Perennial Weeds and Their Control

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INTRODUCTION

Perennial weeds are costing Montana millions of dollars every year. In many counties the infestation is advancing at a rapid rate with little attention being given to the problem. Only a few counties have developed an extensive program to bring these weeds under control.

Unless the farmers of the state recognize the situation and cooperate in solving the perennial weed problem it will be but a few years until the number of acres infested will be so great that the cost of control will be prohibitive.

Eradication should be the ultimate goal in the fight against these weeds. This may be accomplished in areas where the infestation is light and the patches small. However, in areas where the infestation is heavy and involve hundreds of acres, the present approach to the problem is to bring them under control.

Failure to identify these weeds when they first appear is largely responsible for contamination of weed-free areas. Ability to recognize these
weeds in all stages of growth is desirable; however, any area infested with a weed grown from an underground root stalk should be staked off and control methods started.

While annual weeds are a problem in the state, good cultural methods and crop rotation will reduce them to a minimum. Perennial weeds offer a real 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.
CONTROL

The rapid rate of infestation of Montana soils by perennial weeds is caused by:

1. Planting impure seed.
2. Feeding hay and grain carrying weeds and weed seed.
3. Scattering by wind and water.

Prevention is the most satisfactory method of control. "Know what you sow" when seed is planted. The purchase of high quality seed, backed by a purity and germination test, will prevent the accidental spread of these weeds. Hay and feed contaminated with these weeds and weed seeds are generally purchased below market prices. Even at a bargain price they are costly.

Prevention of contamination by wind and water necessitates the destruction of these plants before they have gone to seed. Cutting or burning in the blossom stage will greatly reduce infestations. Particular attention must be given at the source and along the course of all water used on irrigation projects.

Tillage

For areas of 1/2 acre or more, clean cultivation is the recommended method of control. One year of cultivation for perennial weeds, except wild morning glory, Russian knapweed and white top, followed by growing alfalfa three years in a 6-year rotation will result in a fairly good job of control. To eradicate perennial weeds a 2 to 3 year program must be put into operation.

Fallow Method

The infested area should be plowed to a depth of 6 to 8 inches early in the spring or as soon as any of the perennial weeds show above the surface of the ground. The plowing should be carefully done to avoid skips at the turns. Plowing as the initial operation in the control of patches in a large field should extend some distance beyond the outside edge of the infested areas. This will help control any late growth and avoid spreading small root pieces to clean areas.

The land should be kept black: that is, no green growth should appear above the surface of the ground during the entire growing season. The success of the control program will depend on observing this feature throughout the season. Black tillage starves the roots. Any growth appearing above the surface of the ground replenishes the roots with plant food.

Fields infested with wild morning glory, white top and Russian knapweed should be cultivated every 3 to 4 days for the first 5 or 6 cultivations, while
every 6 to 7 days will suffice for other perennial weeds. After the first 5 or 6 cultivations one day each week should be set aside for this work. A strict adherence to the schedule will be necessary to avoid green growth appearing above the surface of the ground.

On irrigated land a maximum of 18 to 20 cultivations may be required during a single season. On dryland the requirement may be less. **Each cultivation should be 5 to 6 inches in depth.** Every effort should be made to maintain a uniform depth on all cultivations. If an even depth cannot be maintained, overlapping each width by half will avoid some difficulty from regrowth.

**IMPLEMENTS**

The duckfoot cultivator, rotary rod weeder and single blade eradicator are implements which have given good results.

The work done by the duckfoot type of cultivator depends on the cutting edge maintained on the duckfoot sweeps. Sharp sweeps will insure a clean cut on new growth. In heavy soil, deep tiller cultivators equipped with 14 or 15 inch duckfoot sweeps may be used.

The rotary rod weeder is very satisfactory in soils where an even penetration can be maintained. Heavier soils have a tendency to become
packed as the cultivation period advances, causing the rod weeder to come to the surface and miss patches of new growth. Unless the soil in the field to be cultivated for the control of perennial weeds is uniform and free from rocks some other type of cultivator should be used.

The single blade weed eradicator, shown below and on page 9 is effective in the control of perennial weeds on irrigated land. Its long sharp cutting blade, pulled through the soil at a depth of about 5 inches cuts through the toughest creeping perennial weed roots. The depth of cutting can be adjusted up or down within a limited range.

The weight of the operator, who stands on the riding platform, aids in keeping the blade at a constant depth. If the soil is hard he stands directly over the blade, but on loose or sandy ground he shifts his weight toward the lower end of the riding platform.

![Single Blade Weed Eradicator.](image)

The eradicator can be built for use with one horse, two horses, or a tractor. The one-horse size has a blade 3 feet long. For two horses the blade should be 6 feet long. Nine feet is considered a maximum length. Shorter blades allow for uneveness in the ground and do not miss so many roots.

An eradicator with a two-horse team can cut from 5 to 7 acres in an 8-hour day. Therefore, an eradicator planned for neighborhood use will serve 30 to 40 acres provided the fields are fairly near each other.

**Description of Eradicator**

The blade is of plow steel 3½ inches wide by ⅜ inch thick. It is attached to 3 U-shaped bars of 2½ inches by 1 inch steel, mounted on a 4 foot x 6 inches wood beam with 2½ feet x 2½ feet x ¼ inch standard angle iron. The two outside bars extend 13 inches beyond the beam to allow for connection to 11 feet x 18¼ inches x ⅜ inch steel plates. These two steel plates support the roller and also provide means for attaching the hitch.
SINGLE BLADE WEED ERADICATOR

Bill of Materials

<table>
<thead>
<tr>
<th>Number Pieces</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wood roller, 12 in. diameter, 4 ft. 8 in. long.</td>
</tr>
<tr>
<td>2</td>
<td>End plates, sheet steel, % in. x 11 in. x 18½ in.</td>
</tr>
<tr>
<td>2</td>
<td>Blade bars, steel, 2¼ in. x 1 in. x 48 in.—ends.</td>
</tr>
<tr>
<td>1</td>
<td>Blade bar, steel, 2¼ in. x 1 in. x 34 in.—center.</td>
</tr>
<tr>
<td>2</td>
<td>Cast iron bearings.</td>
</tr>
<tr>
<td>2</td>
<td>Axles, 1 in. diameter, 18 in. long, steel.</td>
</tr>
<tr>
<td>4</td>
<td>Standard angle irons, 2½ in. x 2¼ in. x ½ in., 6 in. long.</td>
</tr>
<tr>
<td>2</td>
<td>% in. x 2 in. strap steel braces, 3 ft. 2 in. long.</td>
</tr>
<tr>
<td>5</td>
<td>Platform boards, 2 in. x 4 in. x 2 ft. 6 in. fir.</td>
</tr>
<tr>
<td>2</td>
<td>Platform stringers, 2 in. x 8 in. x 5 ft. 6 in. fir.</td>
</tr>
<tr>
<td>1</td>
<td>Beam 4 in. x 6 in. x 6 ft. fir.</td>
</tr>
<tr>
<td>1</td>
<td>Cutting blade, % in. x 3½ in. x 6 ft. steel.</td>
</tr>
<tr>
<td>4</td>
<td>Machine bolts % in. x 3½ in.</td>
</tr>
<tr>
<td>6</td>
<td>Machine bolts % in. x 3 in.</td>
</tr>
<tr>
<td>8</td>
<td>Machine bolts % in. x 5 in.</td>
</tr>
<tr>
<td>8</td>
<td>Plow bolts % in. x 1½ in.</td>
</tr>
<tr>
<td>3</td>
<td>Plow bolts % in. x 2 in.</td>
</tr>
<tr>
<td>2</td>
<td>U bolts for hitch—½ in. malleable iron.</td>
</tr>
<tr>
<td>2</td>
<td>Hitch rods, % in. x 3 ft. steel.</td>
</tr>
<tr>
<td>4</td>
<td>Log screws, ½ in x 4 in.</td>
</tr>
<tr>
<td>1 lb.</td>
<td>16 penny nails.</td>
</tr>
</tbody>
</table>
Plans, specifications and instructions for the use of the Single-Blade Weed Eradicator are adapted from an article in the February, 1937 issue of the Reclamation Era, published by the Bureau of Reclamation, Washington, D. C. The adaptation was prepared by O. W. Monson, Irrigation Engineer, Montana Experiment station and G. H. Bingham, Extension Irrigation Specialist, Montana Extension Service.
CHEMICAL METHOD

The use of chemicals for the control of perennial weeds has given variable results. However, for spot treatment and for inaccessible places such as ditch banks, roadsides and fence rows their use is necessary. Atlacide, a commercial form of calcium chlorate, and sodium chlorate have been used most extensively at the Montana Agricultural Experiment station and in various counties in the state for the eradication of perennial weeds.

Care must be exercised in the use of chlorates to prevent fire. By observing the precautions as recommended by the manufacturers the chances are not great. Any chemical spilled on the clothing and allowed to dry may be ignited by friction. The operator should wear rubber boots and old clothes and should wash them often.

Application

Experimental evidence indicates that chlorates are equally effective when applied in either the dry or liquid form. Applications in the dry form may be made by hand or with commercial duster. This method requires more material than the spray method and offers some difficulty in obtaining uniform distribution especially when applied to the undisturbed top growth.

Better distribution and as good results may be obtained by applying the dry chemical direct to the bare soil or stubble during the late summer or fall after the regular crop has been removed. The dry method is particularly well adapted to the treatment of small weed patches on crop land.

If used as a spray, chlorates should be applied as a fine mist to the stems and leaves, making sure that all parts of the plants are moistened. Two or more applications may be necessary to assure a complete kill of all top growth. For small patches the five gallon knapsack sprayer may be used. For large areas a commercial sprayer is recommended.

The spray method is the most practical method of applying chemical to noxious weeds along canal banks, fence rows, roadsides and other places where the dry method cannot be used satisfactorily.

Amount of Chemical

1. From 3 to 5 pounds of chlorate for each square rod of weeds will be required for the season.
2. From 1 to 3 applications may be necessary.
3. When applied in the dry form one heavy application should be made when the regrowth following mowing is 3 to 5 inches high or in late September or early October. From 3 to 5 pounds will be required.
4. When applied as a spray from 1 to 2 pounds of chlorate should be used for each gallon of water.
5. Regardless of the strength of the spray solution 2 to 3 pounds of
chemical should be applied to each square rod of infested area on dry land and 3 to 5 pounds of chemical to each square rod of infested area on irrigated land.

6. The solution should be kept well mixed at all times.

Time of Treatment

The best results have been obtained by treating weeds in late September or early October. Treatments during early summer have not been so successful. A second application should be made when new growth is 3 to 5 inches high, or the following spring.

Areas treated with chemicals should not be cropped the second year to allow completion of the eradication program. If any regrowth appears the area should be treated. Land treated with heavy applications of chemicals may remain unproductive for several years. However, several heavy irrigations will wash the chlorates out of the soil and bring it back into condition for production.

Along the ditch banks and fence rows it may be advantageous to make applications heavy enough to render the soil sterile for several years. This will require 5 to 8 pounds of chemicals per square rod under most conditions.

OBSERVATIONS

1. A 6-year rotation on irrigated land, including alfalfa, small grains and row crops, will help in keeping perennial weeds under control.

2. A six-year rotation followed at the Montana Agricultural Experiment station, Bozeman, has given the lowest weed count of any rotation used. It consists of barley (seeded as a nurse crop for alfalfa), alfalfa 3 years, spring wheat, potatoes. Corn, beans or beets may be used to replace potatoes as the cultivated crop in this rotation.

3. Unless perennial weeds are controlled the profits from infested farms will decrease rapidly. While tillage and chemical control are costly, the possibility of bringing many acres of land back into maximum production is worth a producer’s consideration.

4. Where perennial weeds have matured, burning will reduce the spread by seeds.

5. Economy in treating heavily infested areas may be secured by cutting and burning in the blossom stage to destroy the seed crop, followed by chemical treatment on the regrowth during September or early October.

6. Many other chemicals have been tried as weed killers, but at the present time the chlorates generally are most satisfactory considering cost, availability and ease of application.

7. Certain tillage practices are eligible for payment under the Agricultural Conservation program.
BLUE LETTUCE—Seed head, basal leaf, and tip of stem.
One-half natural size, original.
BLUE LETTUCE
*Lactuca pulchella* (Pursh) DC.

Other Names—Wild lettuce; showy lettuce; milkweed.

Description of Plant—A perennial milkweed growing in dense patches after it becomes well established. The stems are two to three feet high with smooth leaves covered with a thin white coating or bloom. Leaves variable, oblong to narrow in outline, lower ones often deeply cut, with segments turned backward; upper ones without a petiole and partly clasping the stem. The plant is filled with a bitter, milky juice. Flowers, blue or purple, several to the plant, about ¾ to 1 inch in diameter, shaped like those of a small dandelion. The plants produce many root stocks which extend horizontally underground and send up numerous shoots. In this way patches are formed so dense as to crowd out other vegetation.

The plants bloom in July and August. The seeds are about ¼ inch long, bottle shaped, red when immature, grayish to purplish when ripe, flattened, ridges running lengthwise down each face, making the whole seed look dull and purple. The tip of the seed bears a long white umbrella-like plume which is usually absent on seeds found in commercial grain.

Blue lettuce is propagated by seeds, by roots and by rootstocks. The plant is native to Montana. It is increasing rapidly in cultivated fields in nearly all parts of the state and it will continue to do so until a more determined effort is made to control it.
PERENNIAL WEEDS AND THEIR CONTROL

CANADA THISTLE
Circium arvensc (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 ½ to ¾ 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.

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 ⅛ 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).
PERENNIAL WEEDS AND THEIR CONTROL

KNAPWEED (Russian)

Centaurea picris Pallas.

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, \( \frac{1}{4} \) 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 \( \frac{1}{6} \) 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.
LEAFY SPURGE
One-third natural size, original.
LEAFY SPURGE

_Euphorbia virgata_ Waldst. and Kit.

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.
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 are produced in round capsules 2 to 4 inches each. 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.
POVERTY WEED
One-third natural size, original.
POVERTY WEED

*Iva axillaris* Pursh.

Other Names—Salt sage; small flowered marsh-elder.

Description of Plant—Poverty weed is a coarse perennial herb with a rank, unpleasant odor. It is pale green in color and grows in dense patches. The stems are 8 to 18 inches high and branch very little. The leaves are small, numerous, and have no petiole. The small greenish flower heads are borne in the axils of the upper leaves. Poverty weed develops an extensive system of horizontal roots by which it spreads and makes eradication more difficult.

The seeds are about ⅛ inch long; color variable, olive green, brown to almost black; pear shaped, slightly flattened, striated lengthwise, often keeled on the sides and slightly curved toward the base.

The pest is well named poverty weed. The damage done is directly in proportion to the area and value of the land it covers for where it grows, nothing else can. It seems to have a slight preference for either alkali or heavy land, though it occurs in the best of soil. Few farmers will give the time and effort necessary to eradicate it.
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:

<table>
<thead>
<tr>
<th>Quack Grass</th>
<th>Slender Wheat Grass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>Dense</td>
</tr>
<tr>
<td>Color of foliage</td>
<td>Dark Green</td>
</tr>
<tr>
<td>Root system</td>
<td>Underground rootstocks</td>
</tr>
<tr>
<td>Flowers in spikelet</td>
<td>Brownish yellow color, 4-6</td>
</tr>
<tr>
<td>Leaves</td>
<td>Wide (3/12-5/12 in.) and</td>
</tr>
<tr>
<td></td>
<td>long. Abrupt tip, arise</td>
</tr>
<tr>
<td></td>
<td>chiefly along stems. Soft</td>
</tr>
<tr>
<td></td>
<td>texture. Bend downwards at tip. Rolls spirally when dry.</td>
</tr>
</tbody>
</table>

Lower sheaths........... Midrib depressed, covered with short hairs.
Midrib raised, no hairs.

The seeds of Quack grass, including the scales, are about 3/16 inch long, the outer scales are smooth and strongly nerved, pointed and terminating in an awn 3/16 inch long. The kernel is about 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 3/4 inch in diameter, light purple, and appear from July to September.

The seed is about 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.
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 \( \frac{1}{2} \) 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.
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 1½ to 3 inches long, irregularly toothed to almost entire, 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 ½ 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.