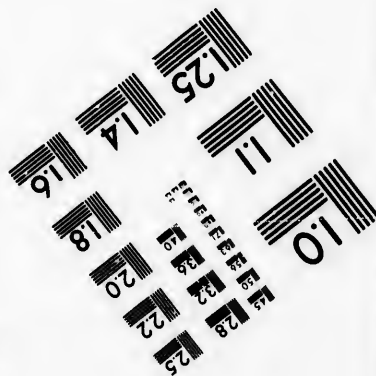
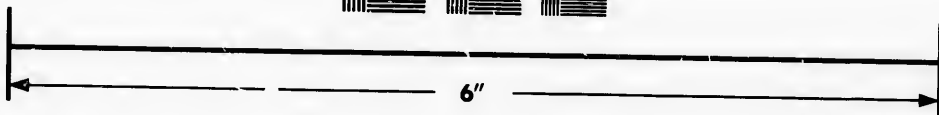
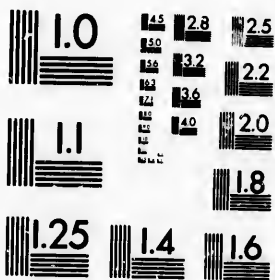


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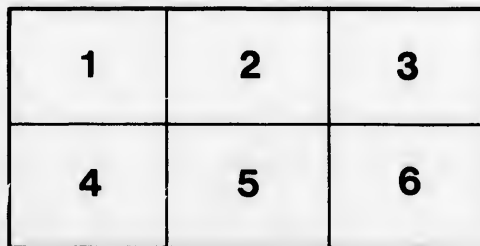
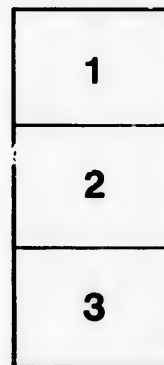
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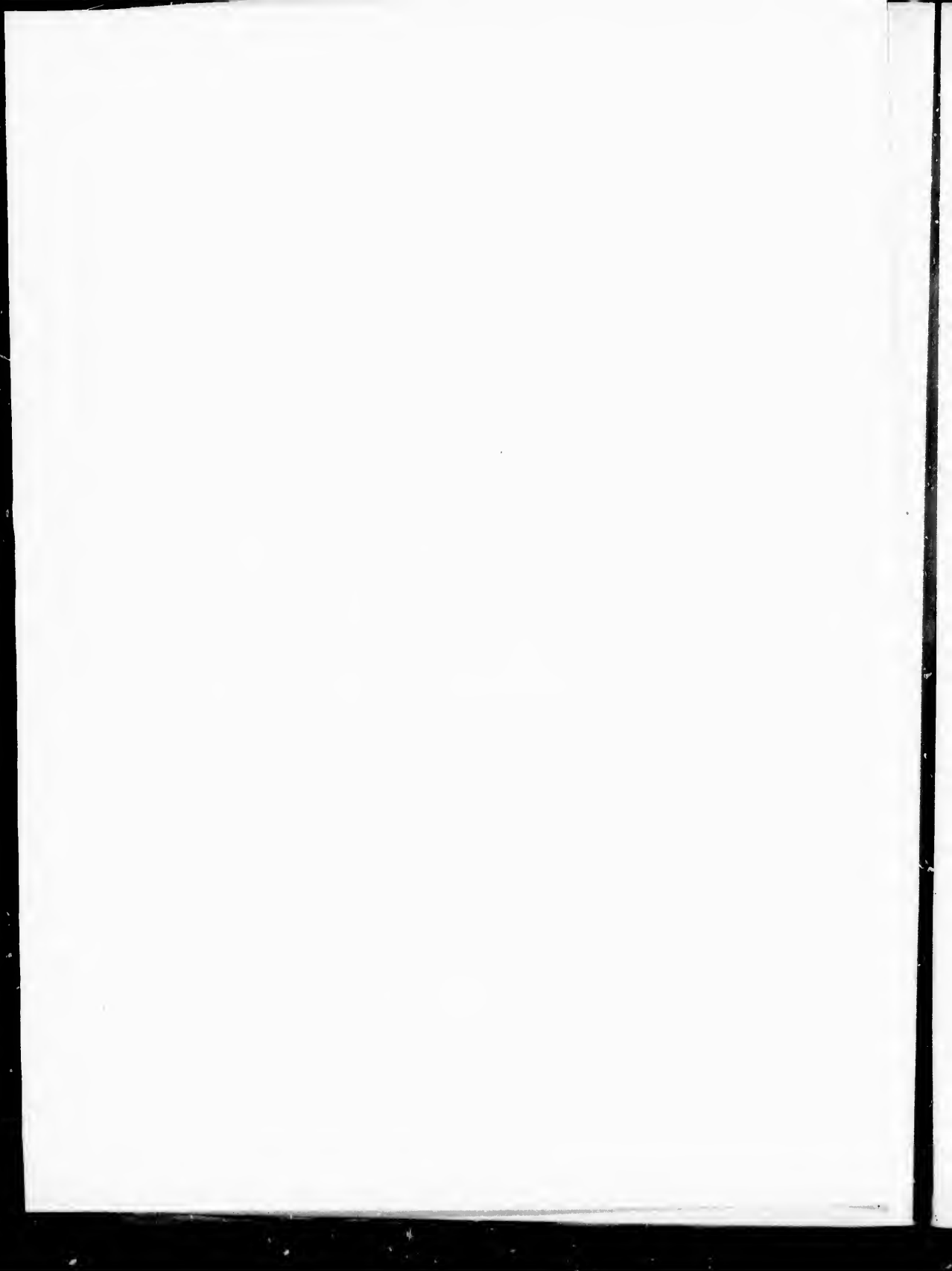
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ONTARIO AGRICULTURAL COLLEGE

EXPERIMENT STATION.

BULLETIN LXXXV.

WEEDS AND MODES OF DESTROYING THEM.

BY THOMAS SHAW, PROFESSOR OF AGRICULTURE, AND
C. A. ZAVITZ, B.S.A., EXPERIMENTALIST.

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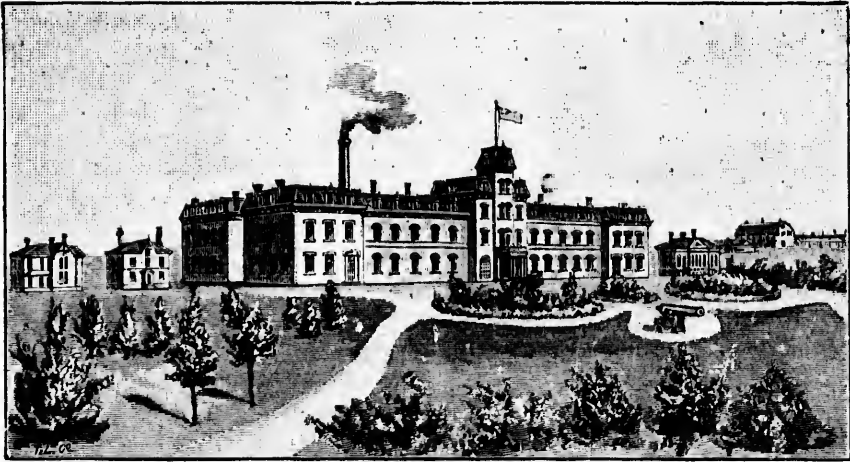
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WEEDS, AND MODES OF DESTROYING THEM.

That weeds prevail to an alarming extent in the Province of Ontario is patent to every one who has given the subject any attention. That they are on the increase is more than probable. The complete eradication of the more noxious forms of weed life has come to be looked upon as an impossibility by many engaged in tilling the soil, a view which tends to paralyze the efforts that would otherwise be put forth to destroy them. The loss which they cause to the farmers of this province in the large amount of plant food which they take from the soil every year is very great, and the labor expended in efforts to destroy them, often to little purpose, probably represents a still greater loss. Some of them, as the Canada thistle, are pretty generally distributed over the country, and are known to every one, but others, as wild flax, are as yet confined to certain sections, from which they are continually being distributed by the various agencies concerned in their propagation, and frequently they obtain a foothold from which it is difficult to dislodge them, before their presence is known.

Objects of the Bulletin. The chief of the objects of this Bulletin include the following, viz.: 1. To furnish information, through illustrations and otherwise, as to the appearance and habits of growth of the more troublesome forms of weed life which infest this country, that their presence may be at once detected when they are brought into centres where hitherto they have been unknown. 2. To outline certain important general principles that apply, though not always equally, to the destruction of all forms of weed life; and 3. To give specific modes of destroying the more troublesome forms of weed life which infest this province, that are not necessarily costly, and many of which have been proved in our experience at this station.

Possible Achievement. In reference to the destruction of the more noxious weeds, our contention is, first, that the more troublesome forms of weed life can be eradicated on every farm in Ontario, if the farmers decide that so it shall be. Second, that this can be accomplished without heavy outlay when it is done in a certain way.

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Third, that when weeds are once eradicated it will be easily possible to keep them so with but little outlay. And, fourth, that the profits will be much larger where the farms are kept free from weeds. When we say that the more troublesome forms of weed life can be eradicated, we mean that they can be removed so completely, that they will cease to interfere with any rotation that may be desired, that they can be completely banished from every farm, except in so far as the seeds are brought again by natural and other agencies, and that when so brought, with the necessary vigilance these in turn can be easily destroyed. That this work can be accomplished without heavy outlay has been fully demonstrated in our experience at this Station, as stated more fully in the Annual Report for 1891, wherein we claim that the whole farm was brought to a clean condition in three years without the loss of a paying crop, and without resorting to the bare fallow, while in a number of instances two crops were grown the same season. The only outlay for which there was no direct return was labor spent in hand pulling and spudding, which in the three years amounted to not more than \$250. The assumption that when weeds are once well overcome, it will not be difficult or costly to keep them at bay, is surely reasonable. That they will come again and keep coming is certainly true. But to affirm that it will cost more to keep them wholly at bay than only partially so, as is sometimes done, is certainly illogical. Our experience during the past year has taught us, that a one hundred acre farm when once in a clean condition, may be kept so where the general methods of cultivation are good, without expending a larger sum than \$25 per year in spudding and hand pulling. That the profits will be much larger when farms are kept free from weeds is also apparent, since they then use less of the nutriment in the soil that should go to sustain the plants, they injure them less through crowding and overshadowing, and there is certainly less labor involved in subduing them.

Agencies in Weed Distribution. The various agencies by which weeds are distributed are well worthy of attention. Sometimes they are wafted incredibly long distances by the winds of heaven, and are in this way distributed over areas widely separated from one another; at other times they are violently shaken out of the seed pods in which they grow, and driven along over the crusted surface of the snow for miles at a time. Birds carry them to and fro in their innocency in seeking supplies of food for themselves and their young. Sometimes the seeds are carried by wild animals when seeking their winter stores. At other times the seeds are carried in the droppings of domestic animals from field to field, and those which adhere to the coat are in this way carried to other centres. Some varieties are borne down upon us by the floods which swell the watercourses coming down from infested farms; oftentimes we buy them in the seeds we pur-

chase from abroad, and very often they are brought to us by the threshing machine from a neighbor's farm. And yet again we buy them in the manures that we purchase in cities, towns and villages, and in fodder supplies that come from distances more or less remote, while many carry them from field to field in the manure made upon the farm. It should be kept in mind at the same time, that there are but two ways in which weeds may increase through their own inherent powers, viz., by maturing their seeds, and by means of creeping rootstocks which push their way through the soil, and in this way form new plants. Happily these are both under our control, so that where weeds are allowed to multiply, it is because suitable measures are not taken to destroy them.

GENERAL PRINCIPLES TO BE OBSERVED IN DESTROYING WEEDS.

There are certain general principles to be observed in destroying weeds, which will be found very helpful in conjunction with the more specific modes that may be required. These include the following :

1. *Study their habits of growth.* We should not only study the habits of the growth of weeds, but we should adapt our methods of subduing them accordingly. Weeds are classed as *annuals*, *biennials* and *perennials*. Annuals complete the cycle of their existence in a single year. When annuals are prevented from ripening their seeds upon any farm from year to year, the time must come when that class of weeds will be completely destroyed. They would be destroyed in a single year, but for the fact that many of the seeds, because of the oily coating in which they are encased, have great power to resist the influences of decay, hence they may remain in the soil for years, and yet retain their vitality. The effort then in destroying annuals, should be first, to prevent them from maturing seeds, and second, to adopt such modes of cultivation as will most quickly force them into germination, that they may be destroyed. These modes include autumn cultivation and the growing of root crops. Biennials complete the cycle of their existence in two years. many of them are characterized by a tap root which goes deep into the soil. During the first year large quantities of starch are stored up in the root, and this is utilized during the second year in producing an abundance of seeds. It follows therefore, that any mode of destruction that may be adopted that will prevent this class of weeds from reproducing seeds, will also, in time, effect their destruction. This class of weeds cannot well resist the influence of good cultivation, hence we find them most common in old meadows, pastures, along road-sides, and in by-places generally. In such places persistent cutting must be resorted to.

Perennials live from year to year. Of these there are two classes—the simple, and the creeping perennial. The simple perennial is reproduced from seed only. The ox-eye daisy is a type of this class. The creeping perennial is not only reproduced from seed, but is also propagated by means of rootstocks, which push through the soil. These rootstocks are filled with latent buds, each one of which is capable of sending up a fresh plant under favorable conditions. These favorable conditions are heat and moisture, and a fresh impulse is also given to growth when any disturbing influences, as breaking off from the parent stem through cultivation, is brought to bear upon the roots. Hence it is, that cultivation in moist weather is more likely to promote than to hinder their increase. The Canada thistle furnishes a familiar example of a creeping perennial. In destroying perennials, we must labor to smother them, or to bring the roots to the surface by cultivation, where they will perish by exposure. Any mode of destroying them will be found effective in one season, that will prevent them from breathing through the leaves for several months in the season of growth. But where the attempt is made to destroy them by cultivation which is only partially effective, the residue of the plants left in the land are given exceedingly favorable conditions for development, owing to the loose condition in which the soil is left. Whenever the attempt is made, therefore, to destroy creeping perennials, they should be crushed out, root and branch, in one season. They will come again through seeds that will linger in the soil, but due watchfulness will soon succeed in removing them.

2. *Drop certain crops out of the rotation.* In the war with weeds it is usually greatly advantageous to drop out of the rotation for a time, such crops as allow the weeds which infest them to ripen. Some weeds, as for instance pigeon weed and wild flax, ripen their seeds early, as in winter wheat and hay crops. Others, as ragweed, ripen their seeds late, as in the second cutting of clover. In combatting these various classes of weeds, therefore, the work will be greatly facilitated by dropping the crop out of the rotation for a time in which the weed ripens. As many weeds, however, grow in every variety of crop, this mode is not so applicable to them.

3. *Adopt methods of eradication to conditions of soil and climate.* These conditions have an important influence on the growth of weeds. The Canada thistle for instance, can be destroyed in clay soils with a stiff subsoil, by turning the land into pasture and mowing them twice a year at certain seasons for a limited number of years. On other soils of more open texture, this mode of eradicating them would not succeed.

4. *Allow no seeds to mature.* We should not allow any seeds to mature where it is possible to prevent it. It may be very difficult to accomplish this at first, when we undertake to clean a farm, but generally speaking it may be largely prevented by modifying the rotation for a time. The specific modes of hindering weeds from ripening will vary with the species of the weed, and also with the crop. These will be given in part at least, in a subsequent portion of this Bulletin.

5. *Exercise Care in purchasing Seeds.* The necessity for exercising great care in the purchase of new seeds will be apparent, when we call to mind that it was through this medium that nearly all the foreign weeds came to us that we now possess. They should not only be purchased from reliable seedsmen, but where their presence is detected, they should at all hazards be removed before sowing the grain. They are oftener carried in the seeds of clovers and grasses than in those of cereal grains, hence a particular care should be exercised in the introduction of these.

6. *Give Threshing Machines due Attention.* When these come from farms infested with weeds, they should be thoroughly swept before commencing their work, and also allowed to run for a little time when empty to further clean them. Sometimes it is thought advisable for a number of farmers to protect themselves from invasion, by clubbing together and purchasing machines to do their own threshing.

7. *Give Attention to Screenings from the Fanning Mill.* It may be wise in many instances to burn the chaff and screenings which are of little or no value, that have come from winnowed grain. The inferior portions of the grain, usually termed screenings, may be boiled or ground before being fed.

8. *Grow Hoed Crops as far as practicable.* Hoed crops should be freely grown as far as possible, more especially during the cleaning period. Opportunity is thus given for combatting almost any form of weed life, at almost any period of the growing season. The frequent stirring of the ground is very helpful to the germination of the seeds in the same. Hoed crops are much more effective as aids in destroying weeds when due attention is given to the cultivation as late as this may be done without injury to the crop.

9. *Grow Clover and Lucerne.* Of the different varieties of clover, the common red is decidedly the most useful for purposes of weed destruction. But few kinds of weeds ripen before this variety of clover, and as it may be cut twice in the year, it is specially helpful in the fight with perennials. Its smothering tendencies are no less helpful when it is a good crop. Lucerne is even more valuable than clover for the purpose indicated, as the cuttings of the lucerne are

more frequent than with clover. Sometimes it may be cut as frequently as four times a year, but not always. But it can only be grown on certain kinds of soil, hence its use for the purpose indicated is somewhat circumscribed.

10. *Keep the land Growing Crops* In the conflict with weeds the land should be kept busily at work. With some kinds of soil we can easily get two crops a year, and where this is practised, the process will be found very helpful in destroying weeds. The nature of these crops will depend largely upon climate, soil, and the requirements of the farm.

11. *Stimulate Growth.* Weeds can much more easily be kept in check where the land is stimulated to a vigorous production. When the growth of the crops is strong, more especially early in the season, many forms of weeds are left behind in the race. Growing good crops is another name for good farming, hence good farming is in itself a great hindrance to the multiplication of weeds. The spread of weeds is always much more rapid in impoverished farms.

Growth may be stimulated by improved cultivation, by the application of manures, artificial or homemade, and by growing catch crops for turning under.

12. *Give Attention to Autumn Cultivation.* By autumn cultivation we mean, the tilling of the soil after harvest, with a view to the destroying of weeds. No other mode of destroying weeds will probably be found so efficacious for the outlay as this. As soon as the crops are removed, the land that is not sown to grass should be gang-plowed. All weeds that are then growing above the surface are turned under. The seeds of others lying in the soil are encouraged to germinate, and these in turn are again destroyed by harrowing or cultivating, or by the late autumn plowing that precedes the advent of the winter. Catch crops may sometimes be grown on lands plowed at this season.

13. *Do the Work Thoroughly.* When the eradication of weeds is undertaken, it should be as complete as possible, and done in the shortest possible time. The cheapness of the process is usually in direct proportion, first to its completeness, and second, to the brevity of the period occupied in doing it.

14. *Maintain Cleanliness when Secured.* When cleanliness has been secured, it should be maintained from year to year. To effect this two things at least require to be done. The general management of the farm must be good, that good crops ordinarily may be grown, and every portion of it must be gone over once or twice a year with the spud, except the part devoted to hoed crops. When lands have once been made fairly clean, one person will have no difficulty in going over ten acres a day with the spud, and removing from the same all noxious forms of weed life. We have proved this over and over again in our own experience.

15. *Costly Methods.* Two modes of destroying weeds are frequently adopted which are good in themselves, but which we do not favor, because of their costliness. We refer to the bare fallow process, and to the destroying of the seeds through the fermentation of the manure. Both are very expensive, the former in the labor involved, and the latter in the loss of much nitrogen in the manure.

SPECIFIC MODES OF DESTROYING OUR MOST TROUBLESOME WEEDS.

Nearly all the modes of destroying the different weeds treated of under this heading we have proved in our own experience. Sketches of each weed have been prepared from living specimens, which show the habits of root growth as well as of the portion above ground. We shall speak of eleven of the more troublesome weeds that disturb the agriculture of Ontario. These are the Canada Thistle, the Corn Sow Thistle, Couch Grass, the Ox-Eye Daisy, the Burdock, Blueweed, Wild Mustard, Wild Flax, Pigeon weed, Ragweed and the Wild Oat.

The Canada Thistle.

The Canada Thistle (*Cirsium arvense*), is a creeping perennial, which grows to the height of two to four feet, according to the character of the soil. It is so universally known in this country, that nothing more needs to be said in regard to its appearance.

This weed comes up early in May, and continues to grow until the time of severe frost in autumn. It comes into blossom in July and August, and also matures its seed in these months, but more especially in August.

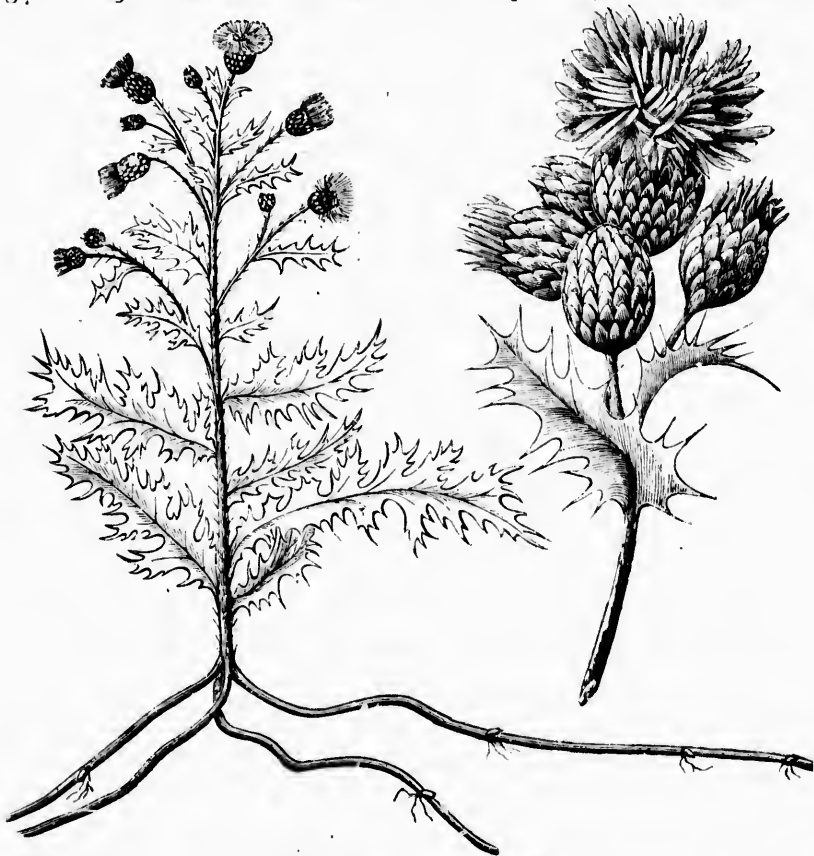
The Canada Thistle will grow in nearly all kinds of soils, but in mucks, with moist bottoms, it does not find a congenial home. It grows amid all kinds of crops, and the seeds ripen along with all the cereal grains, several of the clovers, timothy, and other grasses.

It is propagated by means of the seeds, and also through the medium of rootstocks, more especially the latter. The rootstocks, which penetrate the soil horizontally to great distances, are filled with latent buds, which, when the roots become broken, as by the disturbing influences of cultivation, at once spring into vigorous life. The seeds are not only wafted incredible distances with the wind, but they are also scattered through the medium of the seeds of all kinds of cereal grains and some of the clovers and grasses. They are also carried in the manure,

The following are some of the modes of dealing with this intruder :

1. Drop out of the rotation so far as practicable all such crops as allow the thistle seeds to ripen before these are cut, until infested fields have been dealt with.

2. Plow the land immediately after harvest. Plow shallow with any kind of plow that will cut the thistles off clean without breaking off the creeping rootstocks. Keep the thistles from breathing above ground until the late autumn plowing, which should be



Canada Thistle (*Cirsium arvense*.)

deep, for the sake of the crop which is to come after. In the spring keep the thistles under by the use of a suitable cultivator, until the time of planting a crop of corn, roots or rape. Give the crop thus planted the horse hoeing necessary to keep down all weed growth, and also keep the thistles cut out of the line of the rows by hand hoeing. Go over the crop if necessary once or twice after the horse cultivation ceases, and there should not be one thistle left. The most effective part of the work has been done the preceding autumn providing the weather at that time has been dry.

3. Plow the ground deeply in August. Sow rye early in September at the rate of $2\frac{1}{2}$ to 3 bush. per acre, and cut the following spring for winter fodder. Then plow the ground deeply with any kind of plow that will effectually bury the stubbles. The jointer with skimmer will answer very well. Then roll at once to conserve the moisture. Harrow once a week until it is time to drill the ground for rape. Drill about the last of June or first of July by using the double mould board plow. The drills may be 22 to 24 inches apart. Sow at once with rape by using the ordinary turnip drill and then cultivate and care for as described in section 2 above. In our experience at this farm we have found this mode of destroying the Canada Thistle to be very effective.

4. Plow under pasture land in June, or land from which a crop of hay has been removed early in July. Work the land thus plowed upon the surface, so that all thistles will be kept under until the time of sowing winter wheat. Sow the wheat with clover and repeat the process if necessary, after having cut one, two or three crops of the clover. This method is applicable to stiff soils, where winter wheat can be grown. In sections where winter wheat will not grow, substitute for it rye, spring wheat or barley, as may be desired.

5. Where the land has been sown to clover, cut the crop twice for hay, or once for hay and once for seed. Then follow with a hoed crop properly cultivated. The smothering influences of the two crops of clover in one season, and then two cuttings, are very helpful in reducing the thistle.

6. When the thistles are well brought under they should be kept so by the use of the spud. The grain fields should be gone over before harvest to prevent the thistles from blossoming, and after harvest the meadows and fields sown to grass. So far as the destruction of the thistle is concerned, spudding after the blossoming season is more effective than when this is done sooner. Two or three cuttings with the spud after harvest punish the thistles very badly. We have found that by spudding two or three times a year in the autumn, the thistles soon disappear from the fence borders and by-places generally.

7. In removing thistles from permanent pastures, we must be governed by the character of the soil and subsoil as to our mode of procedure. On stiff clays two or three cuttings a year with the scythe or mower for a limited number of years will suffice, but in open subsoils the spud will have to be resorted to. The first cutting however may be done with the scythe, just before the thistles reach the blossoming stage.

The Sow Thistle.

There are several varieties of this weed, some of which do not give serious trouble to cultivation. It is not an easy task to classify the different varieties, but it will be sufficient for our purpose here to confine our remarks to the variety known as the Corn Sow Thistle (*Sonchus arvensis*), which is by far the most troublesome of this family of plants. The Corn Sow Thistle is a creeping perennial. The plant has an upright habit of growth. It grows to the height of one to three feet and sometimes it attains to a greater height when the soil is congenial. Like the Canada Thistle it is somewhat branched toward the top. The stems are rather hairy or bristly, especially the flower stems. The prickles upon the leaves are harmless. The stems are hollow, and when wounded a milky juice exudes from them. The blossoms are yellow and the plants are great producers of seed.



Sow Thistle (*Sonchus oleraceus*.)

The corn sow thistle makes its appearance in May, and continues to grow until autumn. It blossoms in July, and matures its seeds in July, August and September. It will grow in any kind of soil, but is most at home in rich moist loams, and it gives the least trouble in stiff clays.

This weed infests all kinds of crops, and it ripens its seeds somewhat earlier than the crops amid which it grows. The only exceptions probably are red clover and lucerne. It is propagated by means of the seeds which float about in the air, owing to the downy attachment which they possess, and as the seeds are very numerous, they increase very fast in the neighborhood of where they are allowed to ripen. This plant also propagates rapidly by means of its numerous rootstocks, which contain a very large number of buds, as shown in the sketch. The seeds are also conveyed in those of grains and grasses.

The modes of destroying this intruder are essentially the same as those given for the eradication of the Canada thistle.

Couch Grass.

Couch grass (*Triticum repens*) is known by a great variety of names, of which quack grass is the most prominent. It is a creeping perennial, the rootstocks of which are so numerous that they soon fill the soil. They resemble considerably the roots of June grass (*Poa pratense*), but they are much larger and stronger and more vigorous in every way, and they are very much more tenacious of life. The rootstocks are so strong and unyielding, that they have been known to push their way through the tuber of the potato. The stems grow about as high as those of timothy, and each one is terminated by a slender spike or head, from two to several inches long. The leaves bear much resemblance to those of timothy, but are somewhat larger.

Couch grass makes a good growth early in the season, and it also furnishes considerable aftermath. It matures its seeds in August. It will grow in almost any kind of soil, but is much more partial to loams and soils of a decidedly open texture. It is least at home in stiff clays, and in these it is much more easily destroyed.

This weed grows in all kinds of crops from early spring until late autumn, and so long as the period of growth continues, the work of propagation goes on through the medium of the roots. Its power to crowd out other crops where it gets a footing is very great.

Couch grass is propagated through the medium of the seeds as well as through that of the rootstocks. As the seeds ripen along with those of nearly all the cereal grains, it is distributed by means of these, and also through the medium of the seeds of various clovers and grasses. The seeds are also distributed in the manure. When the attempt is made to destroy couch grass, effective work should be made of it in a single season.

The following mode of dealing with it will be found successful, unless in seasons that are unduly moist :

Plow lightly after harvest, then harrow with the ordinary harrow, and if necessary use the spring tooth cultivator to shake the roots of the grass free from the soil. Then draw them into light winrows with the horsrake, and when dry enough burn them. If the weather should not be dry enough for this, the rootstocks can be



Couch Grass (*Triticum repens.*)

carted into the compost heap. Repeat the process a second time, and even a third time the same autumn if the weather will admit of it, plowing more deeply every time to bring up fresh rootstocks. But in any case do not continue the work in wet weather, else the labor will be lost. When the late autumn arrives, rib the land by turning two furrows together from opposite directions, or plow [so that the

largest possible amount of surface will be exposed to the action of the frost in winter. The frost has the effect, first, of killing the roots of the exposed portions, and second, of freeing them from the adherent soil. In the spring, use the harrow and cultivator occasionally in time of dry weather, and in case of need also the horse-rake, until it is time to plant corn, roots or rape. [Cultivate this hoed crop properly, giving it what hand work may be necessary along the line of the rows, and by the autumn the couch grass should be all gone, unless the season has been a wet one.

In the fence borders it will be difficult to dislodge this grass without removing the fence for a time, and subjecting the ground to a cleaning process by means of cultivation. Another way when it is found in but small patches would be, to pile manure or straw upon it, and leave the same on long enough to smother it.

The Ox-eye Daisy.

The Ox-eye Daisy (*Leucanthemum vulgare*), is a simple perennial, with a branching habit of growth. It grows from one to two feet high, according to soil and crop conditions, but it is usually not more than one foot in height. It produces large flowers, bordered by white rays. The fancied resemblance of the disc in the center to the eye of an ox has probably originated the name.

The ox-eye daisy is a very hardy weed. It commences to blossom early in June, and under some conditions, will blossom as late as September. The seeds possess the power of maturing on the stalk, though the latter be cut before they are quite ripe. Although the plants appear singly at first, if allowed to ripen their seeds, they fall and grow again so thickly, that spudding is impossible, hence in pastures, along road sides, and in bye places where cultivation cannot be introduced, this weed is extremely difficult to eradicate. Live stock will to some extent browse it off when it is young, but they do not relish it, owing to its woody character.

It grows in all soils, but is more vigorous and troublesome in those of loose texture. It infests all kinds of crops, and also road sides and pastures. It is more difficult to dislodge it from meadows than from any of the other crops of cultivated soils, and more especially as they grow older, as the roots of the plants become interlaced. It is least troublesome in hoed crops.

This weed is propagated entirely by means of the seed. It is more commonly brought in the seed of timothy and some kinds of clover, but is also conveyed through the medium of cereal grains. It is often taken from field to field on the farm in the manure, and is carried to some extent by birds.

The following include the principal methods of destroying the ox-eye daisy :

1. Drop meadows out of the rotation until the infested fields have been dealt with. Adopt the same plan with permanent pastures where this may be at all practicable.
2. Grow a crop of rye, followed by rape, as described in section 3, when treating of the modes of destroying the Canada thistle.



Ox-eye Daisy (*Leucanthemum vulgare.*)

3. Pasture meadow land until the middle of June. Then plow deeply, and sow with rape in drills. Cultivate the rape with sufficient care. It may be necessary to follow with a crop of corn or roots.
4. Plow lightly after harvest, and then deeply before winter. Give one or more harrowings in the interval before the final late plowing, to destroy weeds that may germinate, and follow with one or two hoed crops well cared for.

5. Sow with rye and pasture until June, or cut for hay. Follow the rye with a crop of millet, or if desired, work the ground on the bare fallow system until winter wheat may be sown in September.

General observations: 1. After cultivation with a view to the destruction of the daisies, the ground should be sown with grass seeds in the crops which come after. These crops should be gone over with the spud, and any daisies found in them destroyed. The same course may be necessary in the meadow which comes later, more especially the first year. 2. In places which cannot be cultivated, and along fence borders, it is difficult to deal with this pest. Any plan that will prevent it from maturing seeds will doubtless prove effectual, but several years would probably be required to eradicate it by this method.

The Burdock.

The burdock (*Lappa major*), is so common, and at the same time so easily managed, if the work of destroying it is gone about properly, that it would seem almost superfluous to write about



Burdock (*Lappa officinalis*.)

the modes that will prove effective in exterminating it. Notwithstanding, it is one of the most universally widespread weeds that we

have. The burdock is so well-known, that we need not dwell upon a description of it. The sketch below illustrates its habits of growth.

As the burdock is a biennial, the first year it does not produce any seeds. It sends a strong tap root down into the soil, hence it is not easily injured by dry weather. It comes into flower chiefly in the months of June and July, but more especially in July. When cut above the crown, even after seed pods are formed, young shoots will be thrown up around the parent stem, and seed matured in some instances within a few inches of the surface of the ground, and long after the usual time for producing seed.

This weed will grow in nearly all soils free from ground water. It is much prone to get a foothold along the fence borders and in bye places of the farm, but does not give very much trouble where the land is well cultivated. It is propagated solely by means of the seed. It is more commonly carried from place to place through the medium of domestic animals, to the hair and wool of which the burs have become attached.

The burdock may be destroyed as follows :

1. In grain and hay fields the reaping or mowing, as the case may be, will prevent the plants from maturing seeds at the usual season. If the fields are gone over later with the spud or some such implement, and the plants are thus cut below the crown, they must die.

2. In bye places as fence sides, lanes, around buildings, and in pastures, they should be destroyed by the use of the spud. The cutting may be done at any time of the year when the ground is not frozen, and will in all cases prove effective in destroying the plants, when they are cut below the crown. Farmers who go over their fields twice a year with the spud, will soon have no burdocks.

Blue-weed.

Blue-weed (*Echium vulgare*) is a biennial. It is upright and spreading in its habits of growth, as it has several branches, and it grows to the height of one to three feet, according to the character of the soil. The leaves and stems are covered with numerous hairs, which stiffen with the advancing growth of the plant. The blossom is a deep blue.

Blue-weed sends a strong tap root down deep into the ground the first season, and from this branch off several smaller roots. During the second year the strong plants come into bloom in June, and the weaker ones later, hence the period of bloom extends into the closing days of September. When cut off above the surface during the second year, new shoots at once branch out, and some of them hug the ground so closely, that they are not easily cut clean with the scythe or mower.

This weed grows in various kinds of soil, but its favorite feeding grounds are those which contain much lime. It grows vigorously in gravelly soils, even in some of those used in road making. It is not very troublesome in cultivated areas, but along highways and in pastures, and bye places, it is sometimes a great pest.

Blueweed is more commonly propagated through the agency of the winds, which blow the seeds over the crusted snows both far and near, as the seeds frequently remain in the receptacles wherein they grew on into the winter.



Blue-weed (*Echium vulgare*.)

The following methods will be found effective in combating this weed :

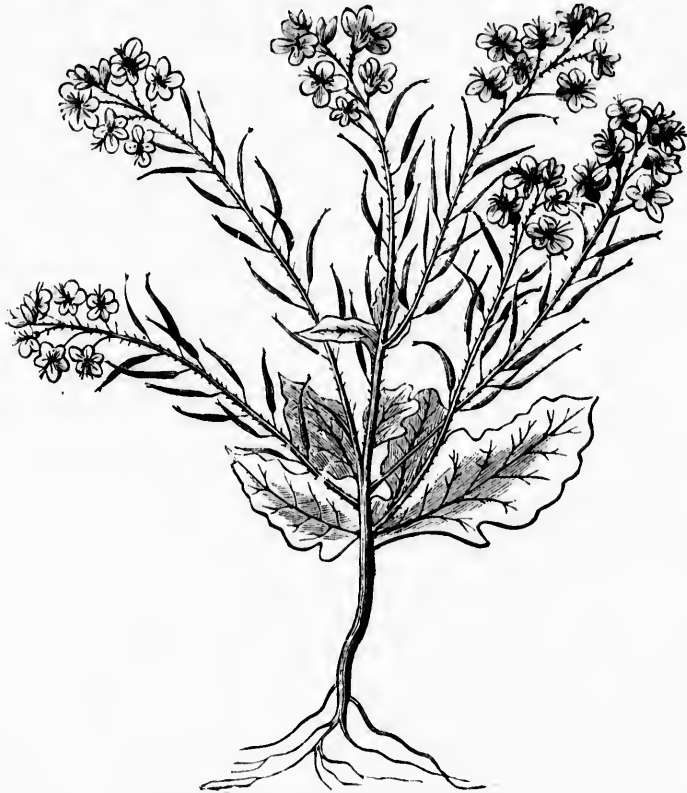
1. Really good cultivation will keep it from getting a foothold to any great extent in cultivated fields. When stray plants put in an appearance, the spud is the most efficient agent in removing them, unless the ground is to be broken up the same season. When cut off at any stage of its growth below the crown the plant must die.

2. In permanent pastures, along roads, and in bye places, any mode of cutting that will prevent the plants from going to seed will remove them in a few years.

3. When fields containing blueweeds are pastured closely during the early part of the season, the growth of seed will be very much hindered. But this agency will not alone suffice to eradicate it.

Wild Mustard.

Wild Mustard (*Sinapis arvensis*), is one of the most difficult of weeds to dislodge where the plants get an extensive foothold. Owing to the extraordinary vitality of the seeds, it requires many years to destroy all the plants, as they continue to come up in the successive crops. This plant is more or less branched, and has a bright yellow



Wild Mustard (*Brassica Sinapistrum.*)

blossom, which can be seen long distances away. In the early stages of the growth, the plants resemble those of the radish or fall turnip. The seeds cannot easily be identified from turnip or rape seed.

Wild mustard is an annual. It comes up early in the season and grows rapidly. The seeds continue to germinate as long as the season of growth lasts. It matures an immense number of seeds in pods

about an inch in length. The first flowers appear early in June, and the late plants will produce seeds on into September. Usually it is about eighteen inches high, but sometimes it grows considerably higher. As it cannot withstand severe frosts, it is not found to any considerable extent in meadows, or pastures, or winter grains as wheat or rye.

This plant will grow in any kind of land, but not equally well. It is most at home in friable limestone soils, that possess good drainage, but it will also grow in great luxuriance on prairies containing much humus.

It grows vigorously in all kinds of grain crops sown in the spring, and it usually ripens its seeds before the grain is ripe amid which it grows.

Wild mustard is propagated by means of various agencies. Some of the seeds are carried by birds, but usually they find their way to new centres in seed grain. The threshing machine carries them from farm to farm. They are also carried in the droppings of cattle and in the manure.

The following are among the more effective modes of fighting this weed :

1. Drop out of the rotation, as far as possible, the spring crops amid which the mustard grows, until the infested fields have been subjected to a cleaning process. Grow hoed crops at the same time to the greatest extent possible.

2. Grow rye followed by rape, as described in section 3, when speaking of modes of destroying the Canada thistle. Follow the rape with barley or spring wheat sown with grass seeds. If the mustard plants in the spring grain are not too numerous, remove them by hand, otherwise cut the crop for fodder before the mustard is ripe. Where necessary, follow the meadow or pasture as the case may be, with a crop of corn, managed as described in section 3, given below. Spring grains sown with grasses should follow the corn.

3. Give careful attention to autumn cultivation. This reduces the number of the seeds in the upper layer of the soil. Plow deeply before winter for the sake of the crop that comes after, and to expose another section of the soil. Cultivate carefully in the spring until time to plant corn or to sow rape. Follow the hoed crop with spring grain sown with grasses. If thought necessary, a second hoed crop may follow the first before sowing with grass seeds.

4. Sow with rye in autumn, as described in section 2. Cut the rye for hay or ensilage, or plow it under for a green manure. Then cultivate occasionally after the ground has been plowed until the time for sowing winter wheat or rye. The wheat or rye, as the

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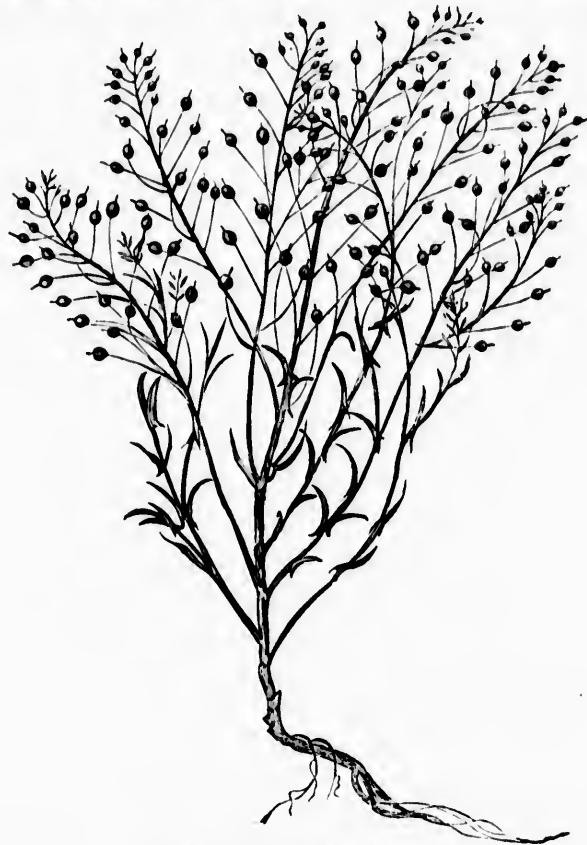
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case may be, should be sown with grass seeds. The few plants which may grow in the wheat or rye, may be removed by hand. Whatever method may be adopted at first, hand pulling must be resorted to before the work can be completed.

Wild Flax.

Wild Flax (*Camelina sativa*), sometimes known as False Flax, is an annual which usually grows about eighteen inches high, but sometimes it grows considerably higher, and when in thick masses many of the plants attain the height of only a few inches. After



False Flax (*Camelina sativa*)

the blossoming stage the upper portion of the plant consists mainly of stems and seed pods, as shown in the sketch. The blossoms are small, and of a pale yellow color.

This plant is very hardy, and can well withstand the influences of frost. It is more inclined to come up in the autumn. The seeds, which are very numerous, are easily shed. They have some resem-

blance to the seeds of the common flax, but are much smaller. It is a weed that will grow in any kind of soil adapted to the growth of winter wheat or meadows.

Wild flax infests winter wheat, rye, meadows and pastures. It does not usually grow to any considerable extent in spring crops. When thus found the plants may have germinated in the autumn.

This plant is propagated in the seeds of the crops amid which it grows, in the farmyard manure, and also to some extent in the droppings of cattle. But the seeds are carried to a greater extent in timothy seed than in that of any other crop.

The following include the principal modes of destroying it :

1. Modify the rotation by dropping out of it for a time in the infested fields such crops as winter wheat, rye and meadows. Grow spring crops instead. One of those may be a hoed crop.

2. Grow two hoed crops in succession when the other conditions will admit of this.

3. Grow rye followed by a hoed crop ; but the rye must not be allowed to ripen.

General observations. 1. In the conflict with this weed grass seeds should invariably be sown along with spring grains, as wheat or barley. 2. Autumn cultivation is all important, owing to the natural tendency of the weed to germinate at that season. 3. When wild flax is found only in certain patches in meadows, the infested parts may be cut and used for soiling purposes. 4. When Lucerne can be substituted for meadow, the first cutting would take place before the flax is ripe.

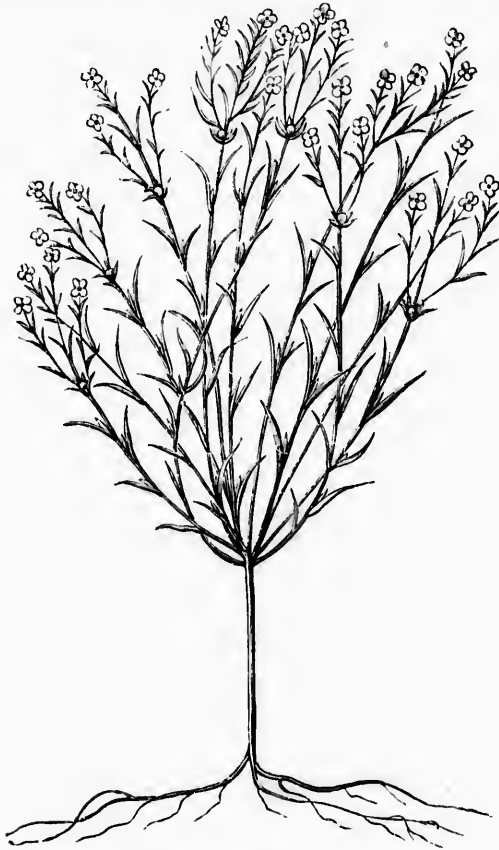
Pigeon Weed.

Pigeon weed (*Lithospermum arvense*), sometimes called Red-root, like wild flax is an annual. It usually grows from eight to sixteen inches high, but sometimes in rich soils it is considerably taller. It is more or less branched in its habits of growth. The leaves have a somewhat lighter tinge than those of cereal grains and grasses. The flowers are small, and of a pale white color. The seeds are abundant. They cluster along the stems, and they are possessed of much vitality.

Pigeon weed, like wild flax, usually comes up in the autumn of the year previous to that in which it matures its seeds. The blossoms appear during the latter part of May and early in June, hence the seeds ripen before our meadows and winter cereals are cut. Its presence is most easily detected just when it is coming into bloom. It will grow in any kind of soil that is dry, but is most partial to sandy loams.

This weed is troublesome only in crops which mature their seeds early, and which have been sown the previous year. These include winter wheat, rye and meadows, and it is also found in pastures.

Pigeon weed is more commonly propagated through the medium of seed grains, as those of wheat and rye, and of grass seeds, as those of timothy, mammoth clover and alsike clover. It is not carried in.



Pigeon Weed (*Lithospermum arvense.*)

the seeds of common red clover. Other agencies in this work are birds, quadrupeds, and threshing machines. It is also distributed in the manure.

The more effective modes of fighting this weed are essentially the same as those given when treating of wild flax, as these two weeds bear much similarity to one another in the crops which they infest, and also in their habits of growth.

Ragweed.

Ragweed (*Ambrosia Artemisioefolia*) is an annual which possesses a slender and much branched stem. There are several varieties, but the one shown in the sketch is by far the most troublesome. It more commonly grows to the height of 15 to 21 inches, though in some soils, under favorable conditions, it will grow to the height of four feet. The leaves are much serrated in the outer edges,



Rag Weed (*Ambrosia 'Artemisioefolia.*)

hence the name. The blossom has something of a yellowish tinge. The buds are small and round and dark in color when ripe, are very numerous, and are chiefly produced on the outer portion of the branches. They are so light that they float readily in water, and are possessed of great vitality.

Ragweed grows late rather than early in the season, so much so that it does not usually ripen its seeds in the cereal crops or in meadows before they are reaped. But in the stubbles, of these the plants continue to grow if not disturbed. They blossom from July onward until the time of frost, according to the attendant conditions of growth.

Ragweed will grow in all soils free from stagnant water, but it very much prefers friable and loam soils, containing a large amount of humus. It revels in black loams and mucks, but does not make much headway in stiff clays. It matures its seeds in the stubbles after the crops have been removed, in late grain crops, and in clover cut for seed.

It is propagated in the seeds of late maturing cereals, mammoth and alsike clover, and timothy, but more especially in common red clover. The seeds are also distributed by threshing machines, birds, the domestic animals of the farm, and in manures. But no agent is probably more potent in distributing it than water in time of freshets.

The following include the more effective modes of destroying ragweed :

1. Modify the rotation suitably, and give special attention at the same time to autumn cultivation. As soon as the cereal crops are reaped, the ground should be gang-plowed, or plowed in any way that may be desired. It may then be stirred occasionally before the late fall plowing. Autumn cultivation is particularly helpful in the destruction of ragweed.

2. Grow hoed crops as described in section 3, when treating of wild mustard.

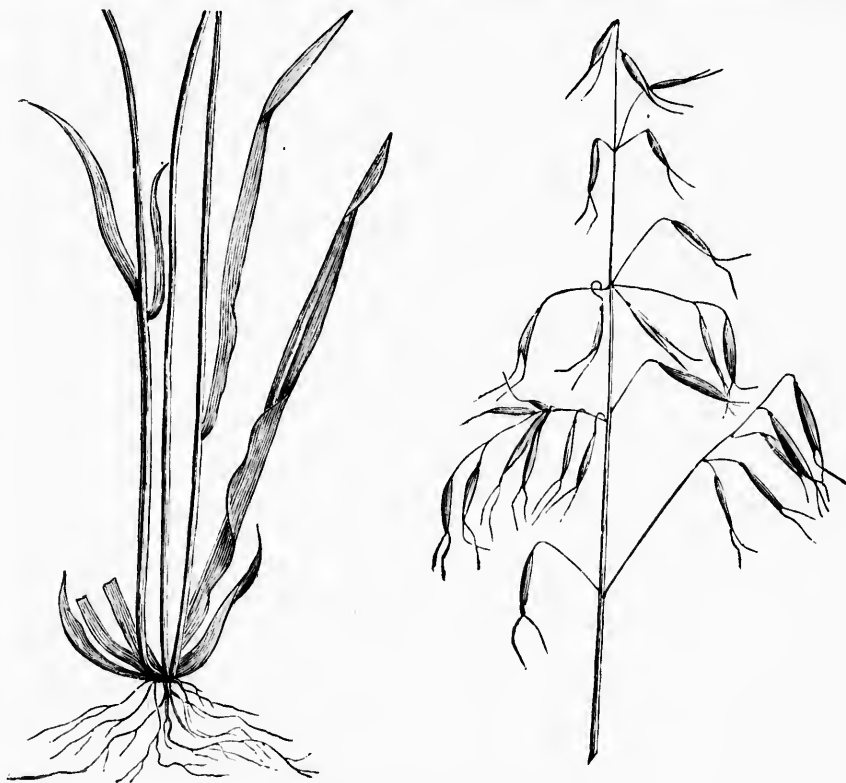
3. Use the mower in the autumn. This can be done when fields are newly sown with grass seeds. Pastures and meadows may be treated in the same way. This will prevent the seeds from ripening in these.

General observations. 1. When infested meadows or pastures are to be broken up, this may be done, where practicable, before any of the seeds ripen. 2. When the plants are well reduced, hand spudding will soon complete the extermination of this weed. 3. Sheep may be made to render substantial service in cropping this weed while it is yet tender.

The Wild Oat.

The wild oat (*avena fatua*) is an annual. It bears considerable resemblance to the common oat, but there are some distinctive points of difference. In the wild oat the chaff scales which adhere to the grain are thick and hairy, while in the cultivated varieties,

they are not so coarse and are hairless. The wild oat has a long, stiff awn, usually twisted near the base; in the cultivated varieties this is entirely wanting, or if present, is not so stiff and is seldom bent. The grain itself is light, being chiefly made up of hull.



Wild Oat (*Avena fatua*.)

This plant matures its seeds in crops of winter wheat, rye and all kinds of spring cereals. It so closely resembles the cereals amid which it grows until the time of coming out in head, that it is practically impossible to remove it by hand before that time, unless when found growing in a crop of peas. It luxuriates in soils well adapted to the growth of cereals, as clay loams, but will grow in nearly all kinds of land. The seed possesses great vitality.

This weed is brought to new centres chiefly through the medium of the seeds of cereal grains, but it also comes down at time of high water from infested fields to lower levels. It is further distributed to some extent in the manure, in the droppings of cattle and through the medium of the threshing machine.

The following modes of combatting the wild oat will be found effective :

1. Grow hay, pasture, fodder crops and hoed crops as much as possible until the oats are much reduced, and drop cereal grains out of the rotation so far as practicable for the time being.

2. Break up sod land in the month of June. Cultivate and harrow occasionally until the time of sowing winter wheat, that the seeds of the oats may be induced to germinate in the upper section of the soil. Sow the wheat with grass seeds, and when the meadow is broken up again repeat the process.

3. Give attention to autumn cultivation, and follow with a hoed crop, as described in section 3, when treating of wild mustard.

4. Grow a crop of rye for fodder, ensilage or pasture, as the case may be, plow the land in June, and manage as described in section 2, above.

5. Cultivate in the autumn, sow early in the spring with oats, peas and vetches, and cut and cure as a fodder crop, and follow this with autumn cultivation, or with a crop of rape grown in drills.

AN ACT TO PREVENT THE SPREAD OF NOXIOUS WEEDS AND DISEASES AFFECTING FRUIT TREES.

R. S. O. 1887, chap. 202, amended by Vic. 53, chap. 59; and by Vic. 54, chap. .

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows :

1. Where used in this Act the term "non-resident land" shall apply to a lands which are unoccupied, and the owner of which is not resident within the municipality, and the term "resident lands" shall apply to all lands which are occupied or owned by persons resident within the municipality.

2. It shall be the duty of every occupant of land, or, if the land be unoccupied, it shall be the duty of the owner—

(1) To cut down and destroy all Canada thistles, ox-eye daisy, wild oats, rag-weed and burdock growing on his land, and all other noxious weeds growing on his land, to which this Act may be extended by by-law of the municipality, so often each and every year as is sufficient to prevent the ripening of their seed, provided that such cutting or destruction does not involve the destruction of the growing grain.

(2) To cut out and burn all the black-knot found on plum or cherry trees on his land so often each year as it shall appear on such trees; and

(3) To cut down and burn any peach, nectarine or other trees on his land infected with the disease known as the yellows, and to destroy all the fruit of trees so infected.

3.—(1) The council of any city, town, township or incorporated village may, by by-law, extend the operation of this Act to any other weed or weeds, or to any other disease of grain or fruit trees or fruit which they declare to be noxious to husbandry or gardening in the municipality; and all the provisions of this Act shall apply to such noxious weeds and diseases as if the same were herein enumerated.

(2) Such council may and, upon a petition of fifty or more ratepayers, shall, appoint at least one inspector to enforce the provisions of this Act in the municipality, and fix the amount of remuneration, fees or charges he is to receive for the performance of his duties; and in case a vacancy shall occur in the office of inspector, it shall be the duty of the council to fill the same forthwith.

(3) The council of any township in which there are any large tracts or blocks of waste or unoccupied land, may upon the petition of not less than thirty ratepayers, by by-law, suspend the operation of this Act, in respect of such waste or unoccupied lands; the by-law to define with sufficient clearness the tracts or blocks of lands so exempted; such by-law to remain in force until repealed by such council; and until repealed the lands therein described shall be exempt from the operation of this Act.

(4) The council may pass a by-law dividing the municipality into such sections or divisions as may be necessary for the carrying out of this Act, and may appoint inspectors for such divisions whose duties and powers shall in all respects be the same as that of the township inspector.

4.—(1) It shall be the duty of the inspector to give or cause to be given notice in writing to the owner or occupant of any land within the municipality whereon the said noxious weeds are growing and in danger of going to seed, (and in the case of property of a railway company, the notice shall be given to any station master of the company resident in or nearest to the municipality), requiring him to cause the same to be cut down or destroyed within ten days from the service of the notice; and it shall be the duty of the inspector to give or cause to be given such notice for the first time not later than the 10th day of July in each year, or such other earlier date as may be fixed by by-law of the municipality.

(2) In case such owner or occupant of land (or, if it be railway property, then the station master upon whom notice has been served) refuses or neglects to cut down or destroy all or any of the said noxious weeds within the period aforesaid, the inspector shall enter upon the land and cause such weeds to be cut down or destroyed with as little damage to growing crops as may be, and he shall not be liable to be sued therefor; or the inspector, instead of entering upon the land and causing such weeds to be cut down or destroyed, may lay information before any Justice of the Peace as to such refusal or neglect, and such owner or occupant shall, upon conviction, be liable to the penalties imposed by Section 10 of this Act.

(3) But no inspector shall have the power to cut down or destroy noxious weeds on any land sown with grain; and where such noxious weeds are grown upon non-resident lands it shall not be necessary to give notice before proceeding to cut down or destroy the same.

5.—(1) The inspector shall keep an accurate account of the expense incurred by him in carrying out the provisions of the preceding sections of this Act with respect to each parcel of land entered upon therefor, and shall deliver a statement of such expenses, describing the land entered upon, and verified by oath, to the owner or occupant of resident lands, requiring him to pay the amount.

(2) If any owner or occupant of land amenable under the provisions of this Act deems such expense excessive, an appeal may be had to the said council (if made within thirty days after the delivery of such statement), and the said council shall determine the matter in dispute.

(3) In case the owner or occupant of resident lands refuses or neglects to pay the same within thirty days after such request for payment, the said claim shall be presented to the council of the municipality in which such expense was incurred, and the said council is hereby authorized and required to audit and allow such claim, and order the same to be paid from the fund for general purposes of the said municipality.

6. The inspector shall also present to the said council a similar statement, verified by oath, of the expenses incurred by him in carrying out the provisions of this Act upon any non-resident lands; and the council is hereby authorized and required to audit and allow the same, or so much thereof as to the council may seem just, and to pay so much thereof as has been so allowed.

7. The council of the municipality shall cause all such sums as have been so allowed and paid by the council under the provisions of this Act to be by the clerk severally placed on the collector's roll of the municipality against the lands described in the statement of the inspector, and to be collected in the same manner as other taxes imposed by by-laws of the municipality.

8. If written complaint be made to the inspector that yellows or black-knot exist within the municipality, in any locality described in such complaint, with reasonable certainty, he shall proceed to examine the fruit trees in such locality, and if satisfied of the presence of either disease he shall immediately give notice in writing to the owner or occupant of the land whereon the affected trees are growing, requiring him within five days from the receipt of the notice to deal with such trees in the manner provided by section 2 of this Act.

. It shall be the duty of the overseers of highways in any municipality to see that the provisions of this Act relating to noxious weeds are carried out within their respective highway divisions by cutting down or destroying, or causing to be cut down or destroyed at the proper time to prevent the ripening of their seed, all the noxious weeds growing on the highways or road allowances within their respective divisions; such work to be performed as part of the ordinary statute labor, or to be paid for at a reasonable rate by the treasurer of the municipality, as the council of the municipality may direct.

10.—(1) Any owner or occupant of land who refuses or neglects to cut down or destroy any of the said noxious weeds, after notice given by the inspector, as provided by section 4, or who knowingly suffers any of the said noxious weeds to grow thereon, and the seed to ripen so as to cause or endanger the spread thereof; or who suffers any black-knot to remain on plum or cherry trees, or keeps any peach, nectarine or other trees infected with yellows or the fruit of trees so infected, shall, upon conviction, be liable to a fine of not less than \$5 nor more than \$20 for every such offence.

(2) Any person who knowingly sells or offers to sell any grass, clover or other seed, or any seed grain among which there is seed of Canada thistles, ox-eye daisy, wild oats, rag-weed, burdock or wild mustard shall, for every such offence, upon conviction, be liable to a fine of not less than \$5 nor more than \$20.

(3) Any person who knowingly offers for sale or shipment or sells or ships the fruit of trees infected with yellows, shall, upon conviction, be liable to a fine of not less than \$5 nor more than \$20.

(4) Every inspector, overseer of highways or other officer, who refuses or neglects to discharge the duties imposed on him by this Act shall, upon conviction, be liable to a fine of not less than \$10 nor more than \$20.

(5) Any person who sows any wheat or other grain knowing it to be infected by the disease known as smut, without first using some proper and available remedy to destroy the germs of such disease shall, upon conviction, be liable to a fine of not more than \$20.

11. Every offence against the provisions of this Act shall be punished, and the penalty imposed for each offence shall be recovered and levied, on summary conviction before any Justice of the Peace; and all fines imposed shall be paid to the treasurer of the municipality in which the offence is committed, for the use of the municipality.

12. The council of every municipality in Ontario shall require its inspector, overseer of highways and other officers to faithfully discharge all their duties under this Act.

