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Perennial Weeds and Their Control



MONTANA STATE COLLEGE
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MONTANA STATE COLLEGE
BOZEMAN

Introduction

Just as silt may pile up behind a large dam and gradually make it less and less useful, noxious weeds in Montana are slowly but surely choking many valuable agricultural lands out of production. In fact, perennial weeds annually cost Montana millions of dollars. They reduce yield and quality of crops, increase dockage because of weed seed in grain, and increase labor and equipment costs in handling crops.

Unless Montana farmers become more acutely aware of the weed menace and cooperate in fighting it, the cost of control in a few years will be prohibitive. While much progress has been made in recent years through cooperative action by farmers under the state weed control law, many more control districts will be needed before the weed hazard can be eliminated.

Weed control work costs money, but the cost today is insignificant compared with what it will be in a few years if weeds are allowed to tighten their grip on productive crop lands.

While eradication is the ultimate goal in the battle against weeds, the immediate objective is to bring them under control. Eradication may be accomplished in areas where the infestation is light and the patches small. But for large areas where the infestation is heavy and involves hundreds of acres, control is the most logical approach to the problem.

Probably one of the chief reasons why steps to control noxious weeds are not taken sooner is that farmers fail to identify them until they have become established. In this publication will be found pictures that will help identify the most common noxious weeds.

While annual weeds are a problem in the state, good cultural methods and crop rotation will reduce them. Perennial weeds offer a more serious threat to profitable returns from Montana soils. For this reason this publication is confined to the 10 most important perennial weeds found in the state—wild morning glory, Canada thistle, white top (hoary cress), leafy spurge, Russian knapweed, quack grass, poverty weed, skeleton weed, perennial sow thistle and blue lettuce.

Montana Extension Service in Agriculture and Home Economics, J. C. Taylor, director.

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Perennial Weeds

and Their Control

By

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CONTROL

Prevention is the most satisfactory method of control. "Know What You Sow" will result in the purchase and use of seed of high purity and germination. **Cheap Seed is the most expensive item used on the farm.**

The cutting or burning of weeds before they go to seed will reduce greatly the possibility of new outbreaks. This is particularly true along water courses where seeds are carried long distances in irrigation streams to infest cultivated fields.

Hay and grain, carrying weed seeds, should not be fed on cropland, but should be confined to feed lots where control methods can be carried on at any time of the year.

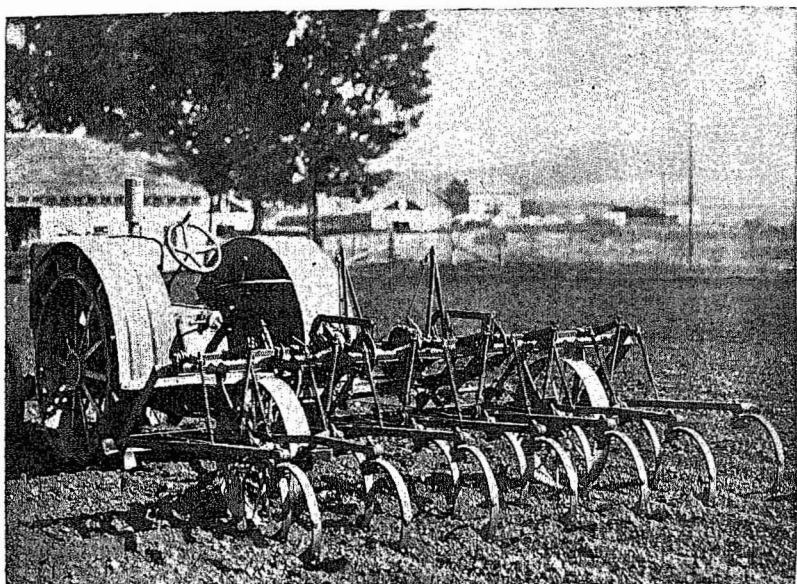
Organization

The control of perennial weeds in most areas is usually too expensive for individuals. Community action is necessary. Under the provisions of the State Weed Law it is possible for the county commissioners to organize a weed control district when 51 percent of the landowners of any designated area sign a petition requesting a weed district. Under the provisions of the state law a county weed commissioner is employed to supervise use of machinery, control methods and to compel control if necessary. Under this system of operation the county participates in the cost of controlling perennial weeds.

A weed control district also can be designated for practice payments under the Agricultural Conservation program.

Cultivation

A 2- or 3-year cultivation program is necessary to control perennial weeds. The job must be well done and consists of cutting off all the new sprouts with successive cultivations. Cultivation is the most satisfactory



Duckfoot Cultivator

as well as the least expensive method of control where an area of one-fourth acre or more is involved.

Delayed Cultivation

Recent research on perennial weed control has resulted in recommending delayed cultivation in place of black fallow. It is more effective and less expensive. It allows for 8 to 14 days of growth of the weeds after they emerge. A caution, however, is necessary—do not allow the plants to grow beyond the 14-day period. To do so is less effective in starving the root system.

Plowing

With most perennial weeds the area to be cultivated should be plowed 4 to 6 inches deep at the bud stage of the plant. In most areas of the state this will be about June 15. In the control of wild morning glory a deep plowing in the fall often delays emergence in the spring until the ground is dry enough to do a good job of cultivation.

Implements

The single blade eradicator, the duckfoot cultivator and the rotary rod weeder have all given good results.

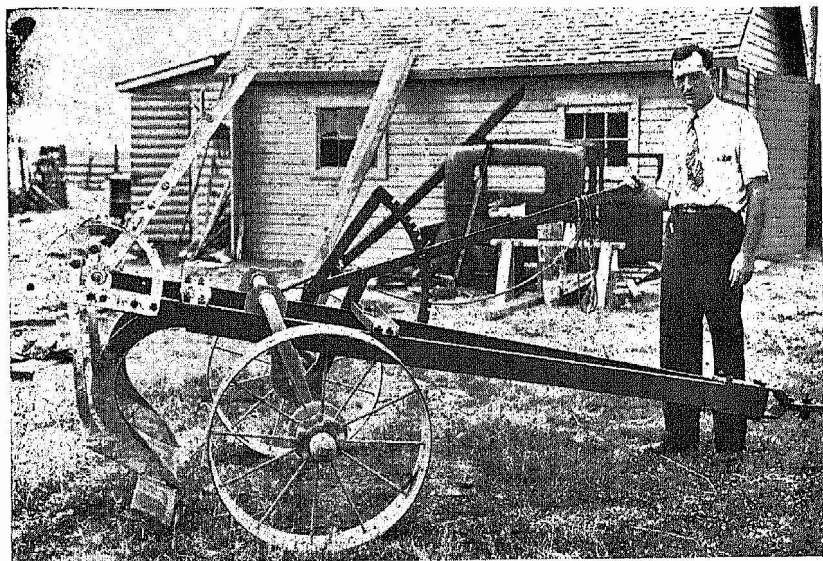
All of these implements must be well-built and sturdy to stand hard

usage and to do a clean job of cutting off 100 percent of the shoots.

The commercial blade weeder on a caterpillar type tractor should be considered seriously in a weed district or community where large acreages are being cultivated. However, any blade of suitable durability attached to a wheeled frame where the depth can be controlled and maintained will do a good job.

The duckfoot cultivator should carry 14- to 15-inch sweeps which will allow for a satisfactory overlap of the cutting area.

The rotary rod weeder can be used only in soils where an even penetration can be maintained. Heavier soils have a tendency to become



Cheney Blade

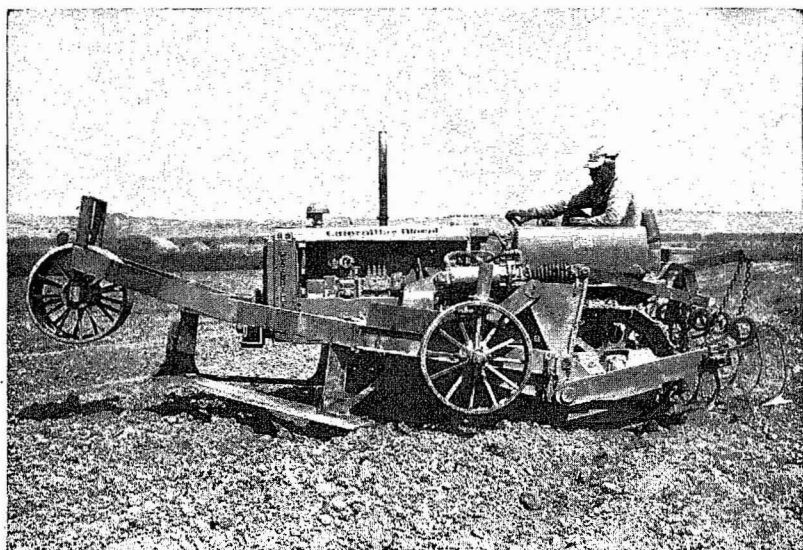
packed as the cultivation period advances, causing the rod to come to the surface and miss patches of new growth.

Depth of Cultivation

A depth of four inches is sufficient for a good job of control. At this depth it will be necessary to cover the area more often, but it will be less expensive regarding use of power, will do a better job and will not be as hard on machinery.

A Cultivator Program

Keeping land in fallow for two or three years is not recommended from a conservation standpoint. If the infestation is bad, it would be



Moran Weeder

much better to spread the program over a five-year period and produce some grain or forage cover while the program is in operation.

One system which has been used is:

First year:

- A. Plow in the fall or spring.
- B. Cultivate until fall.
- C. Seed fall rye September 1 to 15.

Second year:

- A. Cut fall rye for hay.
- B. Cultivate stubble field until September.
- C. Seed fall rye.

Third and fourth years:

- A. Repeat second-year program.

Fifth year:

- A. Place land in six-year rotation including three years of alfalfa, one year of grain and two years of cultivated crops such as beets, beans, corn or potatoes.

By planting fall rye the hazards of wind and water erosion are materially reduced and at the same time the weed control program is maintained.

Should it be advisable, the above program could be adjusted by a complete season of cultivation the third or fourth year. The system can and should be adjusted to suit the farming program.

In Yellowstone county weed districts, some acreage has been turned back to the growers after the second year of cultivation. The yield of beets harvested from this acreage has been high and the regrowth of perennial weeds has been moderate. In several cases it has been necessary to resume delayed cultivation, while other acreage has required only spot treatment with a chemical.

The cost of delayed cultivation is about \$1.00 per acre for each cultivation. This will vary a great deal, depending upon depth of cultivation, soil type, machinery, wages, etc.

Permanent Pasture

The seeding of a permanent pasture affords an opportunity to hold the weeds in check without complete eradication following the cultivation program. The standard "Huntley pasture mixture" will do the best job of control and at the same time produce a good volume of feed. The maximum suggested rate of 24 pounds per acre of "Huntley mixture" should be used.

Chemical Treatment

The use of chemicals for the control of perennial weeds has given valuable results, but their use on large areas is impractical because of the cost. However, for spot treatment of small areas and for inaccessible places such as ditchbanks, fence rows and roadsides, their use is advisable. Much of the difficulty experienced in getting results from chemicals has been caused by the method used and the rate and time of application.

Chlorates

Sodium chlorate and "Atlacide", a commercial chlorate combination, are the two chlorate chemicals used at the present time. They may be used either as a spray or applied in the dry form. Care must be exercised in the use of chlorates to prevent fire. Unless a uniform application of the chemical is made at the proper time, variable results will be obtained.

Rate of Application

The recommended rates of application of sodium chlorate for the most important perennial weeds are:

Wild morning glory (bindweed)	4 lbs. per sq. rod
Perennial sow thistle	4 lbs. per sq. rod
Canada thistle	4-5 lbs. per sq. rod
White top	6-9 lbs. per sq. rod
Leafy Spurge	7-9 lbs. per sq. rod
Russian knapweed	9 lbs. per sq. rod

As "Atlacide" is less effective than sodium chlorate, when "Atlacide" is used, these rates should be increased about one-third.

On soils high in alkali, organic matter or nitrates, the results may be variable and in some cases unsatisfactory.

Time of Application

Best results have been obtained when chlorates were applied in the fall from September 1 to October 15. Many operators make applications as late in the fall as the ground is bare.

Applying chlorates on ground that has been scalped and the vegetative matter removed from the surface, has produced the best results.

Where crop production is not a factor, such as on ditch banks, inaccessible places, etc., increasing the rate of application to produce partial or complete sterility of the soil is practiced.

Carbon Bisulphide

Carbon bisulphide is a highly volatile, highly inflammable herbicide and must be used with great care. However, it has given very satisfactory results. The cost of carbon bisulphide is relatively high so its use should be confined to land of high-productive capacity and spot treatment of small patches on other land. The average cost of treatment with carbon bisulphide is \$2.25 per square rod.

Land Preparation

Carbon bisulphide should be used when the soil is warm and has good moisture content. The area to be treated should be scalped of all vegetative growth.

Application

This material is placed in the soil with an applicator at the rate of 2 ounces per hole, 18 inches apart. Every other row of holes is staggered to increase the area over which the fumes penetrate through the soil. The liquid should be placed 5 to 8 inches deep in the soil. Best results have been obtained on medium heavy soils. Light sandy soil or heavy clay soils do not allow for even diffusion and proper concentration of the poisonous gas.

Borax

More recently borax alone and borax in combination with chlorates has been tested in many states for the eradication of perennial weeds. Borax is the recommended treatment for yellow toadflax at the rate of 7 pounds per square rod and St. Johnswort at the rate of 8 to 9 pounds per square rod.

Results have been variable in the control of the common perennial weeds found on cultivated land. Because of the heavy rate of application recommended and the resulting sterility of the soil, it would be well to confine its use to inaccessible areas where sterility of the soil is not a problem. On cultivated land it should be used with caution until more results have been obtained. It does not present a fire hazard.

Where treatment is made with borax alone, from 20 to 30 pounds per

square rod should be used. When used in combination with chlorates from 2 to 4 pounds of chlorate are mixed with from 6 to 15 pounds of borax.

Searing

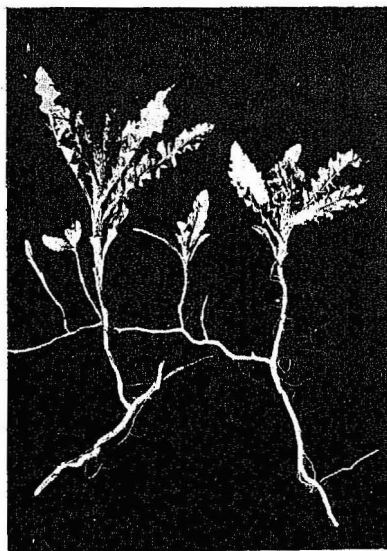
Searing for the control of perennial weeds is also in the experimental stage. There are practically no research results available.

Searing of the plants beginning in the bud stage of growth and repeating at intervals of 14 days until fall, is the recommended procedure.

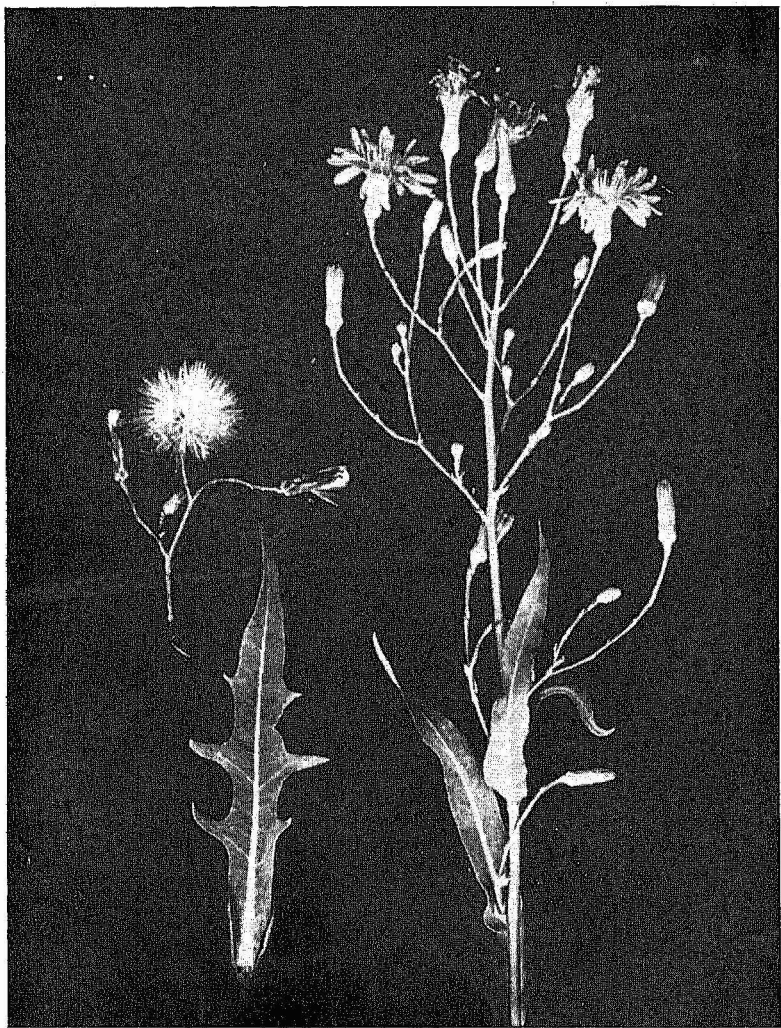
Following the searing program, a treatment of 2 to 4 pounds of sodium chlorate has produced the best results so far.

Preventing seed formation by perennial weeds by searing has a very definite place in a control program. The searing should be done with diesel oil or a low grade fuel oil with a machine, producing from 150 to 250 pounds of pressure, equipped with nozzles made for this purpose.

Searing or partial burning of the bud clusters has given better results than a severe or complete burning of the plants.



Rootstalks
(Courtesy of C. W. Griffin)



BLUE LETTUCE—Seed head, basal leaf, and tip of stem.
One-half natural size, original.



CANADA THISTLE.
One-eighth natural size, original.

CANADA THISTLE

Cirsium arvense (L.) Scop.**Other Names**—Creeping thistle; small-flowered thistle.

Description of Plant—Perennial, growing 3 to 6 feet high, leaves spiny, clasping the stem, and very irregular and wavy of margin, green in color on both sides. Usually found in patches varying in extent from a few square feet to an acre or more. In these patches all other vegetation is crowded out. The plants branch freely at the top, and are covered with flowers $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter, usually purplish in color, the top-most buds blooming first. Some plants bear male flowers only, which form no seeds; other plants bear female flowers only, which, if pollinated, produce many seeds. The male flowers are slightly larger than the female flowers and it is often difficult for an untrained observer to distinguish between them.

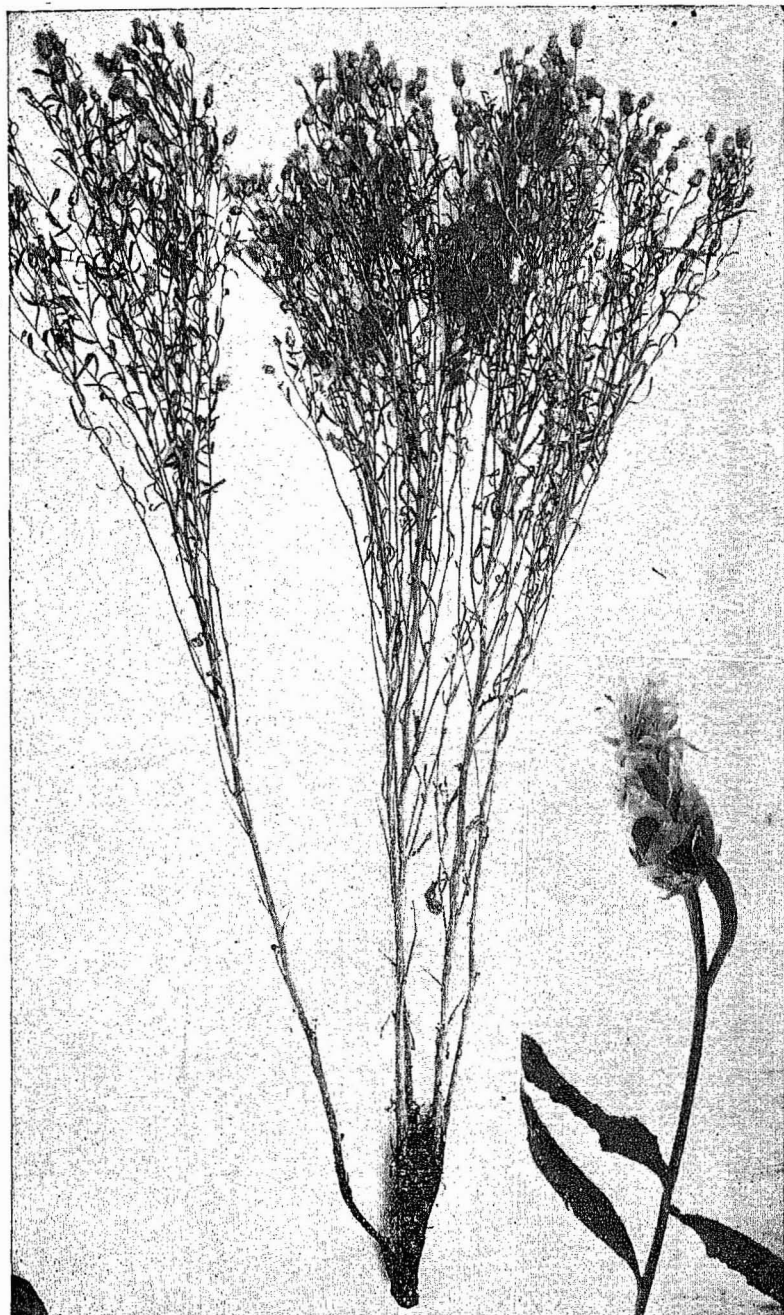


Distribution of Canada Thistle.

Canada thistle propagates by both seed and root stalks. The root stalks may penetrate the ground for several feet. Pieces of the root stalks usually develop new plants under favorable conditions. It is difficult to control.

The plants bloom in July, August and September. The seeds are borne in the heads of the female plants. They are about $\frac{1}{8}$ inch long, light brown, curved or straight, elongated oblong, smooth, somewhat flattened, marked with longitudinal lines. The top is cup-shaped, having a narrow rim with cone-shaped points in the center. The white pappus borne on the tip of the seed breaks off very easily and is very seldom present when the seed is found in commercial grain.

Canada thistle is an introduced weed in Montana, but it now occurs in every section of the state, being more abundant in the irrigated sections.



KNAPWEED

One-third natural size, original.

(Lower right, single head, twice natural size.)

KNAPWEED (Russian)

Centaurea repens L.**Other Names**—Turkestan Thistle.

Description of Plant — Russian knapweed has been recently introduced with imported Turkestan alfalfa seed. It may be distinguished from most other perennial weeds by its lilac-colored flowers in small round heads, and by the tough dark brown or black perennial roots.

The leaves on a mature stem are small, narrow, with smooth surfaces and edges, and without a pronounced midrib or stalk. Short, stiff hairs cover the leaf and stem. The leaves get smaller as they approach the head. The whole stem is hard, tough and practically inedible when dried in hay. The young stems are covered with long, soft, gray hairs or nap, which remains on the lower part of the stem. This nap does not appear on the branches of the flowering stalks.

The first leaves which appear in the spring are large, thick, grayish-green, much longer than wide, with rounded teeth on the margin and covered with nap. These leaves are very unlike the leaves on the upper part of a mature plant.

The lilac-colored flowers are borne in small, almost spherical heads, $\frac{3}{8}$ to $\frac{1}{2}$ inch in diameter. The flowers somewhat resemble those of Bachelor's Buttons, only smaller. The small heads and the absence of thorns or prickles, distinguishes the knapweed from any thistle.

The seeds are about $\frac{1}{8}$ inch long, approximately twice as long as broad, chalky white, sometimes having a tinge of yellow, slightly wedge-shaped, marked with fine longitudinal lines.

Russian knapweed has gained a foothold in many counties in Montana and due to its persistence, its capacity to spread, its density of growth, its presence in hay and pasture, the farmers of the state must learn to farm in the presence of this noxious weed.



Distribution of knapweed.



LEAFY SPURGE
One-third natural size, original.

LEAFY SPURGE

Euphorbia esula L.

Description—Leafy spurge is a long-lived perennial herb with a milky sap. It propagates both by seed and by underground roots. The roots are reddish-brown in color and may penetrate the soil to a depth of four feet or more. It usually occurs in clumps or patches.

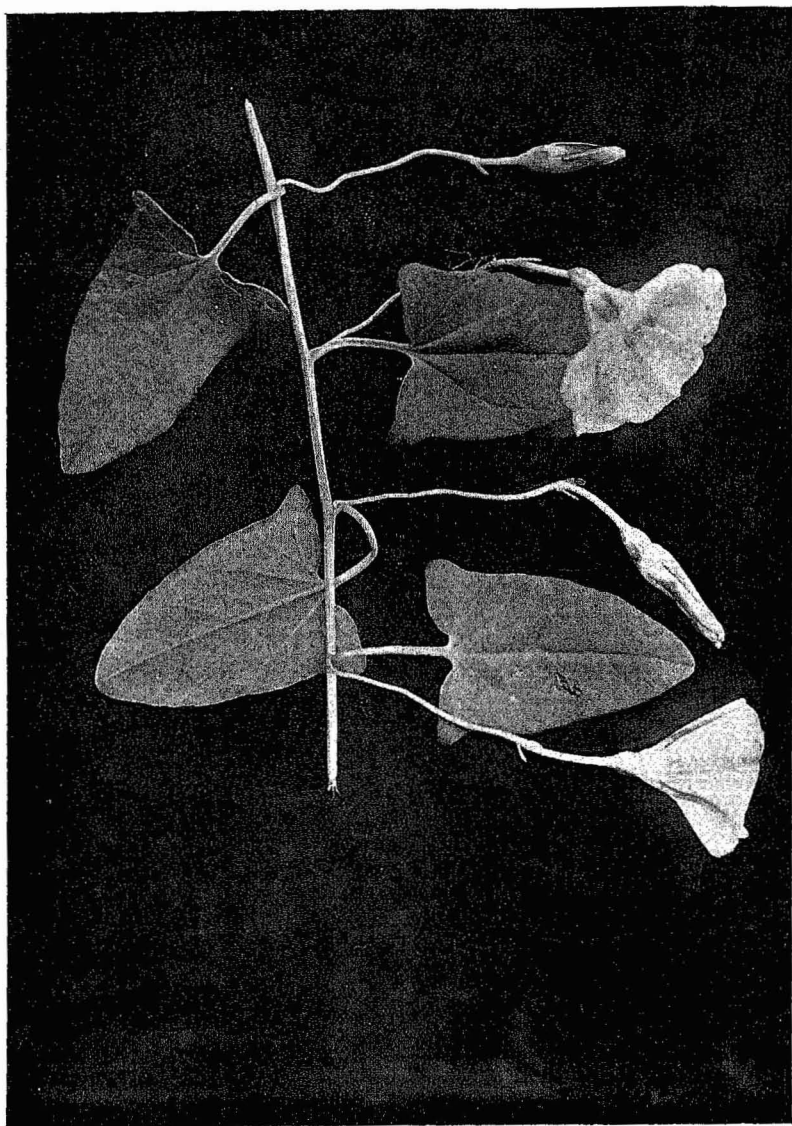
The stem is usually unbranched except for the branched flower cluster, erect, and from 1 to 3 feet tall. The leaves are bluish-green in color, long, narrow, (about $\frac{1}{4}$ inch wide), and have an entire (untoothed) margin and arranged alternately on the stem. During the late summer the leaves become brownish-orange in color. The plant is among the first to resume growth in the spring.

The flowers are very small, inconspicuous, greenish-yellow when young, becoming more yellow as they mature. They occur in small clusters with rounded leaves, and resemble dense tufts of small leaves more than ordinary flowers. They occur mostly in umbrella-like clusters at the tops of the stems.

The seeds are light gray, smooth, and about twice the size of an alfalfa seed. They are borne in a three-sided capsule.



Distribution of leafy spurge.



MORNING-GLORY—Portion of vine.
Natural size, original

MORNING GLORY (Wild)

Convolvulus arvensis L.

Other Names—Small-flowered morning-glory; field bindweed; European bindweed; love-vine; creeping Jenny.

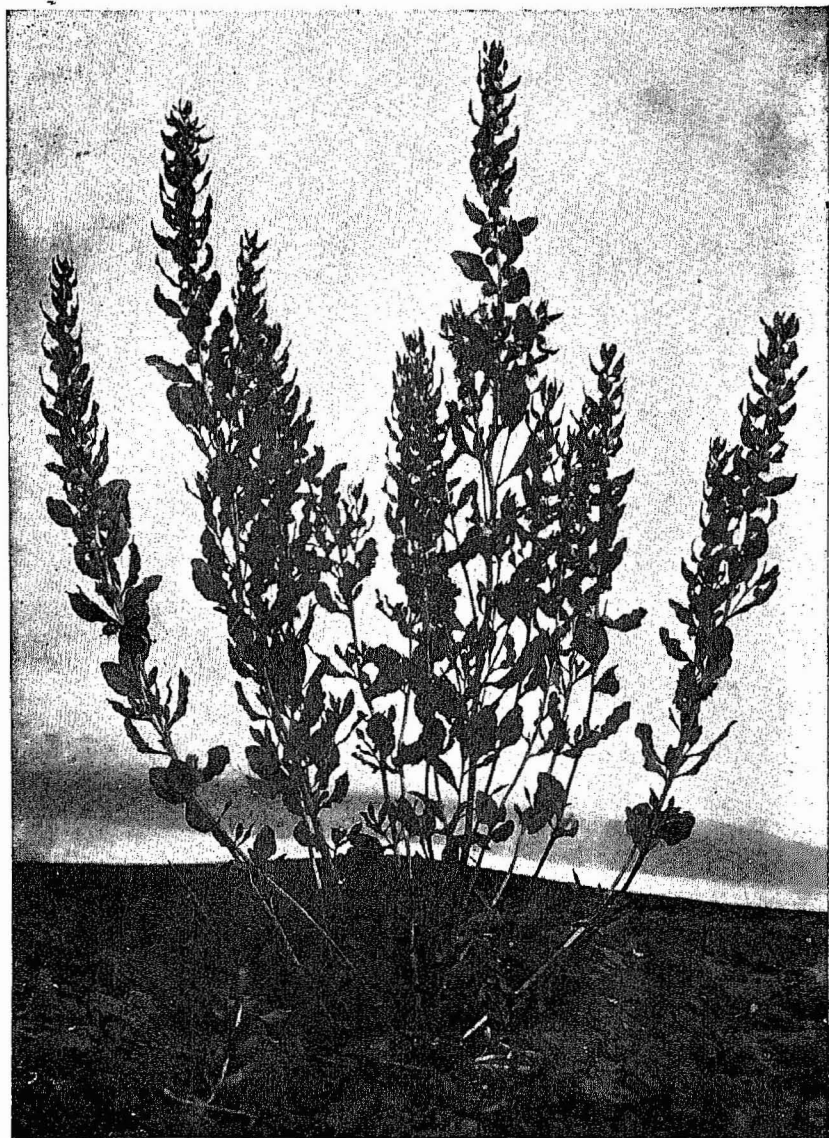
Description of Plant—Wild morning-glory is a perennial plant usually growing in patches. The small pink or white funnel-shaped flowers are about 1 inch in diameter and often grow in pairs. They close up in the evening and during rainy weather. The leaves are shaped like blunt-pointed spearheads. Long cord-like roots grow out in all directions and form buds which send up new shoots. New plants may start from any part or piece of the root.

The seeds (two to four) are produced in round capsules. They are about 1/5 inch long, dull black to dark brown, oval, one face convex, the other angled with flat sides, surface coarsely roughened.

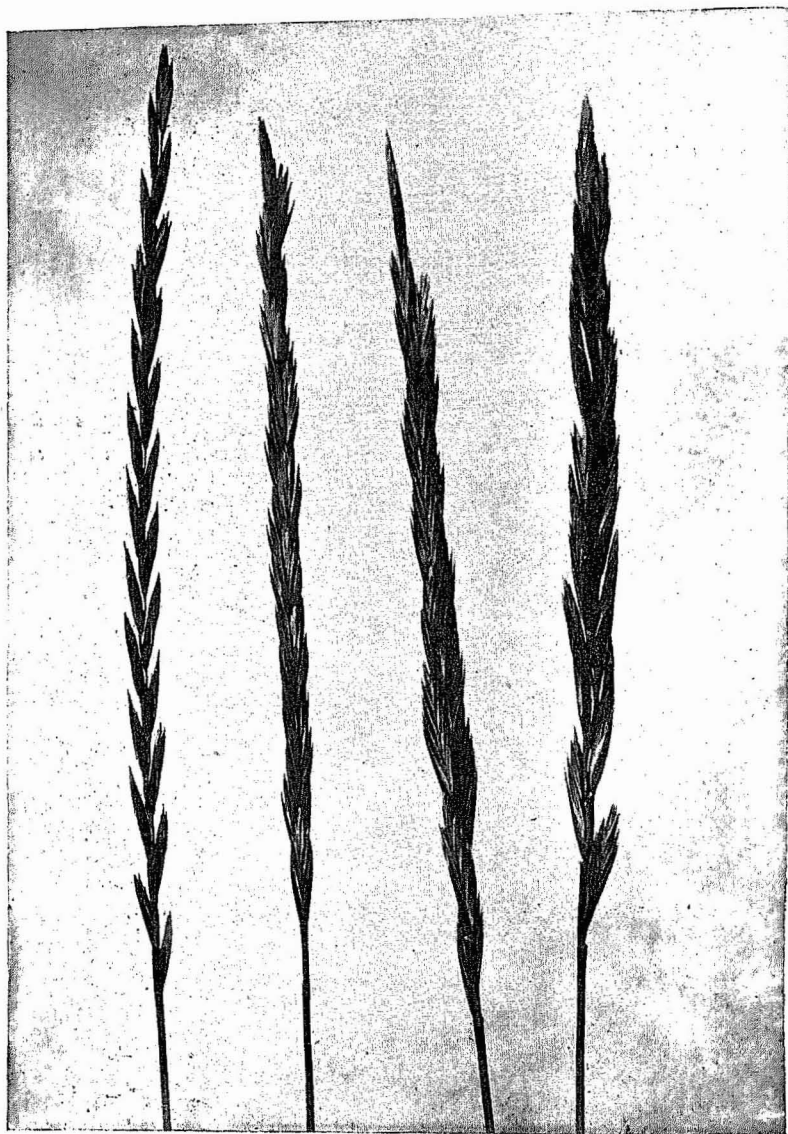
Wild morning-glory ranks as one of the worst weeds in Montana. It trails over the ground with a persistency which fills farmers with dismay.



Distribution of wild morning-glory.



POVERTY WEED
One-third natural size, original.



QUACK GRASS left; BLUE STEM right—Two views of heads.
Three-fifths natural size, original.

QUACK GRASS

Agropyron repens (L.) Beauv.**Other Names**—Couch grass, quitch grass.

Description of Plant—A dark green perennial grass, 2 or 3 feet tall. The character of the heads is shown in the picture. Quack grass produces a perfect mat of underground rootstocks that run close under the surface of the ground and send up innumerable new stems. The result is an unusually dense growth and a very compact sod. Those who are unfamiliar with quack grass may confuse it with western wheat grass (*Agropyron Smithii* Rydb.), sometimes called common blue joint or blue stem. The following comparison gives the distinguishing characteristics:

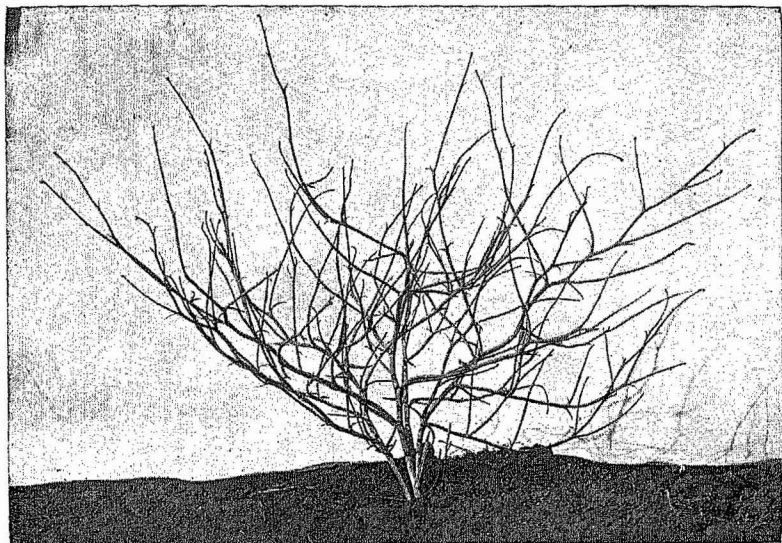


Distribution of quack grass.

	Quack Grass	Slender Wheat Grass
Growth	Dense	More scattered
Color of foliage	Dark Green	Grayish or bluish green
Root system	Underground rootstocks	Underground rootstocks
Flowers in spikelet..	Brownish yellow color, 4-6	Light straw color, 6-10
Leaves	Wide (3/12-5/12 in.) and long. Abrupt tip, arise chiefly along stems. Soft texture. Bend downwards at tip. Rolls spirally when dry.	Narrow (1/12-2/12), rather short. Gradually taper and finely pointed, arise chiefly at base of tufts. Stiff, harsh texture. Bend upward at tip. Rolls tightly longitudinally when dry.
Lower sheaths	Midrib depressed, covered with short hairs.	Midrib raised, no hairs.

The seeds of Quack grass, including the scales, are about $\frac{3}{8}$ inch long, the outer scales are smooth and strongly nerved, pointed and terminating in an awn $\frac{3}{16}$ inch long. The kernel is about $\frac{3}{16}$ inch long, with a wide open groove resembling a small grain.

Quack grass is propagated both by seeds and rootstocks. Pieces of the latter grow readily when carried about the field by cultivators. Quack grass thrives in most soils and competes successfully with all crops but requires considerable moisture for vigorous growth. It is grazed readily by livestock and is not generally discriminated against in pastures. It also makes fair hay. Generally speaking, however, its objectionable features offset its advantages and under most conditions it is considered to be a bad weed.



SKELETON WEED

One-fourth natural size, original.

SKELETON WEED

Lygodesmia juncea Don.

Other Names—Rush pink, wild asparagus.

Description of Plant — Skeleton weed is a perennial plant, and appears leafless, the leaves being very small and scale-like. It grows 6 to 24 inches high. The branches of the plant are slender, hard, rough, wiry, and contain a milky juice. The flowers are about $\frac{3}{4}$ inch in diameter, light purple, and appear from July to September.

The seed is about $\frac{1}{5}$ inch long, very slender and dull in color, and is easily blown about by the wind.

Skeleton weeds usually occur on non-irrigated, sandy or sandy-loam soil, under some conditions competing seriously with cultivated crops.

It spreads by wind-borne seeds and under ground roots.



Distribution of skeleton weed.



SOW THISTLE
One-third natural size, original.

SOW THISTLE (Perennial)

Sonchus arvensis L.**Other Names**—Field sow thistle; creeping sow thistle.

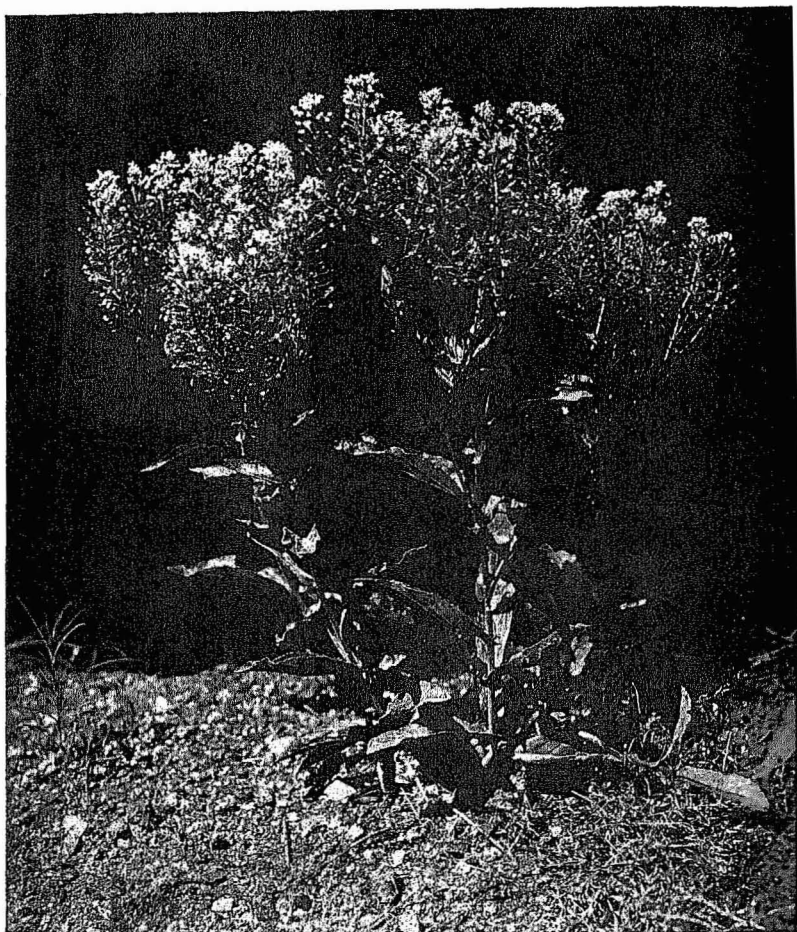
Description of Plant—Perennial sow thistle is a milkweed, 2 to 5 feet high, growing in dense patches. The leaves are more or less toothed and often the teeth look sharp and spiny, but they are rather soft and, compared with Canada and prairie thistles, they are relatively harmless. The flowers resemble those of the dandelion in size and shape. They are closed in bright sunlight. This perennial has many horizontal roots which send up new stems freely. The seeds are about $\frac{1}{8}$ inch long, dull, dark reddish-brown, oblong, slightly flattened, ridged lengthwise and wrinkled transversely. They bear a tuft of reddish-brown hairs. The seeds are carried naturally by wind.

There are two related weeds, common or annual sow thistle (*Sonchus oleraceus* L.) and annual prickly sow thistle (*Sonchus asper* (L.) Hill). These are annuals, without horizontal roots, and have small flowers $\frac{3}{4}$ to 1 inch in diameter.

The sow thistles belong to the chicory family which is characterized by the presence of a milky juice and flowers like dandelions.



Distribution of sow thistle.



WHITE TOP
One-third natural size, original.

WHITE TOP

Lepidium draba L.

Other Names—Hoary cress

White-top is a member of the mustard family, Cruciferae. Other common weeds belonging to this family are fan-weed, hares ear mustard, field mustard, etc.

Description of Plant—White-top is an erect perennial, six inches to 2 feet in height. The leaves are $1\frac{1}{2}$ to 3 inches long, irregularly toothed to almost entire length, grayish-green in color. The upper stem leaves are sessile while the basal leaves are more slender and narrowed into a short stalk.

The flowering branches bear numerous showy, small greenish-white to white flowers about $\frac{1}{8}$ inch in diameter. The plant in flower has a flat-topped appearance. The pod is somewhat heart-shaped, two-valved, and has a short persistent point at the apex. It often becomes prominently veined at maturity. The seeds are dark-reddish, brown, flattened and about the size of alfalfa seed, rounded at one end and narrowed to a point at the other. The seeds will remain viable in the soil for many years. The seeds are very difficult to separate from those of alfalfa or red clover.

The root system consists of well developed horizontal roots, which spreads the plant horizontally and which penetrate vertically many feet.

White-top seems to prefer slightly alkaline conditions, although it thrives under a variety of soil conditions.

Wherever white-top becomes established it takes complete possession of the soil. Control of this weed is very difficult, and requires persistent effort.



Distribution of White-top