be no new infestations of the annuals until more seeds are introduced. Perennial weeds, on the other hand, are different, and more troublesome, because they live from year to year in deep persistent roots. These roots serve for storage of food which is reserve energy for growth, and for regeneration of the tops of the plant when the tops have been killed. One other purpose which is also served by the roots of perennial plants, that seldom has any importance in annuals, is the extension of the plant around the central growth. This is the worst characteristic of perennial weeds, for they spread without the assistance of any agent. Furthermore, even tho these perennials are not allowed to mature seed, they are not hindered nor stopped in their growth, for seed is unnecessary. The fact that the roots are deep, and often large, together with their ability to send up shoots from buds, renders seed essential only for the rapid dissemination of the plant.

Many of the perennial weeds have other habits that make them noxious besides that of complete occupancy of the soil. The poverty weeds are bad in that they rapidly take possession of the bare ground left after the planting of crops. They do not grow large, but make an excellent soil cover once they get possession.

The worst perennial weed in Colorado is the common wild morning glory.** It comes up early in the spring from an extensive root system, and in close stands, completely covers the ground. When any other plant pushes thru the mat of vines, the morning

* Deputy to State Entomologist, Weed Control.
**Convolvulus arvensis.
glories wrap themselves about the stems that have come thru, and either smother them, or bend them down. Mowers are often stalled when they run into a patch of this pest, and any considerable amount of vines in alfalfa, or feed, makes it unfit for use because the tough vines are indigestible. In cornfields or other cultivated crop, the tops and roots collect upon the shovels of the cultivator to make proper working of the soil difficult. Pieces of the roots either fall off, or are removed from the shovels in a place free from the pest, and a new infestation is likely to be started.
CHARACTERISTICS OF PERENNIAL WEEDS

Horizontal Spread of the Roots.—As has been stated, the roots of perennial weeds live for a number of years. Many of the roots grow horizontally for some distance before they turn down into the subsoil. At the bends of the roots, buds form which develop into shoots, and later mature into seed-bearing stalks. A new horizontally growing root starts near the sharp part of the bend in the same general direction as the original root. It proceeds thru the soil for about the same distance as its parent root before it likewise bends down. The length of the horizontal part of the root from bend to bend varies with the plant and the soil, from 20 inches when the poverty weed* is growing in hard soil, to 6 to 10 feet in moist clay soil supporting Canada thistle. Several of these bent roots will be produced successively in a season, so that it is possible for some plants to extend themselves as much as 25 to 30 feet in a year. The common wild morning glory grows horizontally about 10 to 15 feet in a year. The diagram of the way these roots regenerate shows how they grow horizontally, and then bend down.

Fig. 1.—Diagram of the natural arrangement of creeping roots of perennial weeds, such as the morning glory and poverty weeds.

*Franseria tomentosa.

Depth of Penetration of the Roots.—The depth to which the roots of poverty weed and morning glory bend down and penetrate,
depends upon the kind of soil, the height of the water table, and the demands made upon the roots by the tops. A smooth clay furnishes what seems to be the best soil for the growth of most perennial weeds, partly because it holds plenty of water, and partly because it is not so difficult to penetrate as sand or rocky soil. Root tips which strike sand or gravel are usually killed, and the branch roots which arise are seldom as vigorous as the main root. Therefore when sand or gravel is encountered the growth of roots of this kind of plant is greatly hindered. In loam or very fine sand these plants grow fairly well. They will occupy coarse sand, but not in competition with any rank-growing vegetation.

When the roots have come to soil saturated with water, they stop at or near the water table. If the water table is within a reasonable distance of the top, say 20 feet, a large proportion of the vertical roots reach it. Some fail partly because of injury to tips from striking stones, and partly because they find sufficient water at higher levels.

**Storage Function of the Roots.**—The young root is essentially an absorbing organ, and when this function has been served it becomes a conductive organ. It soon, however, develops a thick fleshy layer outside the woody part. This layer becomes, in the course of growth, about 60 percent of the volume of the root. It is in this region that the food is kept for the time of need. The vertical roots generally grow down without branches unless they fork, and two equal parts continue in the general direction of the older root above. When they reach the region for the absorption of water and mineral nutrients, they branch freely into horizontal fibrous absorptive roots.

**Capacity of Roots to Regenerate New Tops.**—One important quality of the roots of perennial weeds which is not dependent upon the extent of the root system, is the capacity of the root to produce a whole new plant from a small piece of the root taken from almost any level below the ground. Little sections of root have a great deal of energy stored in them, for they can send up vigorous shoots thru surprisingly thick layers of soil. This is enough in itself to make these weeds pests that are hard to control or eradicate. The way in which the roots withstand drying in the soil is even more discouraging. As an example, some soil was taken in the middle of September, 1925, and kept in a dry place until the last of October of the same year. There were some morning-glory and poverty-
weed roots in the soil when it was taken up. More than a month later the soil was potted, and watered. The roots of the morning glory, and some of the poverty weed, came up without delay.

**Where Perennial Weeds Grow.**—In general, these perennial weeds grow better on good soil than on poor land, tho they may be more troublesome on the poorer soil because of their relatively greater powers of resistance to unfavorable conditions.

Morning glory grows almost everywhere, but, like any cultivated plant, it does best in places that have been cultivated. The loose surface soil gives the creeping roots an easier pathway, and the seedlings a better seedbed.

The poverty weeds do well in cultivated ground, but they are also found in abundance on roadsides and in low places in undisturbed soil. Altho the poverty weed known as the lesser marsh elder thrives on dry land, it is frequently found in alkaline places that are more moist than the surrounding soil.

Both of the poverty weeds are native to Colorado, whereas the morning glory is an immigrant from Europe.

**CONTROL OF PERENNIAL WEEDS**

The facts just presented show why the control or eradication of perennial weeds is difficult. A great many methods for killing weeds have been tried under all kinds of conditions, and, with sufficient effort, almost any kind of treatment which involves the frequent destruction of the tops will prove successful, provided the leaves and aerial portions are killed before they have time to store food in the roots again. Cultivation is one of the best ways to keep the tops down.

**Clean cultivation** is a treatment which permits of no formation of green tops above the ground for even a day. It means much work, very often, over a long period of time. It is, however, a sure way to free the land from any pest of a weed nature. The time required varies with the conditions of the climate, soil, and the vigor of the plant. Careless or infrequent cultivation may do more to spread the roots than to kill the whole plant. One must always cultivate an area infested with a perennial weed as a separate part of the work, for if he runs his implements thru the plot he almost certainly drags portions of the roots to some distance from the original plot.
and spreads the weed faster than it would naturally spread by seed. It is, of course, common knowledge that clean cultivation will result eventually in the exhaustion of the reserve supply of food stored in the roots, both for the production of new tissue, and for the energy required to send the shoot up thru the soil.

Use of Poisons.—Because of the time and expense connected with clean cultivation, other means have been tried. Chief among these is the application of various poisons to the leaves of the plant when it is in different stages of growth and development. Little has been done on the application of poisons to the roots. Most spray poisons used have arsenic in soluble form as an ingredient. The results have been excellent for killing above ground. There are many commercial arsenical products on the market. With those tried on morning glory at the experiment station weed plots, there was complete killing of the tops to the ground level, but no killing below, for there was perfect regeneration from the parts below the ground. Roots taken from sprayed plots were planted in the greenhouse in boxes, and nearly one hundred percent regeneration of the roots resulted. For checking of the pest, a spray-poison is useful, but with the conditions for its application as poorly understood as they are at present, the result of treatment with poison on the leaves only, is at best but temporary.

Smothering with Other Plants.—A method of treatment not unlike clean cultivation in principle, tho different in its operation, and one that offers large possibilities, is that of smothering the weeds with a heavy crop of some plant that grows more rapidly, and densely than the weed to be controlled. Such a plant occupies the ground, and shuts out the light. Poor water and air conditions may not kill the weed, but it will markedly hamper the growth and lower its vitality. A close, deep sod of grass of any kind will also check the morning glory, and will kill it in time, according to the results of the work at Rothamsted Experiment Station in England. Alfalfa has been used successfully in many places to choke out the morning glory, and other rankly growing plants of that kind. The vigorous, dense growth of alfalfa, followed by a sudden exposure of the ground to the hot sun and drying winds, makes for extreme conditions, with no transition period, that overcome the already weakened plant.
The Difficulty of Eradicating Perennial Weeds.—The problem of control and eradication of perennial weeds that exist in Colorado, is not an easy one to solve. There seems to be little hope that a magic substance will be found which, when sprinkled on the leaves, will kill the plants or so weaken them that they will not be troublesome again. Experiments are being conducted upon the use of certain poisons placed in the soil, which will generate a temporary very powerful killing agent, but which will be harmless or even beneficial in a short time after the application. These have not been carried on long enough to give an idea of the effectiveness of the substances tried or the certainty of the method. The work involved in the use of these soil treatments is rather great, so it seems probable that whatever the choice of method for killing perennial weeds may be, there is no quick and easy way that has any permanent value.

DESCRIPTION OF IMPORTANT PERENNIAL WEEDS

Altho there are many other perennial weeds in Colorado, some of which are very serious in limited areas, the three to be discussed specifically in this bulletin are the worst, because of their abundance and general distribution over the state. What is said about the two poverty weeds will also apply to the sow thistle and Canada thistle and, in a general way, to the dandelion and chicory. The remarks on morning glory are more pertinent to perennial peppergrass because of the similarity of the root systems.

Common Wild Morning Glory
(Convolvulus arvensis)

DESCRIPTION.—Because the wild morning glory is so commonly known, only a brief description of it is necessary. A part of the aerial portion of the stem is shown in the drawing (Fig. 5). The part below the ground, which connects the green leaves and stems with the root, is white to yellow and has small scales which are rudimentary leaves.

Flower.—The light pink, or white funnel-shaped flowers, with lavender or pink buds, are characteristic of the common wild morning glory. The flowers are usually about an inch across. They serve to distinguish this weed from the “black bindweed” or wild buckwheat which is an annual weed with inconspicuous flowers.
Leaves.—The dark green leaves with lobes at the base, making the leaves halberd-shaped, vary greatly in size as well as in shade of green. On dry soil, with plenty of room and light, they are small, dark green, lying flat upon the ground. With plenty of moisture, and in rank growth of either morning glories or other plants, the leaves may be two inches long and nearly as wide at the base. The general shape is the same, but the color is lighter and the leaf blade thinner.

Roots.—The roots of the morning glory are somewhat fleshy. Unless they are several years old, they are light yellow, or nearly white, very tender, and exceedingly abundant in the soil. The older roots are brown, somewhat woody and tough. The horizontally growing roots are not so large as the vertically growing parts of the root system. A small section from any depth of the root can produce shoots when it is placed in conditions favorable to growth.

The extent of the morning-glory root system is very great for so small a plant above ground. The horizontal spread of the roots is from two to four feet before the "runner" bends down. In clay soils, the development is greater than in sandy soils. The depth of penetration depends upon the level of the water table in the soil, provided it is not too deep. Roots have been traced down 16 feet to the water table at Fort Collins. They would probably go deeper if moisture conditions necessitated it. The accompanying drawing of the perpendicular section of the soil with a root in place gives an idea of the depth of penetration. (Fig. 2). Each square in this diagram represents six inches. It is noticeable that this root stopped at the gravel which was several inches thick at a depth of 12 feet.
Fig. 3.—Photograph of the morning glory in bloom, showing how it covers the ground and climbs over other plants.

Fig. 4.—Photograph of a small morning glory plant in bloom.
The photograph (Fig. 3) of the plot of morning glory indicates its general nature. The picture of the single plant (Fig. 4) shows its characteristics of growth, and the drawing (Fig. 5) shows the details of leaf, stem, and flower.

**Time of Bloom.**—Early June to August.

**Time of Seed.**—Two weeks after the first flowers until frost.

**CONTROL.**—As already mentioned, clean cultivation is the surest way to remove any plant pest. Various sprays, such as K-M-G (Kills-Morning-Glory), Squier’s Weed Killer, USSCO, and Champion Tree Killer, are commercially available, and practicable for killing the tops. All those named are solutions of arsenic which, when applied to the leaves as a mist spray, kill only parts of the plant that they touch. Directions for the applications of the spray are to be found on each container. It is well to remember that these materials are deadly poisons and are to be handled with the greatest care. If any of the concentrated material should splash upon the skin, it should be immediately removed with plenty of water. In no case should the concentrated or the diluted poison be allowed to get into or near the mouth or eyes.

**Clean Cultivation.**—Methods for clean cultivation of the morning glory vary with the type of crop on the infested land. If the place has been abandoned for agricultural purposes, a long sharp blade held horizontally while it is moved along under the surface of the ground will effectively destroy the tops, and not drag the roots about. Deep plowing of the infested area only, followed by several treatments with
a spring-tooth harrow, will bring to the surface a great many of the shallower roots of the pest, where they will die from drying. Cultivation THRU spots of the morning glories only aggravates the evil, for the fragments of the roots are dragged away from the parent plant. This usually starts another infestation. If the area is small and young, it can be successfully removed by hand with a long spade. The roots should be either picked or sifted out, whereupon the soil, freed from roots, may be replaced.

As suggested in the first part of this bulletin, the use of a smother crop frequently proves most effective and economical. Alfalfa, vetch or a heavy sod-forming grass will control the morning glory if it does not exterminate it. When the pest is weakened by the smother crop it will be much easier to eradicate by clean cultivation of one kind or another.

Fig. 6.—Photograph of the two poverty weeds. Left: Iva axillaris poverty weed, or lesser marsh elder. Right: Franseria tomentosa poverty weed, or woolly Franseria.
The Poverty Weeds

F. t. Poverty weed, or woolly Franseria. *Franseria tomentosa.*
I. a. Poverty weed, or lesser marsh elder. *Iva axillaris.*

**DESCRIPTION.**—Altho the two poverty weeds do not closely resemble each other in some respects, they are not much different in their growth habits and their behavior as weeds. In the photograph of the two, side by side (Fig. 6), it is easy to note that the flower heads of the F. t. poverty weed grow upon spikes at the top of the plant. The flowers are yellowish, grouped into heads as in the ragweeds. In the other poverty weed, also known as the lesser marsh elder, the flower heads are similar to those of the F. t. poverty weed, but are borne along the stem in the axils of the leaves.

**Stems.**—The stems of the two weeds are different in several respects. The F. t. poverty weed branches freely in the axils of the leaves above the ground, has short, gray hairs and is slightly purplish at the collar, or ground level. The underground part of the stem, which connects the aerial portion with the true root, is purple with dark scales instead of leaves. New shoots arise from the buds under these scales when the tops are destroyed. The stems of the lesser marsh elder or poverty weed do branch above the ground, but chiefly from a much-branched root structure just below the ground. The stems are generally straight, slightly ribbed, and have stiff bristly hairs too short and dull to be spines.

**Leaves.**—The gray-green leaves of the F. t. poverty weed closely resemble those of the smaller ragweed, common on the plains of Colorado. Their many lobes with fine pubescence on both sides, give a matted gray appearance to a patch of this weed when seen from a short distance. The I. a. poverty weed has simple leaves which arise without any petiole from the stem. They have smooth edges, short stiff hairs, and glands that produce a characteristic pungent-smelling oil.

**Roots.**—A study of the roots of F. t. poverty weed shows that they have great powers for spreading and for sinking themselves into the ground. The roots are not so fibrous as those of grass, for they have a large storage space, but are more slender and tougher than the roots of the morning glory. During the first few days of the growth of a given section of a root it is white, but it rapidly becomes the characteristic purple of the root system. Very old roots and dead ones are black.
The horizontal roots grow from 15 to 20 inches between the points where they bend downward. They are smaller in this region than at the bend in the upper part of the vertical portion. Buds can form anywhere along the horizontal root, tho they are found in greatest numbers on the outside of the curve. It seems that poverty weed does not use as much water as does the morning glory for the roots penetrated only 12 or 13 feet in the same excavation that was used to follow the morning glory down 16 feet. The one figured (Fig. 7) penetrated but 8 feet in very fine clay sand.

Roots of the F. t. poverty weed live but three growing seasons. Thus the roots which are formed in the season 1926 will be matured in the summer of 1927, and will bear seed producing tops. During the summer and fall of 1927 they will store food for the spring of 1928 when they will repeat the production of seed. No food will be returned to the roots in the fall of 1928 and they can be found as flabby dark purple roots that still conduct water to the plants borne upon them. In the spring of 1929, they will appear as black strings with a fibrous center. Of course, by that time, other and younger roots will have grown thru the soil and occupied it as fully as did the roots of the preceding seasons. It is seen that these plants are not perennial in the same sense that woody plants are perennial, tho they are perennial, in that they constantly renew themselves. If this renewal can be stopped, or sufficiently impeded, the death of the plant is certain.

Time of bloom.—June to August.

Time of seed.—July to September.

CONTROL.—Keep all seeds from forming for they have hooks that attach themselves to whatever touches them. Even tho the seed is not allowed to form, the plant can persist indefinitely as seen in the discussion of the root system.

Clean Cultivation certainly will kill the plant entirely, tho it is a tedious process. Sprays act as a temporary relief. Smothering is effective when the smothering plant is sufficiently heavy.