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BULLETIN 188
[Revised July, 1916]

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WEEDS OF ONTARIO

BY

J. E. HOWITT, M.S.Agr.

Professor of Botany

from Bulletin 128, which was originally prepared by F. C. Harrison, B.S.A., in 1900, revised by Wm. Lochhead, B.A., M.S., in 1903 and 1906, and including Bulletin 168, "The Perennial Sow Thistle and Some Other Weed Pests," prepared by J. E. Howitt, M.S.Agr., in 1908.

TORONTO, ONTARIO, JULY, 1916

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ONTARIO AGRICULTURAL COLLEGE

(Revised July, 1916)

The Weeds of Ontario

BY J. EATON HOWITT, M.S.A., PROFESSOR OF BOTANY.

ACKNOWLEDGMENTS.

The writer wishes to state that in the revision of this bulletin much of the information about the weeds recently introduced into Ontario has been obtained from "Farm Weeds of Canada," by G. H. Clark, B.S.A., and the late Dr. James Fletcher, of the Dominion Department of Agriculture.

WHAT IS A WEED?

There are several definitions of a weed, viz.: "A plant out of place"; "Any injurious, troublesome or unsightly plant that is at the same time useless, or comparatively so"; "A plant which interferes with the growth of the crop to which the field is temporarily devoted."

INJURIOUS EFFECTS OF WEEDS.

1. They absorb soil moisture and thus lessen the supply of water available to the crop plants. "An average Mustard plant pumps from the soil about fourteen ounces, or seven-tenths of a pint, per day."
2. They use up the plant food in the soil, and thus rob the crop plants. Furthermore, they often mature their seeds before the crop plants, and during the time they are ripening their seeds draw heavily upon the plant food in the soil, and thus leave little available for the crop plants when they require it to mature their seeds.
3. They shade, crowd and choke out useful plants. Weeds frequently grow more vigorously than the crop plants, and thus often stand above them, preventing the light and air required for healthy growth from reaching them.
4. Weeds are a constant source of expense. They increase the cost of every operation, in the preparing of the land, and in the seeding, cultivating, harvesting and marketing of the crop.
5. They may interfere with the regular rotation of crops. It is sometimes necessary, on account of some particular weed, to drop some crop from the rotation entirely.

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6. Some weeds, as Water Hemlock and Horsetail, are poisonous to stock. Quite frequently reports are received of stock being poisoned by eating such weeds.

7. Milk is often tainted by the cows eating such weeds as Wild Garlic and Stink weed.

8. The market value of seed grain, clover and grass seeds is much decreased by the presence of weed seeds in any quantity.

9. Weeds often harbor or favor the development of injurious insects and fungus diseases.

10. Weeds are unsightly, and their presence detracts very materially from the value of a farm. No man cares to buy a weedy place if he can secure a clean one.

INTRODUCTION AND SPREAD OF WEEDS.

Most of the injurious weeds found in this Province have come directly or indirectly from other countries. They are brought in and conveyed from field to field and farm to farm in various ways:

1. *By the wind.* Seeds which are carried by the wind usually have tufts of fine silky hair attached to them. Such are the seeds of the Dandelion, Canada Thistle, Sow Thistle (annual and perennial), Willow Herb, and Cotton Grass. These and similar seeds are wafted to and fro, till they become attached to the soil and commence to grow. In some cases, as in the Dock and Wild Parsnip, the seeds are winged; in others the pod containing the seed has flat and extended edges, exposing much surface to the wind. The Pennycress is an example of the latter.

Some weeds are rolled along the ground by the wind. To this class belong the Russian Thistle and the Tumbling weed of the North-West. When these weeds ripen, they break off close to the ground; and, being light, they are easily carried by the wind, especially on an open prairie, and the seeds drop out as the weed rolls from place to place.

An examination of snow drifts in Dakota, a few years ago, showed the presence of many weed seeds. Thirty-two seeds of nine species were found in two square feet of a drift. In the same place it was observed that a twenty-five mile wind carried wheat seed a distance of thirty rods in a minute.

Seeds which become sticky when wet often adhere to leaves, and go wherever the leaves are carried by the wind. This is true of the Plantain.

2. *By water.* Some seeds, especially those of aquatic plants, are distributed by water. Darwin maintained that many seeds, dropping into the sea, or being washed in from the shore, might be carried nearly a thousand miles by the movements of the water without injuring their vitality. Seeds which float on the surface of water are carried to and fro by the wind till they find a lodgment and begin to grow; and many, of various kinds, are carried from high to low ground and distributed far and near by the rills and streams which flow from mountain, hill and upland after heavy rains and spring thaws. The common Speedwell and Ragweed are often distributed in this way.

3. *By birds and other animals.* Seeds are distributed by animals in a variety of ways. "It is estimated that about 10 per cent. of all flowering plants possess seeds which are dispersed by means of barbed or cleaved processes." By these barbs or processes the seeds cling to the feathers of birds and the hairy coats of animals, and in this way are carried from place to place. To this class belong the Bur, Burdock,

Hound's Tongue, Bedstraw, Cockle, and such like. And the seeds of some plants, such as Mistletoe and Meadow Saffron, exude sticky substances which cause them to adhere to birds and other animals.

In the hardened earth taken from the feet of birds, Darwin found a large number of seeds, many of which germinated; and it is undoubtedly true that seeds are often conveyed from one place to another in the dirt that clings to the feet of animals.

Seeds often pass through the stomachs of animals without being digested; and, during their passage, they are conveyed hither and thither by the animal, and finally deposited, to grow and reproduce their kind, whether of weeds or useful plants. Every farmer knows the truth of this statement as regards cattle, horses and swine; and it may be mentioned that Darwin picked from the excrement of small birds twelve kinds of seeds, which were perfect in form and germinated in nearly every instance.

Ants, locusts, and other insects also do something in the way of distributing the seeds of certain plants, including noxious weeds.

1. *By man.* Man himself, however, has most to do with the spread of troublesome weeds, chiefly through the agency of railroads, implements, farm yard manure, feed-stuffs and impure seed.

Many weeds are carried from one province or country to another in the fodder and litter used by animals in transit on railways and in grain carried by rail. More or less of the grain, litter and fodder are scattered at places along the track, and at stations where grain and animals are unloaded and cars cleaned out. Weeds thus get a start and spread to neighboring farms. The Russian Thistle was introduced in this way.

When implements are transferred from one field to another pieces of dry earth or sod are frequently dislodged, and new weed seeds are introduced. This is a common method of spreading weed seeds all over farms and throughout whole neighborhoods. Threshing machines from dirty farms are well-known sources of trouble under this head.

Fresh barnyard manure from city stables is very often full of weed seeds, and should be rotted or piled and allowed to heat thoroughly before it is applied to clean land. Wild lettuce, for example, was brought from Toronto to the neighborhood of Burlington in manure; and in this way many other pests have been distributed from towns and cities to the farms of the Province.

CLASSIFICATION OF WEEDS.

Weeds may be classified according to the length of time they live, as follows:

Annuals, or weeds which germinate, bloom, fruit and die in one year or season. Wild Mustard is an example.

Winter Annuals, which germinate late in summer or autumn, pass the winter as seedlings or immature plants, and complete the cycle of their existence by blooming, fruiting and dying during the following summer. Such are Chess and Shepherd's Purse.

Biennials, which produce leaves and roots the first year, and flowers and seeds the second year, after which they die. The Wild Carrot and Evening Primrose are familiar examples.

Perennials, which last from year to year, blooming and seeding annually. These are divided into two classes:

- (1) Those with underground creeping stems, such as the Canada Thistle.
- (2) Those with roots which do not spread underground, such as Chicory, Plantain and Dock.

It is important to know the class to which a weed belongs, as the method of eradicating an annual is often very different from that required to destroy a perennial.

COLLECTION AND IDENTIFICATION.

Not only every seedsman, but every farmer and every teacher in a rural school, should have a collection of weed seeds for reference and comparison, in order that he may be able to detect and identify such seeds when they are in grass seed, clover seed, rape seed, or any other kind of seed which is sold or offered for sale. A good collection can be easily made in the summer months. All that is necessary is a number of small bottles and a little attention at the right time. The so-called homeo-

Fig. A. Tripod Magnifier.

Fig. B. Linen Tester.

pathic vials of one drachm capacity are suitable for the purpose, but they should be carefully and plainly labelled. If they are not so labelled, the collection will be valueless.

A small magnifying glass is very useful in identifying seeds. Perhaps the most convenient glass for the purpose is the *tripod magnifier* (Fig. A), costing about fifty cents. The *linen-tester* (Fig. B) is cheaper, but yet quite serviceable.

GENERAL PRINCIPLES IN THE CONTROL OF WEEDS.

1. Never allow weeds to mature seeds. Cut those on the roadsides, headlands, in waste places and in the fence corners, as well as those in the fields.
2. Be constantly on the watch for the appearance of new weeds. Do not wait until a weed has become established before finding out what it is. It is a comparatively easy task to get rid of a few plants of Perennial Sow Thistle, but a long, tedious and costly operation to clean a field which has become overrun by it.

3. Sow only pure seed. Impure seed is dear at any price. Pure seed is the purchaser's right by law, and he should insist on having it.

4. In dealing with perennial weeds with creeping underground "roots," be careful not to harrow or cultivate through patches and drag the "roots" all over the field.

5. See that the separator is cleaned before being brought upon the farm. Burn the refuse from the separator and do not throw it on the manure heap.

6. Avoid feeding stock upon chop containing weed seeds in any quantity. Such food should be boiled before being fed.

ERADICATION OF WEEDS.

The most important points under this head are:

First, a determination to get rid of weeds and to keep the land clean.

Second, the method or methods of tillage and cropping.

As regards the latter point, the writer feels that he cannot do better than submit the method outlined by the late Wm. Rennie, whose experience of over thirty years warranted him in speaking with some confidence on the subject. Mr. Rennie's method not only cleans the land, but increases its fertility, and those who wish fuller information should consult the college reports for 1895, 1896 and 1897.

For various reasons, very few farms in the older sections of the Province of Ontario are free from weeds, and the question how to clean our lands without incurring too much expense is one of the most important which can engage the attention of Canadian farmers.

In the first place, I would say that all obstructions to cultivation, such as piles of stone, must be removed—hailed away to the woods or an out-of-the-way corner in the winter or some other slack time. Secondly, places for harboring weeds, such, for example, as snake fences, should be got rid of as soon as possible. On the Ontario Experimental Farm nearly all field fences have been removed. The outside and lane fences are almost the only ones left. Portable fences are used when required for pasturing live stock.

Annuals and Biennials. Wild oats, wild mustard seed, and some other seeds belonging to these classes, have great vitality. If down pretty well beyond the reach of the air, they will live for twenty years, and will germinate as soon as they are brought near the surface.

The best way to destroy annuals and biennials is by thorough and frequent shallow cultivation early after harvest in stubble ground and in sod plowed for the following year, and at the proper season (spring and summer) among what are called "hoed crops," that is, potatoes, carrots, turnips, mangels, Indian corn, etc. By shallow cultivation the seeds are kept near the surface, and by frequent stirring of the soil they are made to sprout; and, having sprouted, they can be killed by further cultivation. Those which sprout late in the fall are destroyed by the winter frost. It is impossible to get rid of such weeds by plowing the ordinary depth, say seven or eight inches, once in the fall or at any other time. Plow shallow (not more than four inches in sod and three inches in stubble ground), and harrow and cultivate frequently, as by each stirring of the soil fresh seed is made to sprout, and what has already sprouted is destroyed. When necessary to loosen the soil to a greater depth, use a grubber or subsoil plow.

Perennials. It is necessary to study the habits of perennial weeds to see how they grow and propagate themselves from year to year, in order to keep them in check; and a close examination of almost any of them will show that the buds, from which the young plants start are near the surface of the soil. Hence shallow cultivation, similar to that mentioned above, is the effective method of destroying them. Disc harrows cut the shallow, creeping roots into fragments, which bud and greatly increase the difficulty of eradication. Deep plowing only transplants the buds to a greater depth, and increases the trouble. Plow shallow (see preceding paragraph), and harrow and cultivate frequently, using a grubber or subsoil plow when it is necessary to stir the soil to a greater depth. As above, the cultivation must be early after harvest and throughout the fall in stubble ground and sod, and in spring and summer among corn, potatoes and root crops. Ill-timed, irregular or partial cultivation only makes all weeds grow more vigorously.

Canada thistle, perennial sow thistle, couch-grass, bindweed, etc., can be destroyed by the following method: Middle of May gang plow the land about three inches deep and harrow thoroughly. In two weeks, when the weeds are nicely up, cultivate with a common or spring-tooth cultivator provided with wide points that overlap so as to cut off every plant two or three inches below the surface. Then harrow to pull up the plants and leave them to die. In the middle of June there will be another crop, and possibly a greater number of plants, but not so vigorous as the first crop. Repeat the operations with the wide point cultivator and the harrow. In July a few delicate plants will make their appearance and will have to be destroyed in the same way. This will be sufficient for most weeds; but bindweed may need one or two extra cuttings with the wide points, and a corresponding number of harrowings.

The preceding method will clean the land, but it involves the loss of a year's crop; so it is well to add that land may be kept comparatively free from weeds without the loss of a crop, by after-harvest cultivation of all fields not in grass, begun with each field *just as soon as the crop is off* and continued throughout the fall, first by shallow gang-plowing and harrowing, and afterwards at intervals, as above, by the wide-point cultivator and the harrow. This treatment followed by a hoed crop *properly attended to* will destroy most perennial weeds and all annual and biennial seeds that are near the surface.

Note.—To Mr. Rennie's method, or methods, as above given, we would venture to add one which we have seen carried out with the most satisfactory results by Mr. Rennie on the College farm, and with marked success by farmers in other parts of the Province. It may be put in the imperative form, as follows: Sow much with red clover, in order to have a rich clover sod to plow down for all or nearly all spring crops, taking as far as possible only one crop of hay or pasture before plowing, occasionally two, but not more than two. Plow the clover sod shallow, not more than four inches, early after harvest, say the 1st to the 15th of August, and harrow at once. Let it stand a couple of weeks; then cultivate, the same way as it was plowed, two or three inches deep, with a spring-tooth cultivator. After a while, cross cultivate a little deeper. If possible, cultivate a third, or even a fourth time, going a little deeper each time. Then, if you can manage to do so, rib it up with a double mouldboard plow, as you would for a crop of turnips. When this is done the available plant food (clover roots, etc.) is preserved in the centre of the drills, the water runs off early in the spring, and the drills can be levelled with the cultivator and harrow, either for spring grain or for hoed crops.

This method will not only clean land, but will greatly enrich it.

GENERAL METHODS FOR THE ERADICATION OF WEEDS.

1. CROP ROTATION.

Crop rotation is of utmost importance in dealing with weeds. Some sharp, short rotation of crops should be adopted which will allow of the frequent use of the cultivator, the cutting of the flowers before seeding, and the introduction of a smother or hoed crop. One cannot recommend a system of cropping which will be suitable to all kinds of farming. Each farmer must select the rotation most suitable to his conditions, keeping in mind those features of rotation which will best enable him to fight the particular weed or weeds with which he has to contend.

The following short rotation is recommended for the eastern provinces by J. H. Brisdale, Director of the Central Experimental Farm.

"To destroy weeds, probably the best rotation possible is one of three years' duration, including clover and mixed hay, followed by roots or corn, the land shallow-plowed in fall and sown to grain the next spring with ten pounds of red clover and twelve pounds of timothy per acre. (When the land is heavy or clayey, the ten pounds of red clover may be replaced by six pounds of red clover and two of alsike.) If a portion of the arable land must be used for pasture, then the land might be allowed to remain under grass or hay for two years instead of one year, the second being used for pasture, thus extending the three-year into a four-year rotation. The pasture land in the four-year rotation, or the hay land in the three-year rotation, should be broken up early in August and cultivated at intervals to destroy the successive growths of weeds as they appear. The land should be again plowed, or preferable ridged, in the fall."

2. HOED CROPS.

The growing of such crops as potatoes, corn and roots provides a means by which many weeds may be effectively fought. Hoed crops alone do not give entire satisfaction in fighting creeping perennial weeds. This is due to the fact that in cultivating and hoeing the rootstocks are cut but not all destroyed, and in a short time some begin to grow again. Hoed crops, therefore, should not be depended upon alone to eradicate creeping perennials but should be used in connection with other methods as outlined further on.

3. SUMMER FALLOWING.

This method is extremely efficacious with all sorts of weeds, including the Perennial Sow Thistle. By fallowing for weeds a bare fallow is understood, or at least one which is given sufficient cultivation to prevent weeds from reproducing themselves by seeds or "roots." A neglected fallow is nothing more or less than a weed bed, and is useless and a source of contamination for every field on the farm. The chief objection to fallowing is the lying idle of the field for a season, but this is probably offset by the effectiveness of the method in dealing with such weeds as the Perennial Sow Thistle as compared with other methods which require a great deal more labor, time and attention.

4. EARLY AFTER-HARVEST CULTIVATION.

This is one of the best ways to destroy annual and winter annual weeds, such as False Flax, Corn Cockle and Wormseed Mustard. Plow shallow immediately after harvest and harrow and cultivate frequently. By the shallow plowing the weed seeds are kept near the surface, and by the frequent stirring of the soil they

are made to sprout and, having sprouted, they are easily destroyed by further cultivation.

5. SEEDING DOWN.

Fields overrun with some kinds of weeds, particularly annuals, may be cleaned by seeding to grass for hay or pasture. This method has the advantage of requiring little labor, which is expensive at the present time. Cutting the hay crop early will prevent most weeds from maturing any quantity of seed. Close pasturing, especially with sheep, will in time destroy most weeds, even perennials.

6. SHEEP DESTROY WEEDS.

A flock of sheep will do much to keep a farm free from weeds, and it is to be deplored that sheep are not more generally kept upon Ontario farms. **"When an abundance of succulent pasture of the finer grasses is provided, weeds can scarcely be said to be favored by sheep as a staple part of their diet. Sheep will, however, even when good pasture is provided them, vary their diet by nipping off seedling plants or the fresh growing parts, and the bloom with its contents of sweets from older plants of many of our common weeds. When their pasture is depleted, sheep feed readily on Wild Mustard, Ox-eye Daisy, Yarrow, Plaintain, Perennial and Annual Sow Thistle, Wild Vetch or Tare, Docks, Sorrel, Lamb's Quarters, Milkweed, Ragwort, Burdock and Shepherd's Purse. In fact, there are few weeds that sheep will not eat, to the extent of preventing them from seeding, if there is not enough of their favorite grasses to satisfy them. It is only when the supply of food is unusually short that sheep will feed on plants having leaves and stems covered with bristly hairs or spines, or with a flavor that is obnoxious to them. When the plants are young and tender, however, sheep have been observed to eat such weeds as Ragweed, Blue-weed, Cockle, Orange Hawkweed, Hound's Tongue, Stickseed, Mullein, Canada Thistle, Stinkweed, Toadflax, and others that are bristly or have a pungent flavor. Thorough cultivation with a systematic rotation of crops, combined with the maintenance of as many sheep as can be kept to advantage, is a certain and profitable means of keeping weeds under control."*

7. SMOTHERING.

The aim of this method is to kill the weeds by depriving them of light and air. This is accomplished by getting some quick-growing crop, such as rape or buckwheat, established on the land while the weeds are in a weakened condition. The result is that the smother crop soon occupies every available foot of the land and forms a dense shade in which the weeds in their weakened state cannot continue to grow.

8. HAND PULLING.

Hand pulling and the total removal of weeds is the most effective means of destruction, but of course is only practicable with shallow-rooted weeds not very abundant in a field. Small patches of perennial weeds can be destroyed by digging out the plants with a fork, roots and all, and burning them. Great care must be taken to get every bit of the "root," and the patch should be watched, and if new shoots appear they should be taken out at once. In an ordinary season several diggings will be required in order to completely exterminate a creeping perennial.

* *"Farm Weeds of Canada."*

A FEW FACTS REGARDING WEED SEEDS IN CLOVER AND GRASS SEEDS.

ALFALFA SEED.

Out of 147 samples of alfalfa seed submitted for test by farmers and seedsmen, 15 were found to be absolutely free from weed seeds of any kind, 98 to be free from the weeds covered by the Seed Control Act, though containing other weed seeds in various amounts; 34 were found to contain sufficient weed seeds to disqualify them from being offered for sale in Ontario. Out of the 147 samples tested 7 were noticeably dark and discolored, indicating lack of germinative capacity, and 4 were found to contain very large quantities of grit and other inert matter.

The following weed seeds were found to be the most common impurities in alfalfa seed: Green Foxtail (*Setaria viridis*), present in 56 samples; Lamb's Quarters (*Chenopodium album*), present in 42 samples; Russian Thistle (*Salsola kali*, var. *tenifolia*), present in 35 samples; Buckhorn or Ribgrass (*Plantago lanceolata*), present in 32 samples; Curled Dock (*Rumex crispus*), present in 21 samples; Pigweed (*Amaranthus retroflexus*), present in 20 samples; Ragweed (*Ambrosia artemisiifolia*), present in 11 samples; Yellow Foxtail (*Setaria glauca*), present in 10 samples; Chicory (*Cichorium intybus*), Wild Carrot (*Daucus carota*), Bull Thistle (*Cirsium lanceolatum*) and *Centaurea picris* present in 9 samples.

Other weed seeds found in alfalfa were Black Medick (*Medicago lupulina*), Sweet Clover (*Melilotus alba*), Lady's Thumb (*Polygonum persicaria*), Knot Grass (*Polygonum aviculare*), Sheep Sorrel (*Rumex acetosella*), Dodder (*Cuscuta* sp.), Old Witch Grass (*Panicum capillare*), Mayweed (*Anthemis cotula*), Yellow Cress (*Radicula palustris*), Field Mustard (*Brassica arvensis*), Night-flowering Catchfly (*Stene noctiflora*), Scotch Thistle (*Onopordum acanthium*), Corn Flower (*Centaurea nigra*), Black Bindweed (*Polygonum convolvulus*), Mint (*Mentha* sp.), Water Hemlock (*Cicuta maculata*), Musk Thistle (*Carduus nutans*), Stick Seed (*Lappula echinata*), White Cockle (*Lycnhis alba*), Bedstraw (*Galium aparine*), Canada Thistle (*Cirsium arvense*), Barnyard Grass (*Echinochloa crus-galli*), Cow Grass (*Lepidium campestre*), Corn Gromwell (*Lithospermum arvense*), Mallow (*Malva rotundifolia*).

ALSIKE SEED.

Out of 45 samples of alsike seed tested none were found to be absolutely free from weed seeds; 4 only were free from the weed seeds covered by the Seed Control Act; 11 contained weed seeds covered by the Act.

The following were found to be the most common impurities in alsike seed: Night-flowering Catchfly, present in 37 samples; Curled Dock, present in 17 samples; Sheep Sorrel, present in 16 samples; Lamb's Quarters, present in 11 samples; Green Foxtail, present in 7 samples.

Other weed seeds found in alsike were: Bladder Campion, Bugle Weed (*Lycopus virginicus*), Ribgrass or Buckhorn, Rough Cinquefoil (*Potentilla monspeliensis*), Wormseed Mustard, False Flax, Chickweed (*Stellaria media*), Canada Thistle, Black Bindweed, Lady's Thumb, Black Medick, Common Plaintain, Old Witch Grass, Pigweed, Ragweed, Yellow Cress, Yellow Foxtail, Evening Primrose, Pepper Grass (*Lepidium* sp.), Mayweed, Mouse-ear Chickweed (*Cerastium vulgatum*), Shepherd's Purse (*Capsella bursa-pastoris*).

RED CLOVER SEED.

Out of 78 samples tested 1 was absolutely free from weed seeds; 21 were free from the weed seeds covered by the Seed Control Act; 56 contained weed seeds covered by the Seed Control Act; 5 samples contained large amounts of grit and other inert matter.

The following were found to be the most common impurities in red clover seed: Green Foxtail present in 50 samples, Buckhorn or Ribgrass present in 35 samples, Curled Dock present in 26 samples, Lady's Thumb present in 21, Ragweed in 20, Lamb's Quarters present in 17 samples, Pale Plantain (*Plantago rugelii*), Night-flowering catchfly, and Sheep Sorrel present in 12 samples.

Other weed seeds found in red clover were Mayweed, Wild Oats (*Avena fatua*), Black Medick, Canada Thistle, Yellow Foxtail, Common Plantain (*Plantago major*), Bladder Campion (*Silene latifolia*), Heal-all (*Prunella vulgaris*), Pigweed, False Flax (*Camelina sativa*), Braetted Plantain (*Plantago aristata*), Catnip (*Nepeta cataria*), Wormseed Mustard (*Erysimum cheiranthoides*), Stickweed, Evening Primrose (*Enothera biennis*), Old Witch Grass, Barnyard Grass, Cress, Knotweed, Black Bindweed, Wild Carrot, Wild Vetch (*Vicia cracca*), Dodd

TIMOTHY SEED.

Out of 33 samples tested 3 were entirely free from weed seeds, 17 contained weed seeds covered by the Seed Control Act, 13 contained weed seeds covered by the Act.

The following were the commonest impurities found in timothy seed: Plantain present in 16 samples, Lambs Quarters present in 11 samples, Evening Primrose present in 8 samples, Ribgrass or Buckhorn present in 7 samples, Pigweed, Grass and Cone Flower (*Rubdeckia hirta*) present in 6 samples.

Other weed seeds found in timothy were: Mint, Ergot (*Claviceps purpurea*), Blue Vervain (*Verbena hastata*), Night-flowering Catchfly, Spiny Annual Spiny Thistle, Old Witch Grass, Finger Grass (*Digitaria sanguinalis*), Wormseed Mustard, Common Plantain, Rough Cinquefoil, Green Foxtail, Bugle Weed, Curled Dock, Mayweed, False Flax, Lady's Thumb, Sheep Sorrel, Catnip and Mouse-ear Chickweed.

SECTIONS OF THE SEED CONTROL ACT.

(Dominion of Canada.)

PROHIBITORY CLAUSES.

Section 6. No person shall sell, or offer, expose or have in his possession for sale, for the purpose of seeding, any seeds of cereals, flax, grasses, clovers or forage plants, except timothy, alsike, red clover and alfalfa, unless they are free from seeds of noxious weeds, unless every receptacle, package, sack or bag containing such seeds, or a label securely attached thereto, is marked in a plain and intelligible manner:—

- (a) With the full name and address of the seller;
- (b) With the name of the kind or kinds of seed;
- (c) With the common name or names of the noxious weeds, the seeds of which are present in the seed sold, or offered, exposed or had in possession for sale.

Section 7. Every person who, by himself or through the agency of another person

shall sell, or offer, expose or have in his possession for sale, for seeding in Canada, any seeds of timothy, red clover, alsike or alfalfa, or any mixture containing the said seeds, in or from any receptacle, package, sack or bag, shall cause such receptacle, package, sack or bag, or a label securely attached thereto, to be marked in a plain and indelible manner.

(a) With the full name and address of the seller;

(b) With the name of the kind or kinds of seed; in letters not less than half an inch in length, with a designation of the grade of seed, which shall include one of the following four marks, namely: Extra No. 1, No. 1, No. 2, No. 3; provided, however, that such marks may be accompanied by any other private mark or brand if such private mark or brand is not inconsistent with or marked more conspicuously than the one of the said four marks which is to be used with the said receptacle, package, sack or bag.

Section 8. No person shall sell, or offer or expose or have in his possession for sale, any seeds of timothy, alsike, red clover or alfalfa, in or from any receptacle, package, sack or bag, upon which is marked:

(a) "Extra No. 1," unless such seeds are pure as to kind, clean, sound, plump, of good colour, free from the seeds of any noxious weeds, and contain not more than thirty seeds of all kinds of weeds, including other useless or harmful plants per ounce of the seed so marked;

(b) "No. 1," unless such seeds are clean, sound, reasonably plump, of good colour, contain not more than five noxious weed seeds per ounce of timothy, red clover or alfalfa, or ten of them per ounce of alsike seed and not more than one hundred seeds of all kinds of weeds including other useless or harmful plants per ounce of the seed so marked;

(c) "No. 2," unless such seeds are reasonably clean, sound, contain not more than twenty noxious weed seeds per ounce of timothy, red clover or alfalfa, or forty of them per ounce of alsike seed and not more than two hundred seeds of all kinds of weeds, including other useless or harmful plants per ounce of the seed so marked;

(d) "No. 3," unless such seeds contain not more than eighty seeds of noxious weeds per ounce of timothy, red clover or alfalfa, or one hundred and sixty of them per ounce of alsike seed and not more than four hundred seeds of all kinds of weeds including other useless or harmful plants per ounce of the seed so marked.

Section 9. No person shall sell, or offer, expose or have in his possession for sale, for the purpose of seeding in Canada, any seeds of timothy, alsike, red clover or alfalfa, or any mixture containing the said seeds, if the seeds of noxious weeds or other useless or harmful plants are present in greater proportion in the seed sold, or offered, exposed or had in possession for sale, than the maximum number of such seeds that is permitted for seed that may be marked "No. 3," as defined in Section 8 hereof.

Section 10.—No person shall sell, or offer, expose or have in his possession for sale, for seeding, any seeds of cereals, flax, grasses, clovers, forage plants, field roots or garden vegetable crops which are not capable of germinating in the proportion of two-thirds of the percentage standard of vitality for good seed of the kind, unless every receptacle, package, sack or bag containing such seed, or a label securely attached thereto, is marked in a plain and indelible manner with the name of the kind of seed and the percentage of the seeds that are capable of germination.

Section 11. No person shall sell, or offer, expose or have in his possession for sale, for the purpose of seeding, garden seeds, including both vegetable and flower

seeds, in sealed packets, commonly known to the trade as "papered seeds," unless the same are marked in 18-point black type with the year in which the packet was filled before it leaves the premises on which it was filled, and no such seeds shall thereafter be used to mix with any other seeds that may be offered for sale for the purpose of seeding.

NOXIOUS WEEDS.

The following are the weeds classified noxious under the 1911 Order-in-Council

1. Wild Oats (*Avena fatua*).
2. Common Darnel (*Lolium temulentum*).
3. Curled Dock (*Rumex crispus*).
4. Clustered Dock (*Rumex conglomeratus*).
5. Bitter Dock (*Rumex obtusifolius*).
6. Purple Cockle (*Agrostemma githago*).
7. White Cockle (*Lychnis alba*).
8. Night-flowering Catchfly (*Silene noctiflora*).
9. Bladder Campion (*Silene latifolia*).
10. Cow Cockle (*Saponaria vaccaria*).
11. Stinkweed (*Thlaspi arvense*).
12. False Flax (*Camelina sativa*).
13. Small-seeded False Flax (*Camelina microcarpa*).
14. Round-seeded False Flax (*Camelina dentata*).
15. Ball Mustard (*Neslia paniculata*).
16. Wild Radish (*Raphanus raphanistrum*).
17. Wild Mustard (*Brassica arvensis*).
18. Indian Mustard (*Brassica juncea*).
19. Black Mustard (*Brassica nigra*).
20. Bird Rape (*Brassica campestris*).
21. Hare's-Ear Mustard (*Conringia orientalis*).
22. Tumbling Mustard (*Sisymbrium altissimum*).
23. Wild Carrot (*Daucus carota*).
24. Field Bindweed (*Convolvulus arvensis*).
25. Clover Dodder (*Cuscuta species*), in Alfalfa seed.
26. Blue Bur or Stickseed (*Lappula schinata*).
27. Blueweed (*Echium vulgare*).
28. Ribgrass (*Plantago lanceolata*).
29. Great Ragweed (*Ambrosia trifida*).
30. Common Ragweed (*Ambrosia artemisiifolia*).
31. Perennial Ragweed (*Ambrosia psilostachya*).
32. Ox-eye Daisy (*Chrysanthemum leucanthemum*).
33. Canada Thistle (*Cirsium arvense*).
34. Chicory (*Cichorium intybus*).
35. Perennial or Field Sow Thistle (*Sonchus arvensis*).
36. Annual or Common Sow Thistle (*Sonchus oleraceus*).
37. Spiny-leaved or Prickly Sow Thistle (*Sonchus asper*).

AN ACT TO PREVENT THE SPREAD OF NOXIOUS WEEDS.

Province of Ontario.

1. This Act may be cited as *The Noxious Weeds Act*.

2. In this Act,

(a) "Non-resident land" shall mean land which is unoccupied and the owner of which is not resident within the municipality.

(b) "Resident land" shall mean land which is occupied or which is owned by a person resident within the municipality.

3. Every occupant of land or, if the land is unoccupied, the owner shall cut down or destroy all the Canada thistles, ox-eye daisy, wild oats, ragweed and burdock growing thereon, and all other noxious weeds growing thereon to which this Act may be extended by by-law as hereinafter provided, so often in every year as is sufficient to prevent the ripening of their seed, if such cutting or destruction does not involve the destruction of the growing grain.

4.—(1) 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.

(2) The by-law shall define the tracts or blocks of land so exempted and shall remain in force until repealed; and while it remains in force the land therein described shall be exempt from the operation of this Act.

5. The council of any local municipality may by by-law extend the operation of this Act to any other description of weed, or to any diseased growing crops, which are by the by-law declared to be noxious to husbandry or gardening, and in that case the provisions of this Act shall apply to such noxious weeds and diseased growing crops as if the same were enumerated in section 3.

6.—(1) The council of any local municipality 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 if a vacancy occurs in the office, the council shall fill the same forthwith.

(2) The council may by a by-law divide the municipality into sections or divisions 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 those of the township inspector.

7.—(1) The inspector shall give notice in writing to the owner or occupant of any land within the municipality whereon any of such noxious weeds or diseased crops are growing requiring him to cause them 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 such notice for the first time not later than such dates in each year as may be fixed by by-law of the municipality. Such notice in the case of "resident land" in a city may be given by posting the same to the owner or occupant at his address, if known; but if such address be unknown the notice may be addressed to such owner or occupant at the General Post Office of the city.

(2) In the case of the lands of a railway company the notice shall be given to a station master of the company resident in the municipality, or if there is none

resident in it, to a station master resident in an adjoining or neighboring local municipality.

(3) If such owner or occupant of land refuses or neglects to cut down or destroy all or any of such noxious weeds or diseased growing crops within the period mentioned in the notice, the inspector may enter upon the land and cause them to be cut down or destroyed, doing no unnecessary damage to other growing crops, and he may lay information before any justice of the peace complaining of such refusal or neglect, and such owner or occupant shall incur the penalties provided by section 10; but no inspector shall have power to cut down or destroy or to require the owner or occupant to cut down or destroy such noxious weeds or diseased growing crops on any land sown with grain not so diseased.

(4) Where such noxious weeds are growing upon non-resident land it shall not be necessary to give any notice before proceeding to cut down or destroy them.

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

(a) In the case of a railway company, the statement and notice may be served in the manner provided by subsection 2 of section 7.

(2) If the owner or occupant deems such expenses excessive, he may appeal to the council within thirty days after the delivery of such statement, and the council shall determine the matter in dispute.

(3) If the owner or occupant refuses or neglects to pay the same within thirty days after such request for payment, the claim shall be presented to the council and the council shall audit it and allow it or so much of it as it may deem just, and order the same to be paid from the general funds of the corporation.

(4) The inspector shall also present to the 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 land; and the council shall audit and allow the same or so much of it as may be deemed just, and shall pay so much of it as has been so allowed.

(5) The council shall cause all such sums as have been so allowed and paid to be placed upon the collector's roll of the municipality against the land described in the statement of the inspector to be collected in the same manner as other taxes.

9.—(1) Overseers of highways, or other municipal officers charged with the care of highways, shall see that all noxious weeds growing upon the highways in their respective divisions are cut down or destroyed at the proper time to prevent the ripening of their seed, and the work shall be performed as part of the ordinary statute labour or be paid for at a reasonable rate by the treasurer of the municipality as the council of the municipality may direct.

(2) In unorganized townships where road commissioners have been appointed every owner or occupant shall cut down and destroy, at the proper time to prevent the ripening of their seed, all such noxious weeds growing on any highway adjoining such land from the boundary of such land to the centre line of the highway, and in case of default after notice from the road commissioners requiring such work to be done on or before a day named in the notice, such owner or occupant shall incur a penalty of \$5 for each lot or parcel in respect of which default is made, and the penalty when recovered shall be paid to the road commissioners and be expended in improving the roads in such township.

(3) Where such default occurs the road commissioners may perform the work in place of such owner or occupant, and the cost thereof at the rate of \$2 for each day's labour involved shall be recoverable as a debt due by such owner or occupant to the road commissioners in any court of competent jurisdiction.

10. Any owner or occupant of land who contravenes any of the provisions of this Act or who refuses or neglects to obey any lawful order of the inspector given under this Act shall incur a penalty of not less than \$5 nor more than \$20 for every such offence.

11. 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, ragweed, burdock or wild mustard shall for every such offence incur a penalty of not less than \$5 nor more than \$20.

12. Any person who sows any wheat or other grain knowing it to be infested by the disease known as smut without first using some proper and available remedy to destroy the germs of such disease, shall incur a penalty of not less than \$5 nor more than \$20.

13. Every inspector, overseer of highways or other officer who refuses or neglects to discharge the duties imposed on him by this Act shall incur a penalty of not less than \$10 nor more than \$20.

14. The penalties provided by this Act shall be recoverable under *The Ontario Convictions Act*, and, except as provided by subsection 2 of section 9, shall when recovered be paid over to the treasurer of the municipality in which the offence is committed.

DESCRIPTIONS OF THE WEED-SEEDS ILLUSTRATED.

1. *Green Fox-Tail*. About one-twelfth of an inch long; oval with blunt ends; unequally bi-convex; brown and often mottled; surface granular and striate. Yellow Fox-Tail seed is about one-eighth of an inch long, plano-convex, with fine, distinct cross ridges.

2. *Chess*. About one-third of an inch long; back rounded; glume 7-nerved, middle nerve projecting as an awn; the palea bears a row of spine-like hairs along each nerve.

3. *Wild Oat*. About three-fourths of an inch long; spindle-shaped; glume 9 nerved, middle nerve forming a twisted and bent awn; a tuft of brownish hairs arise from sear at base.

4. *Couch Grass*. Seeds about one-half inch in length; rather slender; oval; and tipped with a short awn.

5. *Curled Dock*. One-eighth to one-twelfth of an inch long; pointed elliptical, with three faces; surface smooth; reddish brown.

6. *Sheep Sorrel*. Seeds about one-twentieth of an inch in length; usually greyish or reddish brown, and finely roughened; provided with three equal faces, egg-shaped, each face of the cover of the seed bears central ridges with branches.

The small drawings beside the enlarged drawings represent the natural size of the seeds.

The small drawings beside the large drawings represent the natural size of the seed.

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7. *Lamb's Quarters*. Circular, lens-shaped, and black; grooved on one face; often partially covered with the seed covering.

8. *Purslane*. One-twenty-fourth to one-twenty-fifth of an inch in diameter; jet black; flattened egg-shaped; notches at smaller end; surface finely roughened.

9. *Corn Cockle*. Seeds from one-twelfth to one-eighth of an inch long; angular in outline; color jet black; occasionally dark brown; each surface is crowded with ridges or spines arranged in circular rows leading from the scar.

10. *Bladder Campion*. About one-sixteenth of an inch in length; kidney-shaped; surface roughened by many little projections arranged more or less in concentric rows; light brown in color.

11. *White Cockle*. Resembling Bladder Campion, but lighter in color; roundish and not so angular; depression about scar not so well marked.

12. *Night-Flowering Catchfly*. Resembles White Cockle, but darker.

13. *Pepper-Grass*. About one-sixteenth of an inch in length; egg-shaped but much flattened; the groove is curved and quite evident; the scar is white; reddish yellow to reddish brown.

14. *Penny Cress*. Seeds one-twelfth of an inch long; somewhat egg-shaped and flattened; surfaces have 12-14 curved ridges, which start and end at the pointed end of the seed; color dark reddish brown.

15. *Wild Mustard*. One-sixteenth of an inch in diameter; dark brown to reddish brown in color; almost spherical in outline.

16. *Worm Seed Mustard*. About one-twenty-fourth of an inch in length; most are pointed at the end opposite the scar; the groove is quite evident; surfaces smooth and dull; reddish yellow in color.

17. *Shepherd's Purse*. About one-twentieth of an inch in length; somewhat flattened; oval; each face has two grooves; color reddish yellow.

18. *Small Seeded False Flax*. Reddish brown; more or less oval and slightly flattened; about one-twentieth of an inch long; the groove more evident on one face than on the other; a whitish scar at one end.

19. *Field Bindweed*. About one-sixth of an inch long; oval; color dark brown; surface is somewhat roughened; outer face convex; inner face divided by a ridge into two plane faces.

20. *Dodder*. Ranging from one-sixteenth to one-twenty-fourth of an inch in length; slightly egg-shaped and flattened; notch near one end; resembles red clover seed, but is smaller, with a dull, roughened surface; color is yellow to brown and reddish, or often yellowish green.

21. *Hound's Tongue*. Seeds are spiny nutlets, one-eighth of an inch long; upper side flat, oblique and roughened with hooked prickles.

22. *Blue Weed*. Stone-like in hardness; about one-tenth of an inch in length; surface roughened and of a grey color; the scar is large and triangular at flat end; the ridge along the outer face is convex.

The small drawings beside the enlarged drawings represent the natural size of the seeds.

23. *Mullein*. About one-twenty-fifth of an inch in length; thimble-shaped; base flat with sear at centre; thimble slightly six-sided, each side deeply pitted; pits of adjacent rows alternate; light to dark brown. The seeds of Moth Mullein and Common Mullein are much alike.

24. *Ribgrass*. From one-eighth to one-twelfth of an inch in length; oval in shape with one face rounded, the other deeply grooved bearing a central sear; dark brown or amber colored.

25. *Ragweed*. Ranging from one-fifth to one-twelfth of an inch in length; top-shaped; apex-pointed and bearing a crown of four to eight spines; light brown to dark brown in color.

26. *Yarrow*. Seeds about one-twelfth of an inch long; small end thin; slightly egg-shaped; color varying from yellowish-white to gray.

27. *Ox-Eye Daisy*. About one-twelfth of an inch long; ten slender, white ribs running from end to end a knob at the broad end; and slightly club-shaped.

28. *Burdock*. One-fifth to one-fourth of an inch in length; prismatic and mottled; four or five faces; apex broader than base; apex star in centre of a distinct brown ring.

29. *Canada Thistle*. From one-eighth to one-twelfth of an inch in length; brown in color; somewhat spindle-shaped, but often flattened; top end cup-shaped with a rim and a small central knob.

30. *Chicory*. From one-eighth to one-twelfth of an inch in length; usually light brown; usually cylindrical; top flat and crowned with scales.

31. *Prickly Lettuce*. Seeds one-eighth to one-sixth of an inch in length; broadly lance-shaped; each face has 5-7 ribs; color dark brown, somewhat mottled with black; apex is tipped with a beak which is almost as long as the seed.

32. *Spiny Sow Thistle*. One-eighth of an inch in length varying from oval to lance-shaped; flat; each face bearing three narrow ridges which meet at the ends, surface smooth; color straw-colored to reddish brown.

33. *Perennial Sow Thistle*. Slightly spindle-shaped with blunt ends and often much flattened; five coarse, finely wrinkled ridges running lengthwise on each face; dark reddish-brown; about one-eighth of an inch long.

34. *Fleabane*. Seeds one-twentieth of an inch long; oval; remnants of pappus bristles remaining often at the apex.

35. *Dandelion*. Seeds one-eighth of an inch long, exclusive of short beak; lance-shaped in outline; ten ridges running lengthwise; provided with barb-like teeth towards the apex; color varies from light to dark brown.

36. *Wild Carrot*. Seeds each one-eighth of an inch in length; and flattened on the back; primary ribs slender, bristly, and five in number; secondary ribs, 4 in number, each bearing a row of barbed prickles.

37. *Pigeon Weed*. Nutlets one-twelfth of an inch long; egg-shaped and curved; sear is conspicuous; surface roughened; gray in color.

38. *Broad-Leafed Plantain*. Seeds about one-twentieth inch long; flattened; outline variable from oval to rhomboidal; wavy lines on surface; color brown.

The small drawings beside the enlarged drawings represent the natural size of the seeds.

39. *Pig-Weed*. About one-twenty-fourth of an inch in length; flattened, egg-shaped, or lens-shaped; polished and jet black; a slight notch on sharp edge the scar; near the scar-notch is a small projecting point.

40. *Barnyard Grass*. One-tenth of an inch long, plano-convex or mandolin-shaped. It is a smooth, glossy seed, and the color is usually greenish or grayish yellow.

41. *Witch Grass*. A small, shiny gray seed, about one-sixteenth of an inch long, oval and somewhat flattened bi-convex.

42. *Black Medick*. Often found in the black, ribbed pod or legume which is somewhat coiled up. The seed is egg-shaped, but otherwise resembles Alfalfa seed.

43. *Common Chickweed*. Very small seed, one-twenty-fourth of an inch in diameter, somewhat wedge-shaped, with a notch at the point. The surface is finely tubercled, in four or five looped rows on each of the parallel faces, and the color varies from reddish to gray.

44. *Cinquefoil*. Minute, yellowish-gray seeds, somewhat kidney-shaped, and covered with curved ridges.

45. *Orange Hawkweed*. Small torpedo-shaped seed, about one-twelfth of an inch long, and grooved. Ripe seeds are dull jet black, immature seeds reddish.

46. *Cone Flower, Yellow Daisy, Black-Eyed Susan*. A small dull-black seed, curved and somewhat angular, with fine longitudinal striations on the four faces.

47. *Wild Lettuce*. A thin, flat, oval seed, with a slender beak or tip. It has a dull black color and faint cross-ridges, and is about one-sixth of an inch in length.

48. *Wild Buckwheat, Black Bindweed*. A jet black, shiny three-sided seed, about one-eighth of an inch long. It is broadest near the abruptly pointed apex, and the sides are slightly concave, but the angles are rounded.

49. *Heal All, Self-Heal*. A brownish seed, about one-twelfth of an inch long, oblong-oval, tapering to a small white triangular scar-appendage at the base. Dark lines follow the margins and centres of the faces. These pretty double lines are characteristic.

50. *Evening Primrose*. An angular, reddish-brown seed, usually with a narrow wing along the edges. The four faces are finely roughed, and faintly ridged. Some seeds are pyramidal, some prismatic, others wedge-shaped, but commonly four-sided with one face rounded.

HORSETAIL FAMILY (*EQUISETACEAE*).

HORSETAIL OR SCOURING RUSH. (*Equisetum arvense*, L.).

This plant is found in damp grass lands, in low places in cultivated fields, and on apparently dry sandy land which has a poorly drained subsoil. If fed in quantity in hay it is poisonous to horses.

The Horsetails appear in early spring as small pale stalks with yellowish or brownish heads. Later in the season feathery, tail-like leafy green shoots appear

These are frequently described by correspondents as being like little pine trees. This is this form of plant which is usually noticed in cultivated fields.

Remedy. The appearance of this weed in any quantity always indicates lack of proper underdrainage. This lack supplied, the weed soon disappears from cultivated fields.

THE GRASS FAMILY (*GRAMINEAE*).

FOX-TAIL, YELLOW FOX-TAIL OR PIGEON GRASS. (*Setaria glauca*, L.).

A common weed in stubble, fallow or root fields. It has an annual root, with stems about two feet high, of erect habit of growth. At the summit of that part of the leaf which sheathes the stem (the ligule) there is a fringe of hairs. The leaves are flat, rough above, and smooth beneath. The dense, close spike, which resembles millet, is bristly and tawny yellow in color.

The seeds are one-eighth in. long, of various shades of brown in color, and with transverse wrinkles. They frequently retain their green color, and are quite commonly found as an impurity in clover and grass seed. An average plant produces about 15,000 seeds.

Time of flowering, July-September.

Time of seeding, August-October.

Remedy. Gangplow stubble ground about three inches deep early in the fall; as soon as the seeds have had time to sprout, cultivate thoroughly; repeat cultivation and rib the land with a double mould-board plow the last thing before the frost. Put in a hoed crop (potatoes, roots or corn) next spring, and cultivate thoroughly throughout the growing season. Follow with a grain crop seeded with clover, without plowing after the roots, for if the land is plowed it is liable to bring more seed to the surface. When the soil is broken up, plow shallow in the latter part of harvest, cultivate with harrow and cultivator throughout the fall, and rib up as above.

In the early after-harvest cultivation of stubble ground, some harrow the stubble as the first step; and when the weed seeds have sprouted under their light covering, then gang-plow and harrow, and stir afterwards with the cultivator as time permits throughout the fall.

GREEN FOX-TAIL. (*Setaria viridis*, L.).

A grass very similar to Yellow Fox-tail and found in similar situations. It can, however, be distinguished from Yellow Fox-tail by the denser spike with green or golden bristles, and by the seeds which are smaller and with the cross ridges less distinct. The seeds are very frequently found in clover and grass seed. The method of eradication is the same as for Yellow Fox-tail.

CHESS, CHEAT OR WHEAT THIEF. (*Bromus secalinus*, L.).

A weed naturalized from Europe. It is a winter annual, with fibrous roots and rough, coarse leaves. It has large spikelets, dark green in color, of characteristic shape, and grows from three to four feet high.

Many look upon Chess as degenerated wheat, because it appears among fall wheat that has been winter-killed. This idea is erroneous and without foundation. The fact is that Chess will mature seed under adverse conditions, even though the

Fig. 1. Yellow Fox-tail (*Setaria glauca*).

Fig. 2. Chess (*Bromus secalinus*).

plant be only a few inches high. The seed possesses great vitality, and is often found among wheat and rye.

Chess is most commonly found among wheat and rye.

The flour made from it is dark-colored, and has narcotic principles. Care in the selection of seed grain and careful cultivation, tending to prevent the maturing of the seeds, are the chief remedies. The planting of a crop that can be harvested before the Chess matures is a good plan in badly infested localities. An average plant produces about 1,000 seeds.

Time of flowering, June. Time of seeding, July.

"Chess is a typical plant belonging to the genus *Bromus*. Wheat belongs to the genus *Triticum*. Chess will produce Chess and only Chess, and a seed of wheat cannot be sown to produce Chess, and Chess cannot produce wheat under the most favorable conditions of growth.

"In instances where parts of a plant, apparently a combination of Chess and wheat, were so united as to seem but one plant, close examination proved them to be parts of separate plants, and that the apparent union was not real."

Remedy. Avoid sowing Chess in seed grain. The seed is comparatively short-lived, and a four-years' rotation exclusive of winter grain will clean it out of the soil. Patches in grain fields should be cut before the plants mature their seeds. Thick seeding with early red clover is recommended for badly infested fields. The first crop of hay should be cut before the Chess has had an opportunity to produce seeds. Shallow, after-harvest cultivation will do much to keep this pest in check.

WILD OAT. (*Avena fatua*, L.).

An annual weed with erect and smooth stems. The leaves and stems are covered with white bloom, which give a peculiar white-green color to the whole plant. The head forms a loose panicle, with nodding and spreading branchlets. The awn is long and bent, and covered with brown hairs. It is bent most when dry; but if moistened, it uncoils and wriggles around, thus causing the seed to move appreciable distances.

The principal points of difference between the wild and cultivated oats are (1) In the former the chaff is thick and hairy, while in the latter it is thin and hairless; and (2) The wild oat has a long, stiff awn which is bent and twisted when dry, while the cultivated oat either has a much smaller and less stiff awn or none at all. An average plant produces about 800 seeds.

Time of flowering, July.

Time of seeding, July-August.

Dispersal—Conveyed from place to place by threshing machines, and as an impurity in seed-grain.

Wild oats are at home in any soil that will grow cereals, and they ripen their seed among almost any cereal crop. The seeds possess wonderful vitality, some of them remaining buried in the soil for years and germinating as soon as they are brought under favorable conditions.

Remedy. On a field infested with wild oats, cereal crops should be dropped out of the rotation as far as possible; and hoed crops, soiling crops, hay, and pasture should take their place. To get the land under grass, it should be fallowed during part of the season, the cultivation being frequent and shallow to destroy all seeds that may have germinated in the upper layer of the soil. The land can then be

Fig. 3. Wild Oat (*Avena fatua*)

Fig. 4. Couch Grass or right of figure and part of a stalk of perennial Rye-grass (*Lolium perenne*) on left. Note the arrangement of spikelets in Rye-grass.

sown with winter wheat and seeded, or with an early variety of barley, which should be cut on the green side. The treatment mentioned is suitable for pasture land, or land which has produced a hay or soiling crop during the fore part of the season. Two hoed crops in succession will do much to exterminate this pest.

**COUCH-GRASS, TWITCH-GRASS, QUACK-GRASS, QUITCH-GRASS, OR QUICK-GRASS.
ALSO WHEAT-GRASS. (*Agropyron repens*, L.).**

Couch-grass is a creeping perennial which grows from 1 to 3 feet high. It has a jointed root-stock which penetrates deeply into the ground and possesses great vitality. The plant produces spikes from 3 to 8 inches long. The small spikelets alternate at each notch of the flower stalk, with the side of the spikelet turned towards the stalk.

The seeds are about one-half in. long, and rather slender. (Fig. 4.) An average plant produces 400 seeds.

Time of flowering, June-July.

Time of seeding, July-August.

Dispersal—The root-stocks are carried around by implements, and the seeds are occasionally found in seed-grain.

Whatever value Couch-grass may have for pasture, its habit of taking and keeping possession of the soil renders it extremely objectionable. It flourishes best in loamy or humus soils, from which it is especially difficult to eradicate.

Remedy. As soon as the crop is harvested plow lightly, then harrow with the ordinary harrow, and, if necessary, cultivate with the spring-tooth cultivator. This shakes the roots free from the soil and makes it possible to gather them up with the horse rake. Burn as soon as they have dried sufficiently. Repeat this process two or three times. If the weather at this time should happen to be dry and hot, it is much the better. Late in the fall rib up the land into drills, and allow to stand over winter. The frost, in all probability, will render material assistance in the eradication. The following spring plow about the end of May, cultivate well, and put in some hoed crop, or summer fallow, sowing buckwheat, the crop to be plowed in. A carefully cultivated crop of rape is recommended as being particularly effective in destroying this pest.

The use of rape in the destruction of Twitch-grass has proved very satisfactory. The directions for this method are as follows:

Cultivate the field until about the middle of June, running over it frequently with the cultivator so as to keep the tops down and thus weaken the "roots." Then apply manure at the rate of about 20 tons per acre (12 good loads). Cultivate the manure in thoroughly, and with a double mould board plow, slightly ridge up the land, making the ridges about 26 inches apart. On the ridges sow pasture rape (Dwarf Essex variety) at the rate of $1\frac{1}{2}$ lbs. per acre. It is important that the right amount of rape should be sown, for if too little is sown the stand will not be thick enough to smother the twitch-grass, and if, on the other hand, too much is sown, the plants will be too crowded and not grow vigorously enough to keep ahead of the weed. Sow the rape when the land is sufficiently moist to insure quick germination of the seed. If the rape is slow in starting, the Twitch-grass may get a start in the rows and thus necessitate hand cultivation there. Cultivate the rape every week or ten days until it occupies all the ground and makes further cultivation impossible. If, when the rape is cut or pastured, any Twitch-grass remains in the field should be ridged up the last thing in the fall and put in with a hoed crop.

Fig. 5. Skunk-tail Grass (*Hordeum jubatum*).

the following year. This should not be necessary if a good stand of rape is secured.

SKUNK-TAIL GRASS, WILD BARLEY, OR SQUIRREL-TAIL GRASS. (*Hordeum jubatum*, L.).

This grass is very troublesome in the West, and is now quite frequently found in many parts of Ontario, especially along railways.

A native perennial grass forming tufts from 8 to 12 inches high. Leaves are pale green in color, from 3 to 4 inches long with rough margins. Flowers are in a silky, bristly spike, from 3 to 4 inches long, pale yellowish green in color. The seed is slender, sharp-pointed, somewhat resembling a small barley seed, and has a long upwardly barbed awn.

Remedy. Cut the plants whenever they appear in waste places, and thus prevent them from going to seed and spreading. This weed is not troublesome if it comes out. This will not injure the other grasses in the meadow.

OLD WITCH GRASS OR TUMBLE GRASS. (*Panicum capillare*, L.).

An annual grass, very common in neglected hoed crops, gardens and waste places. Plants stout, with hairy leaves and large, finely branching, loosely spreading tops (panicles) which are often seen rolling over the ground on windy days in the fall of the year.

BAINYARD GRASS OR COCKSPUR GRASS. (*Echinochloa crusgalli*, L.).

This grass is often abundant in hoe crops, headlands and waste places. The seed occurs occasionally in commercial seeds. A coarse annual grass from one to three feet high with broad leaves. Inflorescence 1 to 3 inches long, consisting of several one-sided branches crowded together and bearing numerous short-awned spikelets. Seeds dark green to brown, flat on one side, round on the other, one-eighth inch long, very smooth and shining.

Remedy. Proper cultivation of hoe crops and taking care to cut in waste places before it seeds will cause it to disappear.

FINGER GRASS OR CRAB GRASS. (*Digitaria sanguinalis*, (L.) Scop.).

A troublesome grass in lawns and sometimes in low fields. A much branched leafy annual, from ten inches to two feet high, spreading on the ground and frequently rooting at the lower joints of the stem. The leaves are from two to four inches long with rough margins. Flowers are produced in spikes which come out from the stem like the fingers on the hand, hence the common name, Finger Grass.

Remedy. A much harder grass to eradicate than the Fox-tails, because it roots so readily at the joints. Repeated cultivation after harvest will do much to destroy it. Spud out patches in lawns and stir the soil with a rake and sow heavily with pure lawn grass seed when the ground is moist.

THE BUCKWHEAT FAMILY (*POLYGONACEAE*).

DOCK, CURLED DOCK, SOUP DOCK, OR YELLOW DOCK. (*Rumex crispus*, L.).

A deep-rooted perennial weed introduced from Europe.

It occurs around buildings, in neglected lanes, along waysides and in pastures. The stem is quite slender, and the leaves are from six to twelve inches long, with wavy margins; hence the common name, "curled dock." The flowers are in racemes, green in color.

The seed is winged, and is carried considerable distances by the wind. The manner of attachment of the seed to the wing is shown in illustration (Fig. 6). The seeds are light brown in color, triangular, with sharp edges and tapering point. They are smooth and shiny.

The wind acts as an agency in scattering the seed, and it is a very common impurity in clover and other seeds used on the farm.

An average plant produces about 17,000 seeds.

Time of flowering and seeding, July-August.

Remedy. In most cases this weed can be kept in check by the frequent introduction of well-cared-for hoed crops into the rotation. The shorter the rotation the better. The later sown hoed crops, especially rape, are more effective than those sown earlier in the season. Before the hoed crop is sown, this weed may be kept from breathing above ground by going frequently over the field with a broad-shared cultivator, which will cut the plants an inch or two below the surface; but, as the roots are tough and strong, it may sometimes be necessary to use the gang-plow, or even the single plow. About the 1st of July the land may be sown with rape in drills, say 26 inches apart, and kept clean, or nearly so, by the horse-hoe and more or less hand hoeing. The rape can be pastured off in the usual way during the fall; and, occasionally, it may be necessary to put another hoed crop on the same ground the following spring, say a crop of corn, but much depends upon the soil, the skill, regularity, and thoroughness with which the hoeing is done.

SORREL, OR SHEEP SORREL. (*Rumex acetosella*, L.).

A perennial with running root-stocks. The stem is slender and erect with branched leaves. The leaves are spear-shaped and quite characteristic. The flowers occur in racemes, and are green in color. The foliage has a pronounced acid taste.

The seed is 1-16 in. long, triangular, smooth, and shining when naked, but dull brown when invested by its covering. An average plant produces about 10,000 seeds.

Time of flowering, June-September.

Time of seeding, July-October.

Propagation—By its running root-stocks, and as an impurity in clover seed, especially Alsike.

Remedy. Sorrel is usually an indication of a poor, sandy, or gravelly soil. It prefers acid soils, hence liming and manuring are effective remedies when the land is well tilled. The remedies given for the Dock (Fig. 6) are applicable to Sorrel, only it requires more frequent use of the broad-shared cultivator, which should be used so as to cut the roots just below the surface of the soil, without bringing up any of the creeping root-stocks.

Fig. 6. Curled Dock (*Rumex crispus*).

Fig. 7. Sheep Sorrel (*Rumex acetosella*).

Lady's Thumb, or Smartweed (*Polygonum persicaria*). This plant grows to a height of 12 to 18 inches. Its leaves are lance-shaped, usually with a dark blotch near the centre. It is an annual and is often abundant.

Remedy. Prevent from seeding, and sow clean seeds.

WILD BUCKWHEAT OR BLACK BINDWEED. (*Polygonum convolvulus*, L.).

An introduced annual found commonly in cereal crops throughout Ontario. It is a twining herb with branching stems and thin, smooth, arrow-shaped leaves. Flowers small, greenish, in clusters in the axils of the leaves and at the end of the stems. Seed, black, buckwheat-shaped, $\frac{1}{8}$ of an inch long, but when found in grain the outer black coat is often missing and the seed is then white and waxy in appearance.

Time of flowering, from June to September; seeds ripen about the middle of July.

Dispersal—By seeds.

Remedy. Sow pure seed grain. Cultivate lightly after harvest and cause the seeds to germinate, then harrow out the young plants.

THE SPINACH OR GOOSEFOOT FAMILY (*CHENOPODIACEAE*).

LAMB'S QUARTERS, OR GOOSEFOOT. (*Chenopodium album*, L.).

An annual weed widely distributed in cultivated land. It grows to a height of from 2 to 6 feet. The stem is grooved and much branched. The leaves are whitish-green below and dark green above. The flowers are inconspicuous and greenish in color.

The seed (Fig. 9) is black and shining, lens-shaped and round, about 1-16 in. in diameter.

Time of flowering, June-October.

Time of seeding, August-October.

Distribution—By seeds, especially as an impurity in clover and grass seeds.

Remedy. Late cultivation is especially necessary in combating this weed, as it flowers and seeds till very late in the season. The land should be gang-plowed shallow and harrowed immediately after harvest, and cultivated at intervals until late in the fall, when it may be plowed or ribbed up for a hoed crop the following spring. Subsequent treatment the same as for Foxtail (Fig. 1).

Oak-leaved Goosefoot. Usually spreads on the ground. Its leaves are like minute white oak leaves.

Maple-leaved Goosefoot. Grows erect, with large, thin, triangular leaves.

Strauberry Blite. Resembles the last, but has red seed clusters.

Spreading Orache. Somewhat resembles Lamb's Quarters, but has larger and thicker leaves, goosefoot shaped. It is much branched or spreading and the seed covers are warty.

Fig. 8. Wild Buckwheat (*Polygonum convolvulus*).

Fig. 9. Lamb's Quarters (*Chenopodium album*).

RUSSIAN THISTLE. (*Salsola Kali*, var *enuifolia*, G. F. W. Mey.).

This is a weed which has appeared on many farms in Ontario during the last few years. It has been introduced as an impurity in Alfalfa seed. A large percentage of the samples of Alfalfa seed examined at the Department of Botany in spring, 1907, contained the seeds of this weed, and already this fall several specimens of the weed, found in Alfalfa fields, have been sent in for identification. Russian Thistle is a very serious pest in several of the Western States, and is common in the Prairie Provinces, but has not yet been reported as being very troublesome there. The plants, when ripe, break off at the surface of the ground and are carried long distances by the wind, scattering their numerous seeds on their journey. It is this tumbling habit that makes this weed particularly adapted to the prairie lands of the West, and it probably will never be a serious pest in Ontario, where

Fig. 10. Russian Thistle.

houses, trees and other obstructions will prevent its being spread far and wide by the wind.

Description. The Russian Thistle is a native of Europe and Western Asia. It is a nearly smooth, bushy branched annual, from 1 to 3 feet high. Mature plants are more or less spherical in form. The stems and branches are red in color. The leaves are awl-shaped, 1 to 2 inches long, soft and fleshy when young, very prickly when mature. The flowers are inconspicuous, being small, without petals, and solitary in the axils of the leaves. The seeds are about 1-12 of an inch long, conical in general outline, with a cup-shaped depression at the upper end, in the centre of which is a pointed projection; color dull grey or green, embryo spirally coiled.

Remedy. The Russian Thistle, being an annual weed, is not hard to exterminate. If once cut off at the surface of the ground it never grows again, and hence in well-cultivated fields it is not likely to prove a pest. The chief danger lies in neglect. A single plant produces an enormous number of seeds, and if a few

Fig. 11. Pigweed (*Amaranthus retroflerus*)

If specimens are allowed to mature they will seed down a whole field and cause serious trouble the following year, especially in a crop which does not allow of the frequent use of the cultivator. Farmers in Ontario should, therefore, be on the lookout for this weed and destroy any specimens they may find in their fields, fence corners, or along the road sides. If a field is neglected until it becomes seeded, repeated plowing will be required in order to clean it. *When the plant is not more than six inches high careful plowing with a drag chain from the end of the double-furrow to the plow beam, dragging back so as to have every plant dragged under the furrow, with harrowing to fill every crevice between the furrows, will destroy every plant that cannot get its leaves to the surface."

THE PIGWEED FAMILY (*AMARANTHACEAE*).

PIGWEED, OR REDROOT. (*Amaranthus retroflexus*, L.).

An annual, with pink root, stout, erect stem, and many branches, it grows from 1 to 6 feet high. The leaves are light green in color, and ovate in shape. The flowers are in spikes, which terminate branches, or are from the axils of the leaves, and are green in color.

The seeds (Fig. 11.) are round and lens-shaped, smooth, and shiny black in color, resembling the seed of Lamb's Quarters, but slightly smaller and thinner. An average plant produces 15,000 seeds.

Time of flowering, July-September.

Time of seeding, August-October.

Dispersal—The seed is distributed by the wind and as an impurity in grass seed.

Remedy. Special attention must be given to fall cultivation of the soil so as to prevent plants from ripening, and to sprout and destroy the seeds which have fallen upon the ground. The land should be gang-plowed shallow and harrowed immediately after harvest, and cultivated at intervals until late in the fall, when it may be plowed or ribbed up for a hoed crop the following spring. Subsequent treatment the same as for Foxtail (Fig. 1).

Tumble Weed, or White Pigweed (*Amaranthus graecizans*). This plant resembles Russian Thistle quite closely, but can be distinguished from it by its round, shiny, jet-black seeds, and by its leaves, which, although small, have a definite blade. It is a low-branched annual when growing in sandy, open fields and roadsides.

Remedy. Prevent the maturing of the seeds, which ripen in August. The plants, as a rule, are conspicuous, and may be readily collected and *burned*. The seeds are often found in grass seed mixtures.

Spreading Amaranth (*Amaranthus blitoides*), forms large mats on waste ground, along roadsides and walks.

Fig. 12. Corn Spurrey (*Spergula arvensis*).

Fig. 13. Corn Cockle (*Agrostemma githago*).

THE PINK FAMILY (*CARYOPHYLLACEAE*).CORN SPURRY. (*Spergula arvensis*, L.).

This is an annual weed introduced from Europe. It is found chiefly on sandy soil. It grows from 15 to 18 inches high. The flowers are small, white, and in loose terminal clusters. The leaves are needle-like in whorls at the joints of the stem. The seeds are dull black, mottled with brown, round and flattened, with the margin extending into a narrow rim.

Time of flowering, July; seeds ripen, July to August.

Dispersal.—By seeds.

Remedy. Frequent stirring of the soil to make the seeds sprout, and frequent harrowing to destroy the seedlings.

CORN COCKLE, OR PURPLE COCKLE. (*Agrostemma githago*, L.).

An annual adventive from Europe, about 1 to 3 feet high, with erect habit of growth. It has but few branches, and the stems are all very hairy, with whitish-green hairs. The leaves are rather long and narrow, with pointed ends. The flowers are red to purple, and the flower cup (calyx) has long lobes, three or four times the length of the petals.

The seed capsules are generally well filled with seed, which is black in color and kidney-shaped, with tubercles (small conical projections) arranged in rows around the sides of the seed. (See Fig. 13.) The seed is about $\frac{1}{8}$ in. across. An average plant produces about 500 seeds.

Time of flowering, July.

Time of seeding, August.

Dispersal—By birds, in manure, and as an impurity in seed.

It may be noted, in passing, that the seed is injurious to young chickens, and the husks of the seed often elude the miller and appear as black specks in flour, which is seriously damaged thereby. An old writer, Gerarde, says:

"What hurt it doth among corn (wheat) the spoyle unto bread, as well in colour, taste, and unwholesomeness, is better known than desired."

Remedy. Sow clean seed; and when the weed is not very thick pull it by hand. Practise a short rotation of crops. Cultivate thoroughly after harvest. If this weed is very abundant fall wheat should be omitted from the rotation for four years.

BLADDER CAMPION, COW BELL OR BLADDER WEED. (*Silene latifolia*, Mill).

This is another bad weed which is becoming a serious pest on many farms in Ontario, and about which a great many enquiries have been made during the past few years. It is spread chiefly as an impurity in clover seed. A large number of samples of clover seed, especially those of red and alsike clover, sent to the Department of Botany this past season for examination as to purity have been found to contain the seeds of this weed. As it is a free seeder, and very difficult to exterminate once it becomes established, too much care cannot be taken to secure clover seed free from this impurity, and to dig up by the roots and burn any stray specimens that by any means may find their way on to the farm.

Fig. 14. Bladder Campion (*Silene latifolia*).

Description. The Bladder Campion is a naturalized, deep-rooted, freely branching, perennial weed belonging to the Pink Family (*Caryophyllaceae*). It grows from six inches to two feet high. The leaves are ovate lanceolate, smooth in pairs, with their bases meeting around the stem. The flowers are white, nearly an inch in diameter, and borne in loose clusters, which are often drooping. The petals are two-cleft and the calyx much inflated and bell-shaped, with distinct purplish veins. It is from the inflated calyx that the plant derives its common names, Bladder Campion, Bladder Weed and Cow Bell. The capsule or "seed pod" is enclosed by the inflated calyx, and opens at the top by five short recurved teeth. This weed flowers from June to August, and matures seed from July to September. Large quantities of seed are produced. They are about 1-16 of an inch in length, irregularly kidney-shaped, light brown to dark grey in color, the surface covered with regularly arranged rows of tubercles. Typical seeds show a marked depression at the scar. This character, and the more conical shape of the tubercles, make it possible for a careful observer to distinguish them from the seeds of the Night-flowering Catchfly and White Cockle, which they resemble very closely.

Remedy. The roots of this pest are very long, thick, and much branched. A good-sized plant will have a root over two feet long, with numerous deep root stocks. A weed with such an underground root system is necessarily hard to combat. Some means must be taken by which the deep roots and rootstocks can be destroyed. Small patches should be carefully dug out early enough in the season to prevent seeding, taking pains to get every piece of the root and rootstock. Badly infested fields should be plowed deeply immediately after harvest; and then thoroughly cultivated and cross-cultivated with the broad-sharred cultivator in order to cut up and weaken the underground root system. The following spring continue the deep cultivation at intervals of about two weeks until it is time to put in a hoed crop, which must be kept thoroughly clean in order to be effective. Corn, following thorough cultivation as above, has been found to be an excellent hoed crop to fight this weed with.

WHITE CAMPION, OR WHITE COCKLE. (*Lychnis alba*, L.).

A biennial weed introduced from Europe, with hairy and branching stems from 1 to 3 feet high. Like the Night-flowering Catchfly, it has a viscid secretion which attracts many insects. The leaves are oblong, with acute tips. The flowers are in loose panicles, white or pink in color, and nearly $\frac{3}{4}$ in. broad. As a rule they open at night, and remain so until the morning of the following day. The pod has short teeth around the top, which curl back when dry, and the seeds are distributed by the winds swaying the stem, when the seeds drop out. In wet weather these teeth straighten out and completely close the opening at the top.

The seed (Fig. 15) is grey in color and kidney-shaped, with tubercles regularly disposed over the surface. An average pistillate plant produces 10,000 seeds.

Time of flowering, June-August.

Time of seeding, July-August.

Dispersal—By wind and as an impurity in seeds.

Remedy. A persistent weed that is difficult to eradicate. Exercise great care in cleaning seed grain, and examine all purchased grain and clover seed for the

Fig. 15. White Cockle (*Lychnis alba*).

seed of this weed. It is claimed that bare summer fallow, with thorough cultivation, will suppress it. Prof. G. E. Day states that the roots are fleshy and hard to kill unless dragged right up to the surface of the soil. If there is a little earth covering any part of them they will continue to grow and try to produce seed. When spudded below the surface they will grow again, but do not produce seed that season. A short rotation of crops will keep it in check. Discing bare stubble will help to prevent it from seeding late in the season. Thick seeding with clover will restrict it by smothering. Pastures following a single cut of early clover should be trimmed with a mower about the middle of August to prevent the maturing of the seed.

COW CUCKLE OR COW HERB. (*Saponaria vaccaria*, L.).

A weed common in grain fields in the West. The seed is often found in grain from the West. During the past few years it has been found in many parts of Ontario, but has not yet become a serious pest in this Province. It is a smooth, glaucous, annual plant, from 1 to 2 feet high. The leaves are oval lance-shaped, opposite and clasp the stem at the base. Flowers are bright pink, about $\frac{1}{2}$ inch in diameter. Seed pod is enclosed in the inflated, 5-angled calyx, and contains about 20 black, spherical seeds about 1-12 inch in diameter, with the surface minutely pitted.

Time of flowering, July; seeds ripe in August.

Dispersal—By seeds only.

Remedy. The plant being conspicuous, is easily hand pulled. Fall and spring cultivation will do much to clean badly infested fields.

The Night-flowering Catchfly (*Silene noctiflora*, L.), resembles the Bladder Champion but it is an annual, tall and very leafy, with a viscid secretion all over its stem, often so profuse that the stem and leaves are covered with small insects entangled in it. It opens at night, and possesses a fragrant smell. It is not so bad a weed as its relative, the Bladder Champion.

PURSLANE FAMILY (*PORTULACACAEAE*).

PURSLANE, OR PURSLEY (*Portulaca oleracea*, L.).

Purslane is pre-eminently a garden weed, and is readily recognized by its fleshy leaves and stem, which lie prostrate on the ground. It is an annual.

The stems are red, and the leaves wedge-shaped and clustered at the ends of branches. The flowers are bright yellow, about $\frac{1}{4}$ in. across, and open only during full sunlight for a few hours in the morning. The seeds (Fig. 16), in small capsules, are black, kidney-shaped, and extremely small. An average plant produces 60,000 seeds.

Time of flowering, July, until frost.

Time of seeding, August, until frost.

Dispersal—By seeds.

Fig. 16. Purslane (*Portulaca oleracea*).

Purslane has been used as hog feed in very dry seasons, but the cost of gathering it is too great.

Remedy. Careful hoeing and constant cultivation. The latter should be as early as possible. Plants which have been hoed out should be raked up and destroyed before they will mature the seeds.

THE BUTTERCUP FAMILY (*RANUNCULACEAE*).

TALL BUTTERCUP, TALL CROWFOOT, MEADOW BUTTERCUP (*Ranunculus acris*, L.)

A noxious weed in low meadows and pasture lands. It crowds out the grass, and cattle will not eat it on account of its hot tasting, blistering juice. It is seldom troublesome on well-drained land under a short rotation of crops.

An introduced perennial weed with fibrous roots and an erect, somewhat hairy stem. The leaves are three-parted, with the divisions again three-cleft with deeply lobed segments. Flowers are produced from early in June until frost. They are bright yellow in color and conspicuous. The dry seed-like fruits are in globose heads.

Time of flowering, June to September; seed ripe by July.

Dispersal—By seeds.

Remedy. When possible the land should be well drained and brought under cultivation, and not seeded down again until the weed has disappeared. On pasture lands which cannot be cultivated the weed should be cut closely two or three times each year; once early in June and again in July or August. This treatment to be successful must be repeated for two or three years.

THE MUSTARD FAMILY (*CRUCIFERAE*).

PENNY-CRESS, BASTARD-CRESS, FRENCH WEED, WILD GARLIC, OR STINK-WEED
(*Thlaspi arvense*, L.).

A winter annual, introduced from Europe, and a very bad weed. It is very abundant in Manitoba, and is becoming rather common in Ontario. It grows as an erect plant, with a number of branches from the upper part. The leaves are numerous during the first of the season, and clasp the stem by ear-like lobes. The flowers are white and small, with spreading flower stalks. The pods which succeed the flower are very characteristic. They are nearly orbicular, about half an inch broad, quite flat, with a broad wing all around, and notched at the top. Fig. 18 shows this peculiarity. Each pod produces about twelve seeds, which are dark brown to black and oval in shape, with curved lines. An average plant produces about 20,000 seeds.

The plant has a peculiar odor, resembling that of garlic, hence some of the common names. The seed has a very pungent taste. When eaten by milch cows it imparts a disagreeable flavor to the milk.

Time of flowering, May-September.

Time of seeding, June-September.

Dispersal—Chiefly by the wind.

Fig. 17. Tall Buttercup (*Ranunculus acris*).

Fig. 18. Penny-cress (*Thlaspi arvense*).

Fig. 19. Pepper Grass (*Lepidium apetalum*).

Remedy. Hand pull and burn when in small quantities. If the field is badly infested the following method of eradication is recommended: * "Run a disk harrow over the stubble as soon as the crop is removed so as to start into growth the seeds near the surface. The following spring cultivate or harrow these plants down; and as soon as a growth of fresh plants starts plow the land and harrow once. This land may be sown late to a green feed crop or it may be kept under clean fallow for the whole season if the land can be spared. The following spring any growth of weeds should be cultivated down before sowing the crop."

Plants with fully formed pods should never be plowed down, as the seeds will mature below the ground and maintain their vitality for considerable time.

PEPPER GRASS, OR TONGUE GRASS (*Lepidium apetalum* Willd.).

A native annual which grows from six inches to a foot and a half high. The stem usually has many branches, and the lower leaves terminate in a large lobe (with small lateral ones), with edges slightly cut in along the margin. The upper leaves are tapering. The flowers are small and white, with slender spreading flower stalks. The seed pods are round, with a very small wing at the top and a notch at the extremity. The end of a branch with seed pods is shown nearly natural size in Fig. 19.

The seeds are reddish-brown, flat and oval in shape, and 1-16 in. long. The average plant produces about 18,000 seeds.

Time of flowering, June-August.

Time of seeding, July-September.

Dispersal—By birds and as an impurity in clover seed.

Remedy. Be careful to prevent the plants from seeding, and do not plow the land under half ripe, as many of the seeds will germinate even though partially mature. Pull and burn where only a few plants exist, and when they are numerous use the method employed for the eradication of Mustard.

FIELD PEPPER GRASS OR COW CRESS (*Lepidium campestre*, Br.).

This is a comparatively new weed in Ontario, about which many enquiries have been received during the past few years. From information gathered from correspondents it seems certain that it has been spread as an impurity in clover seed.

Field Pepper Grass or Cow Cress is an introduced annual or biennial weed belonging to the Mustard family (*Cruciferae*). It grows from 1 to 2 feet high, and branches freely. The basal leaves are petioled, oblong and entire; stem leaves spear-shaped, entire or slightly toothed, and clasping the stem by their arrow-shaped bases. Flowers are small, white or yellowish in color. The seed pods are broadly ovate, boat-shaped, being rounded below and hollowed out above. They stand out stiffly from the stem on pedicels of about their own length. The seeds are reddish-brown in color, about 1-12 of an inch long, sharply egg-shaped, rounded or somewhat flattened, and the surface is granular and slightly scurfy.

Remedy. Hand pull small patches. Cut clover early enough to prevent seeding. Plow up badly infested fields and put in a hoed crop for one season.

SHEPHERD'S PURSE (*Capsella bursa-pastoris*, L.).

A winter annual, naturalized from Europe, with a long, deep, tap root. The root leaves are lobed and form a large rosette, which lies close to the ground, and in the state it passes the winter. The following spring a more or less branched stem

* "Farm Weeds of Canada."

Fig. 20. Field Pepper Grass or Cow Cress (*Lepidium campestre*).

arises, with arrow-shaped leaves thereon. The flowers are very small and white in color, and are much less conspicuous than the seed vessels, which are triangular in shape, and are attached to the stalk or pedicel at the lower apex of the triangle. From the character of these pods the plant obtains its scientific and common name. The triangular pod is divided down the centre by a partition, forming two cells, each of which contains from 10 to 12 seeds (Fig. 21). In size the plant varies greatly from a few inches to two feet, depending on the soil and locality. But even a very diminutive plant produces many seeds. The seed is very small, light brown in color, and oblong in shape (Fig. 21). An average plant produces over 50,000 seeds. Fig. 21 shows shape of seed, also the arrangement of seeds in the pod.

Time of flowering, early spring till the beginning of winter.

Time of seeding, early spring till the beginning of winter.

Dispersal—as an impurity in grass seed; also by birds, as the pods when ripe open and drop the seeds, which are eaten by birds, and often evacuated without digestion or injury.

Remedy. It easily succumbs to cultivation; and as the plant spreads only by seed, persistent effort should be made to prevent seeding.

FALSE FLAX, OR GOLD OF PLEASURE (*Camelina sativa*, L.).

This weed probably came to this country in imported flax seed. In Europe it is cultivated for the fine oil extracted from the seed, which is used in feeding cattle. Its common name arose from its supposed resemblance to flax.

An annual and winter annual, with simple or branching stems; the lower leaves are long, with a stem, or petiole; and the upper ones clasp the stem with arrow-shaped bases. The flowers are numerous, yellow, and somewhat inconspicuous. The seed vessel, or pod, is pear-shaped or globular, with a small projection from the upper end. The little stalks holding the pods are slender and spreading or ascending. The seed is brown and larger than that of Shepherd's Purse. (Fig. 22.) An average plant produces about 40,000 seeds.

Time of flowering, June-August.

Time of seeding, July-August.

Dispersal—As an impurity in flax and clover seed, and occasionally in grain.

Remedy. Plow lightly as soon as the crop is harvested. Harrow and then cultivate frequently throughout the autumn to destroy the young seedlings. It is important that this autumn cultivation should be thorough. Grow a hoed crop the following year. The rotation of crops should be modified in the infested fields by dropping winter wheat out for a time. Grass seed should be sown along with the spring wheat or barley.

BALL MUSTARD (*Neslia paniculata*, Desv.).

A weed of European origin, common in grain fields in the western provinces, and now becoming frequent along railway lines and in waste places in Ontario.

A slender annual or winter annual from 2 to 3 feet high. Leaves oblong, pointed and clasping the stem at the base. Flowers small, orange yellow in color, in long, slender terminal clusters (racemes). Pods round, veiny, ridged and containing single yellow seed. They do not split open, and are commonly taken for the seed. They are frequently found in seed grain and screenings from the West.

Remedy. Avoid sowing seed grain containing "seeds" of this weed. Hand pull and burn when in small quantities. Badly infested fields should be given thorough early after-harvest cultivation, followed by spring cultivation and a hoed crop next season.

Fig. 21. Shepherd's Purse (*Capsella bursa-pastoris*).

Fig. 22. False Flax (*Camelina sativa*).

Fig. 23. Ball Mustard (*Neslia paniculata*).

WILD RADISH (*Raphanus raphanistrum*, L.).

This is a weed of European origin which is a serious pest in the Maritime Provinces, and which has recently been introduced into Ontario. It is an annual, winter annual from 1 to 2 feet high. In general appearance it is like the Wild Mustard, but its yellow flowers have purplish veins on the petals and the pods much more jointed in appearance. The seeds are 1-10 of an inch long, light reddish brown, oval in outline, and with the surface finely roughened.

Time of flowering. June to September; seeds ripen by August.

Dispersal.—By seeds.

Remedy. Hand pull when it first appears to prevent it from spreading. If it becomes very plentiful, follow the method of cropping outlined for Wild Mustard.

WILD MUSTARD, CHARLOCK, OR HERRICK (*Brassica arvensis*, (L.) Ktze.)

Among the worst weeds in Ontario is the Wild Mustard, an annual, naturalized from Europe, with fibrous roots and erect habit of growth. The stem is rough with stiff hairs somewhat scattered over the surface. The branches arise from the upper part of the stem and bear oblong leaves and the lower leaves have one terminal lateral lobe and several smaller lateral ones (lyre shaped). The flowers are yellow, showy and about 2-3 in. broad, with stout flower stalks, which are more noticeable when the plant is in fruit. The pods, which appear on the lower part of the stem when the top is in flower, are from 1 to 2 inches long, and are either spreading or ascending.

The shape of the pod is characteristic; it is constricted between the seeds, thus giving the appearance of a rounded enlargement where each seed is borne. This appearance is termed "knotted." The pod terminates in a two-edged beak, and the two valves of the pod are strongly veined or ribbed.

The seed (see Fig. 25) is black, 1-16 in. in diameter, perfectly spherical, and very much like rape or turnip seed, and it retains its vitality for a long time when buried in the soil. An average plant produces 15,000 seeds.

Time of flowering. June-September.

Time of seeding. July-September.

Dispersal.—By birds and implements, but chiefly as an impurity in seed.

Remedy. Owing to the great vitality of the seed, Mustard is a very hard weed to eradicate. The seeds, once in the ground, live for years, and continue to germinate as they are brought near the surface. Hence it takes patience, a great deal of labor, and a long time to get rid of the weed when it once gets possession of the land. When present only in small amounts, hand-pulling is the best method, providing the pulling is done before seeds have formed; and as persons pulling in a hurry cannot wait to examine for seed, it is best to put the weeds, as they are pulled, in bundles where they can be burned when dry.

When fields are overrun with the weed, it is best to proceed as follows: Harrow stubble-ground early after harvest, or gang-plow and harrow. As soon as the seeds have had time to sprout, cultivate thoroughly; repeat cultivation at intervals; and rib up with a double mould-board plow the last thing in the fall. Put in a hoe crop, either roots or corn, the following spring, and cultivate it thoroughly throughout the growing season. Cultivate and harrow well two or three times after roots or corn, having first run the plow along each row of corn roots to cut the roots and turn them up; and rib up before the frost. (If the plow is used after roots or corn it is likely to bring more seed to the surface.) Sow a crop of grain the following

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Fig. 24. Wild Radish (*Raphanus raphanistrum*).

spring and seed with clover. Pull weeds by hand out of the grain crop; take crop or two of hay, or pasture; and break up the clover sod, treating it as outlined in the note to Mr. Rennie's method of cleaning land. (See page 5.) When necessary at any stage in this method, use a grubber or subsoil plow to stir the soil to a greater depth than is reached by the surface cultivation.

SPRAYING WITH CHEMICALS.

Repeated tests have proved that solutions of blue stone (blue vitriol, or copper sulphate) or of green stone (copperas or iron sulphate) can be used successfully to destroy Mustard in cereal crops without injury to the standing grain.

The experiments conducted by the Botanical Department would indicate that iron sulphate is on the whole more satisfactory for this purpose than copper sulphate. A 20 per cent. solution of iron sulphate should be used (80 lbs. to 40 gals. of water) and the field should be sprayed on a bright sunny day when the young Mustard plants are well up and just about to come into bloom. If the solution is applied too late some of the older plants will not be destroyed and may produce seed and the results, therefore, will not be entirely satisfactory. If copper sulphate is used a 2 per cent. solution (1 lb. in 5 gals. of water) is sufficiently strong. Stronger solutions would be apt to injure the crop.

An ordinary barrel sprayer with a hand pump or a potato sprayer with a broadcast attachment can be used to apply these solutions. Further information on spraying to kill Mustard may be had by applying to the Botanical Department, O.A.C.

HARE'S-EAR MUSTARD (*Conringia orientalis*, (L.) Dnmort).

A weed which is quite general throughout the West, in grain fields, on stubble and by roadsides; spreading rapidly. It has been found in one or two places in Ontario. An annual and winter annual with a straight, slightly branched stem from 1 to 3 feet high. Whole plant smooth and when young covered with a bloom like that of a cabbage. Leaves somewhat fleshy, oblong, oval, entire and clasping the stem by two rounded lobes. They resemble in shape a hare's or rabbit's ear, hence the common name, Hare's-ear Mustard. Flowers are creamy white, about 1-4 inches across. Pods are four-sided and 3 to 4 inches long. Seeds are dark reddish brown, 1-12 of an inch long, somewhat wheat-shaped, with the surface granular roughened.

Time of flowering, July; seeds ripen in August and September.

Dispersal—By seeds.

Remedy. Hand pull small patches when the weed first makes its appearance. If a field becomes badly infested, try thorough, early, after-harvest cultivation.

TUMBLING MUSTARD (*Sisymbrium altissimum*, L.).

This mustard, which is troublesome in the West, is now found in many parts of Ontario, though it has not yet become a pest in cultivated fields in this Province. The fact, however, that it produces great quantities of seed indicates that if neglected it may become a serious nuisance. It is therefore advisable that a watch be kept on it in order that any plants which appear in cultivated fields may be destroyed before they mature their seeds.

Tumbling Mustard is a bushy-branched annual or winter annual, from 2 to 4 feet high. The lower leaves are pinnatifid with the segments pointing backward (runcinate); the upper leaves are very variable in size and outline, but are

Fig. 25. Mustard (*Brassica arvensis*).

Fig. 26. Hare's-ear Mustard (*Conringia orientalis*).

deeply pinnatifid with narrow segments. The flowers are numerous at the end of the branches, pale yellow, and about 1-3 of an inch in diameter. They are succeeded by long, slender pods, each of which contains numerous seeds. The plants, when mature, break off near the surface of the ground and are rolled about by the wind, scattering their seeds as they go. It is from this tumbling habit that the plant gets its name, Tumbling Mustard. The seeds are very small, less than 1-24 of an inch in length. They are greenish yellow to olive brown in color and somewhat U-shaped. Being so very small they are not readily crushed by grinding, and thus frequently find their way unharmed into chop. It has been estimated that a single plant may produce a million and a half seeds, but fortunately they do not appear to have the vitality of the seeds of Field Mustard.

Time of flowering, June to September; seed ripe in August.

Dispersal—By seeds.

Remedy. Pull stray plants along the roadsides and in waste places before they mature. Hand pull in fields unless very abundant. Badly infested fields may be cleaned by fall cultivation and harrowing over spring grain to destroy the seedlings.

GREEN TANSY MUSTARD (*Sisymbrium incisum*, Engelm., var. *filipes*, Gray).

A common weed in grain fields in the West. In Ontario it is found chiefly along railways and in waste places. During the year (1910) it was reported as growing as a weed in cultivated fields from one county in Ontario. It is a biennial weed and produces the first season a rosette of finely divided leaves which lie on the ground; the second season it produces a much branched stem from 2 to 4 feet high. Leaves bright green, much divided into fine segments. Flowers bright yellow, 1/2 of an inch across, borne in elongated clusters (racemes) and succeeded by narrow, smooth, slightly curved pods from 1/2 to 3/4 inch long, on slender, spreading stems. Seed is brownish red, about 1-25 of an inch long, somewhat oblong in shape.

Time of flowering, July; seeds ripe in August.

Dispersal—By seeds.

Remedy. Hand pull. Thorough fall and spring cultivation will clean badly infested fields.

WORMSEED MUSTARD, OR TREACLE MUSTARD (*Erysimum cheiranthoides*, L.).

A native weed, which seems to be spreading rapidly through the Province. Many specimens have been sent here for examination during the past years.

An annual or winter annual with erect and branching stems from 8 inches to 2 feet high. The foliage is bright green and abundant. The leaves are long, tapering at the base into a short petiole, and they are covered with T-shaped hairs. The flowers are yellow and about 1/4 inch across. The little stalks (pedicels) holding the pods, come out from the stem obliquely, but the pod stands erect on the pedicel, parallel with the stem. The pod is about an inch long and four-angled, with one row of seeds in each cell. The seeds are 1-16 inch long and light brown in color, with a furrow on one side. An average plant produces 25,000 seeds.

Seeds give a bitter taste to feed containing them.

Time of flowering, June-July.

Time of seeding, July-August.

Dispersal—Frequently as an impurity in clover seed.

Remedy. Hand pulling and burning is the best remedy when the weed occurs in small quantities; but where there is much of it, the following procedure is advised:

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Fig. 27. Green Tansy Mustard (*Sisymbrium incisum*).

Harrow stubble-ground early after harvest, or gang-plow and harrow. As soon as the seeds have had time to sprout, cultivate; repeat the cultivation, and rib up the land with a double mould-board plow the last thing in the fall. Put in a hoed crop, either roots or corn, the following spring, and cultivate thoroughly throughout the growing season. Cultivate after the roots or corn, sow a crop of grain, and seed with clover. If not too much, pull weeds by hand out of the growing crop.

ROCKET, OR SALAD ROCKET (*Eruca sativa*, Lam.).

This is an annual weed which has been introduced into Ontario as an impurity in alfalfa seed. It is a native of Europe, where it is not considered a pest. At a little distance it might easily be mistaken for Wild Mustard or Charlock, which it resembles somewhat closely in size, habit of growth, foliage and flowers. It requires, however, only a glance to distinguish it. The leaves are more or less deeply pinnately lobed. The flowers are light yellow and the petals are distinctly veined with purple. When the pods are present the plant can be known with certainty, for the upper third of the pod is a flat, empty beak.

Remedy. Though this plant is not considered a noxious weed in Europe, it is not safe to take chances with it in this country. Hand pull and burn, if the plants are not too plentiful. In alfalfa that is cut two or three times during the season, the Rocket does not get a chance to seed, and being an annual should soon disappear. If the plants are numerous in a fresh seeding of alfalfa, cut them with a scythe before the seeds begin to ripen.

THE ROSE FAMILY (*ROSACEAE*).

ROUGH CINQUEFOIL (*Potentilla monspeliensis*, L.).

A native annual weed found frequently in meadows and hay fields in some parts of Ontario. Stem erect, branching, rough-hairy. Leaves compound, with 3 somewhat oblong, oval, toothed leaflets. Flowers bright yellow, in terminal clusters (cymes). The seeds are light brown, about 1-30 of an inch long, blunt and slightly curved, with branching longitudinal veins on the surface.

Time of flowering, June to July; seeds ripe July to September.

Dispersal—By seeds, which are frequently found in timothy seed.

Remedy. This weed will not persist in cultivated crops. Repeated close cutting in hay fields, meadows and waste places will destroy it.

ROUGH-FRUITED CINQUEFOIL (*Potentilla recta*, L.).

A perennial weed with larger, paler, yellow flowers than the last, and 5 to 7 leaflets in each leaf. It is reported as being troublesome in meadows and hayfields in some parts of Ontario. Breaking up the field and putting it under a cultivated crop should clean out this weed.

Fig. 28. Worm-seed Mustard (*Erysimum cheiranthoides*).

Fig. 29. Rough Cinquefoil.

THE PEA FAMILY (*LEGUMINOSAE*).WHITE SWEET CLOVER (*Melilotus alba*, Desr.).

This and the yellow species (*Melilotus officinalis*) are found commonly on vacant grounds and neglected fields about cities and along roadsides. They are tall, rank growing plants, and thrive best on heavy clay soils. They are biennial and produce in the second year tall, tough, many-branched stems which bear the sweet scented flowers so attractive to honey bees. These plants have the redeeming feature of being nitrogen gatherers and good soil formers.

Remedy. Keep closely cut for two years in succession. Plants which are cut off early in the season may grow again and produce seeds before frost comes. Two or three cuttings are therefore often required in a single season.

WILD TARES, OR PERENNIAL VETCH (*Vicia cracca*, L.).

This is a perennial plant with a deep system of root-stocks. It is often reported difficult of eradication. The flowers are blue, and there are 10 to 12 pairs of leaflets to each compound leaf. This plant appears to persist most tenaciously in dark soil. The same cultivation which is used in controlling the Canada and Perennial Sow Thistles will subdue the Perennial Vetch.

ST. JOHN'S-WORT FAMILY (*HYPERICACEAE*).COMMON ST. JOHN'S WORT (*Hypericum perforatum*, L.).

This weed is sometimes troublesome in perennial pastures and meadows. It does not persist where a systematic short rotation of crops is practised.

Common St. John's-Wort is a perennial weed with slender creeping roots, stems clustered woody at the base, upright, from one to two feet high; leaves without stems (sessile), opposite, entire, elliptic or linear oblong in outline, black dotted to the edges, and with semi-transparent dots all over, which can be readily seen when the leaves are held up to the light; flowers borne in loose terminal clusters, the petals with black dots on the margin. The seeds are about 1-24 inch long, cylindrical rounded at the ends, dark brown to black in color.

Time of flowering, from June to September.

Time of seeding, from July to October.

Remedy. In meadows or pastures which cannot be brought under cultivation close cutting several times during the summer is recommended. An application of salt, a small handful, to each plant after close cutting in hot, dry weather, is also recommended where the weed is not too abundant. If the land can be cultivated and brought under a systematic rotation of crops, the St. John's-Wort will soon be suppressed.

Fig. 30. Common St. John's-wort (*Hypericum perforatum*, L.).

Fig. 31. Common Evening Primrose (*Oenothera biennis*).

THE EVENING PRIMROSE FAMILY (*ONAGRACEAE*).

COMMON EVENING PRIMROSE (*Oenothera biennis*, L.).

A tall, stout, native biennial weed found frequently in Ontario in hayfields and on the edges of cultivated fields. The leaves are from 1 to 6 inches long, oblong to lance-shaped, with wavy, slightly toothed margins. Flowers open in the evening and are large and bright yellow in color. Seed pods lie close to the stem and are about an inch in length. Seeds are reddish brown and irregular in outline, 4 to 5 sided.

Time of flowering, June to September; seeds ripe by August.

Dispersal—By seeds.

Remedy. Spud out plants on the headlands and in the fence corners. Never troublesome when a field is brought under cultivation.

THE PARSLEY FAMILY (*UMBELLIFERAE*).

SPOTTED COWBANE, OR WATER HEMLOCK (*Cicuta maculata*, L.).

A weed of wet, marshy places. Cattle are frequently poisoned by eating the roots of this plant, especially early in the spring when pasture is scarce.

A smooth perennial from 2 to 5 feet high. Leaves compound, of 2 or 3 divisions, the stalks with expanding bases which clasp the stem, the leaflets lance-shaped and sharp-toothed. The flowers are small, white and in flat topped clusters (umbels). The root consists of a number of spindle-shaped "tubers."

Remedy. Watch marshes and low places for this weed and hand pull any plants that are found. This is easily done if the roots are first loosened with a spud or other implement. Be sure to destroy the plants after pulling them.

WILD CARROT, BIRD'S NEST, OR DEVIL'S PLAGUE (*Daucus carota*, L.).

This is a biennial, naturalized from Europe, with a deep, strong tap root, a bristly stem, and much divided leaves like the cultivated carrot. The clusters of flowers are in compound umbels which resemble bird-nest cavities.

Time of flowering, July-September.

Time of seeding, August-December.

Dispersal—By seeds carried by wind and animals.

Remedy. Spudding is quite effective when the roots are cut before blossoming the first season. When the field becomes badly infested it should be plowed and cultivated and treated to a hoed crop. Sheep will suppress it in pasture lands.

Fig. 32. Spotted Cowbane or Water Hemlock (*Cicuta maculata*).

Fig. 33. Wild Carrot (*Daucus carota*, L.).

MILKWEED FAMILY (*ASCLEPIADACEAE*).MILKWEED, OR SILKWEED (*Asclepias syriaca*, L.).

This plant quite frequently appears in cultivated crops in Ontario, and once becomes established its extermination is a difficult task.

It is a deep-rooted perennial weed, with a stout stalk from 2 to 5 feet high covered with soft hairs. Leaves large, lance-oblong to broadly oval with fine down on the under surface. Flowers dull purple to white in color and borne in compact clusters (umbels). Fruit, a large pod which opens down one side (follicle) to allow the white plumed seeds to escape.

Remedy. Cut early to prevent from seeding. Spud out scattered plants in meadows and grain fields. If a field is very badly infested break it up and follow one of the methods suggested for Perennial Sow Thistle.

THE MORNING GLORY FAMILY (*CONVOLVULACEAE*).BINDWEED (*Convolvulus arvensis*, L.).

A very troublesome weed which winds its tough and curling stems around the stalks of various plants, partially chokes them, and thereby hinders their growth. It is a perennial with a very extensive creeping root which penetrates far into the soil, and any piece of the root possessing one or more buds is capable of starting new plants; hence it is necessary to clean implements very thoroughly after they have been used in a field containing this weed. The stems are branched and either trail on the ground or climb by twisting around some other plant. The leaves are rather small, with 2 to 4 lobes at the base, giving them an arrow-headed shape. The flowers are white or rose-colored and 1 inch across. The seeds, three in number, are large, black and angular, and are held in a spherical capsule (Fig. 34). An average plant produces about 160 seeds.

Time of flowering, June-September.

Time of seeding, August-October. Often no seed is produced.

Dispersal—Chiefly by means of its creeping roots; sometimes as an impurity in seed grain.

Remedy. This is a very difficult weed to eradicate, and careless cultivation only increases the trouble by carrying the roots from place to place. Salting is recommended by some practical farmers who have succeeded in eradicating this very troublesome pest; but we cannot speak from experience as to the value of this method of treatment.

The weed may be kept in check by the frequent introduction of well-cared-for hoed crops into the rotation, and the shorter the rotation the better. The late sown hoed crops, especially rape, are more effectual than those sown earlier in the season. Before the hoed crop is sown, the weed may be kept in check by going frequently over the field with a broadshare cultivator, so as to cut all the plants an inch or two below the surface without bringing up any of the creeping root stocks. About the 1st July the land may be sown with rape in drills, say 26 inches apart, and during the early growth of the crop the weeds may be kept in check by means of the horse-hoe, with more or less hand-hoeing. If the land has been we

Fig. 34. Bindweed (*Convolvulus arvensis*).

manured or is naturally rich in vegetable matter, the rape will make a rank growth and smother some of the weeds. The rape may be pastured in the fall, and in extreme cases may be followed by another hoed crop, such as corn. If the corn is well cultivated and hoed, most, perhaps all, of the plants will be destroyed.

In some cases it may be advisable to summer-fallow, and in such cases it is better not to plow more than is absolutely necessary, but to depend mainly on the broad-share cultivator. Buckwheat sown on summer-fallow and plowed under when coming into blossom, followed by surface cultivation with broad-share cultivator will assist very much in killing the weed. If necessary, the summer-fallow may be followed by a hoed crop.

DODDER, DEVIL'S GUT, OR STRANGLE WEED (*Cuscuta epithymum*, Murr.).

This weed is spreading very rapidly as an impurity in alfalfa and clover seed. It is by no means a new weed in Ontario. During the year (1910) was especially abundant. Judging by the numerous samples sent in for identification, and by the hosts of questions asked concerning it, more information is required as to its appearance, habit of growth and method of control. It is therefore discussed rather fully here.

Dodder differs from ordinary weeds in possessing no leaves. The yellow thread-like stems of the plant twine around the clover plants and send into their tissues small short rootlets, which are called suckers or haustoria. By means of these suckers the Dodder draws from the clover the food necessary for its growth and reproduction. It thus kills the clover by robbing the plant of its food and causing it to starve. The yellow thread-like stems of the Dodder first appear quite early in the season. They soon spread from plant to plant until a tangled mass of yellow threads covers a whole patch of clover. Badly infested fields may become entirely covered with this pest in a short time. On these yellow threads are produced dense clusters of small white flowers, which are succeeded by rounded, brown seed pods. Each plant produces a large number of seeds. The seeds vary in size from 1/16 to 1/15 of an inch; are grey or yellowish brown in color, vary greatly in shape, but are generally somewhat oval in outline, and the surface is dull and roughened.

Great care should be taken to secure clover seed free from Dodder seed. Alfalfa seed containing this impurity is dear at any price. Small patches should be mowed, raked and burnt early enough to prevent seeding. If by any chance some of the seeds are scattered before the patches are mowed, several thorough hoeings should be given in order to prevent any young plants from getting established. Badly infested fields should be plowed and put under a hoed crop for a season. Clover and alfalfa should not be sown in the field again for two or three years.

Fig. 35. Field Dodder on Red Clover.
a Flowering Cluster; *b* Cluster of Dry Seed Vessels. From a
 photograph. Natural size.
 (Reproduced by the courtesy of the U. S. Dept. of Agriculture, from
 Farmers' Bulletin 306, "Dodder in Relation to Farm Seeds,"
 by F. H. Hillman.)

THE BORAGE FAMILY (*BORAGINACEAE*).BLUE BUR, STICKSEED, OR SHEEP BUR (*Lappula echinata*, Gilbert).

A disagreeable weed on roadsides, in waste places and in pastures. The burs become matted in the wool of sheep.

An introduced annual and winter annual. Erect and branching, covered with rough hairs. Leaves linear oblong, stem-leaves without stalks. Flowers small, $\frac{1}{8}$ inch across, pale blue in long slender one-sided clusters. Seeds greyish brown in color, pear-shaped, about $\frac{1}{8}$ inch long, with hooked spines around the margin.

Time of flowering, from June; seeds ripe in July.

Dispersal—By seeds.

Remedy. In pastures and waste places continued close cutting for a number of years will prevent its seeding and finally cause it to disappear. If a field becomes very badly infested, break it up and put it under a cultivated crop for a year or two. Hand pull stray specimens.

BLUE WEED, VIPER'S BUGLOSS, BLUE THISTLE, OR BLUE DEVIL (*Echium vulgare*, L.).

A biennial weed naturalized from Europe, with deep tap root, which penetrates to a great depth. During the first year, the portion above ground is a rosette of leaves; and from the centre of this, next season, bristly, hairy and erect stems arise 1 to 2½ feet high. The leaves are oblong, 2 to 6 inches in length, with both upper and lower surface hairy. The flowers are numerous, arranged in a rich spire, and are azure blue in color. The seeds are hard and brown in color, with a broad base and angular body $\frac{1}{8}$ inch long (Fig. 36). An average plant produces 3,500 seeds. The seeds are probably dispersed in winter by the wind, as they remain for a long time on the plant.

Its names, both Latin and English, are significant of the notion that it was an effectual remedy against the bite of a viper.

The weed prefers gravelly and lime soils.

Time of flowering, July-October.

Time of seeding, August-October.

Dispersal—By seeds, especially in winter, when they are blown over the snow.

Remedy. This weed gives very little trouble in arable land, if the cultivation is at all thorough. In fence corners, on roadsides, and in waste places, cutting below the crown with a spud is practically the only effective method of destroying the weed. Sometimes, however, this is impracticable, because of the number; and in such cases some special treatment, similar to that recommended for the Dock, may be resorted to.

HOUND'S TONGUE, DOG BUR, OR BURS (*Cynoglossum officinale*, L.).

A biennial weed, with erect hairy stem, of rank growth, and much branched, to 3 feet high. The lower leaves have petioles; the upper ones clasp the stem. They are 6 to 12 inches long and covered with downy hair, and have a disagreeable odour resembling that of mice. The flowers are small and lurid purple-red in color. The fruit consists of a broad, rounded bur, $\frac{1}{4}$ inch long, with one flat side.

Fig. 36. Blue Weed (*Echium vulgare*).

Fig. 37. Hound's Tongue (*Cynoglossum officinale*)

and covered with short spines which enable it to adhere to clothing or to animals. (Fig. 37). An average plant produces about 600 seeds.

Time of flowering, June-August.

Time of seeding, July-September.

Dispersal—Chiefly by animals carrying the burs.

Remedy. Spud or cut deep in fall and early spring; the former to destroy the plant in its first year, and the latter to complete the destruction by removing those that escape the first cutting.

PIGEON WEED, WHEAT THIEF, RED ROOT, OR CORN GROMWELL (*Lithospermum arvense*, L.).

A winter annual naturalized from Europe, with reddish roots. It is usually branched, and grows to a height of 12 inches. The leaves are sessile, narrow and harsh to feel. The flowers are small and white; at maturity, four small smooth seeds are produced, which have considerable vitality.

Time of flowering, from April to July.

Time of seeding, from June to August.

Dispersal—Mainly through seed, such as wheat, rye, timothy and alsike clover; often spread by birds and distributed in the manure.

Remedy. Drop fall wheat from the rotation. Cultivate lightly after harvest and cause the seeds to germinate. When three or four inches high, harrow c. plow them under. If this treatment is repeated each fall, wheat can again be grown.

MINT FAMILY (LABIATAE).

GROUND IVY, GILL-OVER-THE-GROUND, CREEPING CHARLIE (*Nepeta hederacea*, (L.), Trevisan).

This little plant is primarily a weed in lawns, where it often becomes very abundant and crowds out the grass. Once established in a lawn, it is very difficult to get rid of.

Ground Ivy is a creeping and trailing perennial weed; leaves small, round, kidney-shaped, the margin with rounded teeth; flowers bright blue, two-lipped, in small clusters in the axils of the leaves.

Remedy. If this weed occurs in the lawn in small patches here and there, cover these with a heavy coating of coarse salt. This will destroy all vegetation. The patches should then be thoroughly raked, removing as completely as possible any roots or stems of the weed which may still remain. Then thoroughly drench the patches with water so as to wash away all the salt, and reseed them with pure lawn grass seed. If the Ground Ivy is all over the lawn the foregoing treatment will not be practicable. The only thing that can be done in such a case, without plowing of the lawn, is to rake and pull out the Ground Ivy as thoroughly as possible early in the spring when the ground is moist. Then stir the surface of the lawn with a coarse rake and reseed with pure lawn grass seed, the object being to get a good thick stand of grass and clover started before the weed begins to grow again. If this is done, the Ground Ivy will be prevented from spreading and becoming conspicuous.

Fig. 38. Ground Ivy (*Nepeta hederacea*).

THE FIGWORT FAMILY (*SCROPHULARIACEAE*).

MULLEIN, OR VELVET DOCK (*Verbascum thapsus*, L.).

The mullein is a weed introduced from Europe: very common in waste places, roadsides and gravelly or sandy pastures. It is a biennial, with large, long roots, from which spring a tall and usually unbranched stem, 2 to 6 feet high. Both stem and leaves are densely woolly all over, with branched hairs. The leaves are whitish, thick and velvety to the touch. The flowers are yellow and arranged on densely crowded elongated spikes. The capsule containing the seeds is about $\frac{3}{4}$ inch long, and the seeds are small, about 1-20 inch long, six-sided, with irregular ridges running lengthwise between the sides. The color of the seed is dark brown. An average plant produces 6,000 seeds.

Time of flowering, July-September.

Time of seedling, August-November.

Dispersal—As an impurity in clover and grass seed.

Remedy. Spud or cut below the crown, or dig up the roots when young, or break up the soil and grow hoed crops. It easily succumbs to cultivation.

The Moth Mullein (*Verbascum blattaria*) is a worse weed than common mullein, as it infests meadows and bears far more seed. The seed is often found as an impurity in clover and timothy. The plant itself is smooth and tender, from 2 to 6 feet high, with dentate leaves. The flower is yellow, with brown marks on the back of the petals; and the stamens have violet filaments. The seed is brown, very small, and six-sided. Treat it the same as common mullein.

In Fig. 39 are shown the seeds of the mulleins—the upper seed is the common mullein, the lower is the moth mullein.

TOAD FLAX, OR BUTTER AND EGGS (*Linaria vulgaris*, Hill).

This weed has become very plentiful in Ontario, and is now found in many pastures, on roadsides and in waste places.

It is a deep-rooted, persistent, perennial weed. The stem is slender and erect, somewhat wiry, and from 12 to 18 in. high. The leaves are narrow, stalkless and scattered along the stem at very short intervals. The flowers are showy, distinctly two-lipped, about 1 in. long, bright yellow in color with orange lips and borne in a long terminal cluster (raceme). The seeds are dark brown or black in color, about 1-10 in. in diameter, flat and disc-like, with a distinct wing around a thicker central portion which is roughened with little projections.

Time of flowering, June to September; seeds ripe by August.

Dispersal—By seeds and rootstocks.

Remedy. Adopt a short rotation of crops and give thorough deep cultivation in spring and fall. Hand pull when the soil is wet in pasture lands which cannot be broken up. Break up badly infested pastures in July, keep under clean summer fallow until fall, and put on a hoed crop the following season.

Fig. 39. Mullein (*Verbascum thapsus*).

Fig. 40. Toad Flax, or Butter and Eggs (*Linaria vulgaris*).

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THE PLANTAIN FAMILY (*PLANTAGINACEAE*).

COMMON PLANTAIN (*Plantago major*, L.).

A weed of meadows and lawns, the seeds of which are too often found in grass and clover seed.

A perennial with a short, thick rootstock bearing numerous large, dark green, oval, long-stalked leaves close to the ground. Flowers inconspicuous, borne in long, dense spikes. Seed pods oval, dividing about the middle and containing from 8 to 16 small, flat, irregularly-shaped brown seeds.

Fig. 41. Common Plantain (*Plantago major*).

Remedy. A short rotation including a hoed crop will keep this weed in check. * "Plantain in lawns may be weeded out when the soil is firm by forcing a special implement like a chisel, with a half-rounded blade having a point like the tip of a spoon, between the soil and the fleshy crown of the weed to a depth sufficient to break the plant away from its fibrous roots without disfiguring the turf."

PALE PLANTAIN, OR RUGEL'S PLANTAIN (*Plantago rugelii*, Dene).

This Plantain is found as frequently as Common Plantain, from which it may be distinguished by the paler green leaves with the stalks dark purple at the base, the longer and more tapering spikes with the flowers less crowded, and the

* "Farm Weeds of Canada." By G. H. Clark, B.S.A.

which open below the middle and contain from 4 to 9 flat, irregularly-shaped black seeds, which are larger than the seeds of the Common Plantain.

PLANTAIN, BLACK PLANTAIN, RIB-GRASS, OR RIB-WORT (*Plantago lanceolata*, L.).

This plant was once very generally believed to be a favorite food of cattle, yet the opinion of most agriculturists is against it. It is considered a bad weed, especially when it appears in lawns. Numerous inquiries ask what it is, and how to get rid of it. It is a perennial or biennial, with a short thick rootstock, or erect growth, or more generally lying on the ground as a rosette of leaves. At the base of the leaves there are tufts of brown hair; and the leaves themselves are long, narrow and tapering, with prominent veins, or ribs running lengthwise; hence some of the popular names. This flower-stock is slender and channelled, is without leaves and terminates in a dense spike. The stamens project from the inconspicuous flowers, giving a whitish appearance to the whole head. The seeds are enclosed in small pods, each containing two seeds. The seeds are about 1-12 of an inch long, brown and shiny, with a groove on one side, in the centre of which there is a black spot. The opposite side is rounded, as are also the ends. An average plant produces 1,200 seeds.

Time of flowering, June-September.

Time of seeding, July-September.

Remedy. Sow pure seed. If the plants are not numerous cut below the crown with a spud. If they are, break up the field and put in a hoed crop. A short rotation of crops will soon suppress this weed. It is very common in clover fields and it is hard to obtain clover seed free from the seeds of this weed. It is advisable to purchase only the best grade of clover seed. If the weed appears in a clover seed crop, pull the plants or the seeds will depreciate the market value of the clover seed. Special screens are required to separate this seed from Red Clover seed. Small quantities can be cleaned by spreading the clover seed on damp canvas. The plantain seeds will stick to the cloth and the clover seed will drop off when the canvas is inserted.

THE SUNFLOWER FAMILY (COMPOSITAE).

CANADA FLEABANE, HORSE WEED, OR BUTTER WEED (*Erigeron canadensis*, L.).

A tall, hairy plant, very common in meadows. It is a winter annual. The stem is much branched, hairy and may vary from 3 inches to 10 feet in height. The leaves are downy, from 1 to 4 inches long. The flower heads are numerous, about 1 1/2 inch broad, with white flower rays. The seeds are small, light in color, and 1-16 inch long, with a pappus of short tufty hairs. An average plant produces 120,000 seeds (Kerner).

Time of flowering, June-September.

Time of seeding, June-September.

Dispersal—Chiefly by the wind.

Remedy. Having a small root, this weed can be easily pulled. Hence, where there is not very much of it, hand-pulling is a satisfactory means of eradication. As a rule, the weed is troublesome only in meadows, and the frequent breaking up of meadow land tends to keep it under control.

TALL DAISY FLEABANE (*Erigeron annuus*, L.) has larger and fewer flowers, 1 1/2 in. across. It is common in meadows and along roadsides from May to November.

Fig. 42. Plantain (*Plantago lanceolata*).

Fig. 43. Fleabane (*Erigeron canadensis*).

GREAT RAGWEED, OR KINGWEED (*Ambrosia trifida*, L.).

A weed in Western grain fields and in waste places in Ontario. A rough, coarsely growing annual weed from 3 to 6 feet high, with large opposite leaves which are mostly three-lobed. The flowers are of two kinds, the sterile borne on tape-shaped spikes about 4 inches in length; the seed-producing flowers grow close to the base of the spikes in clusters in the axils of the leaves at the base of the spikes; sterile flowers 1½ inches across, cup-shaped, nodding; stamens yellow and conspicuous. Seed-producing flowers inconspicuous with slender purplish pistils.

Time of flowering, July; seeds ripe by August.

Dispersal—By seeds. Wheat from districts of the West often contains Great Ragweed seed.

Remedy. Hand pulling and mowing.

RAGWEED, HOGWEED, BITTERWEED, OR ROMAN WORMWEED (*Ambrosia artemisiifolia*, L.).

Ragweed is an annual. The stem is much branched and slightly hairy. It grows 1 to 3 feet high. The leaves are very finely divided, the lower surface being a lighter color than the upper. The flower heads are very numerous, from 1 to 2 inches long, green and inconspicuous. The flowers are yellow, 1-6 inch across. The sterile flowers are infertile in the terminal spikes, and fertile only at the base of the spikes. The seed head is dark brown, with a sharp tip, around which are arranged 4 to 6 spines, 3-4 inches long. They have great vitality and remain in the soil a long time without losing vitality. An average plant produces about 5,000 seeds. The seed has a bad taste and a peculiar odor to the milk of cows which eat it.

Time of flowering, July-September.

Time of seeding, August-November.

Dispersal—As an impurity in seed grain; and by wind and water, being blown long distances by freshets.

Remedy. For the eradication of this weed, special attention must be given to the fall cultivation of the soil, to prevent seeds from ripening. Gang-plow, cultivate, and harrow stubble ground immediately after harvest, and repeat cultivation at intervals until late in the fall: then plow or rib up, and follow with a roller. Care should be taken with the hoed crops that no specimens of Ragweed are left to seed. When in grass, go over with a mower in September or October, if the plants are likely to mature seed. Do not sow late maturing crops. Ragweed eaten by cows causes bitterness in milk.

YELLOW DAISY, CONE-FLOWER, BLACK-EYED SUSAN, OR NIGGERHEAD (*Rudbeckia hirta*, L.).

A biennial and sometimes annual weed found in pastures and meadows. It grows about 1 to 3 feet high. The stems are sparingly branched and very brittle. The leaves are thick, hairy, oblong and tapering towards the point. The flower is about 1 in. across, with orange yellow rays or petals (10 to 20 in number), and dark purple brown discs almost spherical or cone-shaped. The seeds are brown, almost black, four-angled, and about 1/8 in. long, with no pappus, or with a very short one of hair. (Fig. 46). An average plant produces about 2,000 seeds.

Time of flowering, June-August.

Fig. 44. Great Ragweed (*Ambrosia trifida*).

Fig. 45. Ragweed (*Ambrosia artemisiifolia*).

Time of seeding. July-September.

Dispersal—As an impurity in seed grain.

Remedy. It can generally be killed by mowing, but it is sometimes necessary to break up meadow or pasture land, as suggested in note to Mr. Rennie's method of cleaning land, and follow with a hoed crop. If this is well cared for, it will destroy all Cone-flowers.

OX-EYE DAISY, WHITE DAISY, WHITE WEED, OR POVERTY WEED (*Crysanthemum Leucanthemum*, L.).

The Ox-eye Daisy is a weed naturalized from Europe, and is very closely related to the *Crysanthemum* or national flower of Japan.

It is a perennial with short, thick rootstocks, possessed of much vitality. Very many stems spring from one root. It grows from 6 inches to 3 feet high. The leaves slightly clasp the stem, the lower ones narrow, long, and toothed along the edges, the upper ones small and without teeth. They are slightly aromatic, more perceptibly if bruised. The flowers are 1 to 2 inches broad, on long stalks, with from 20 to 30 white rays and bright yellow disc. The seed is about 1-12 in. long and angled, with alternate white and black longitudinal ribs. It has a short point but no puppus (Fig. 47). An average plant produces 7,500 seeds.

Time of flowering, June-August.

Time of seeding, June-September.

Dispersal—Chiefly in grass seeds and by birds.

Remedy. The Daisy is most troublesome in pastures, and can be got rid of only by breaking up the sod. It can be eradicated by the method outlined for Canada Thistle, or by seeding down to clover and plowing up after one crop has been cut and taken off. The clover should always be cut before the Ox-eye Daisy has had a chance to mature seed.

COMMON RAGWORT, TANSY RAGWORT, OR STAGGERWORT (*Senecio Jacobaea*, L.).

This plant has been sent to the Department on one or two occasions from the neighborhood of Guelph. It has probably been reported before as occurring in Ontario, since it is mentioned in the official list of the Toronto Educational Department Herbarium, but as it is not recorded, to our knowledge, in any other list, it is for all practical purposes a plant new to the Province.

This is the weed which has caused so much trouble in the Eastern Provinces. It is a very dangerous weed because, when eaten by cattle, it causes a curious and fatal disease of the liver (*Hepatica cirrhosa*). For this reason farmers should keep a sharp lookout for it, and destroy it whenever it appears. It is easily recognized being a large, conspicuous, strong growing plant, about 2 to 3 feet high. The flowers are in numerous heads in corymbose clusters, bright yellow in color and very showy. The root leaves are 6 to 8 inches long, petioled. Stem leaves sessile and clasping, all leaves dark green, deeply twice pinnatifid, the segments crowded and overlapping, crisped and waved.

Remedy. If they are not too numerous, grub out the plants, roots and all. If they are numerous, plow up the field and bring it under a short rotation of crops. If on land that cannot be broken up, cut the weed in time to prevent it from seeding for several successive years. Keep cattle off fields in which this weed is growing.

* "Farm Weeds of Canada." By George H. Clark and Dr. James Fletcher.

Fig. 46. Cone Flower (*Rudbeckia hirta*).

Fig. 47. Oxeye Daisy (*Chrysanthemum Leucanthemum*).

LESSER BURDOCK, BUT, CLOT BUT, OR BEGGAR'S BUTTON (*Arctium minus*, Bernh.)

A biennial weed with tremendous roots, probably the largest of all weed roots. This root is uniform in size for a foot below the surface; further down it is branched, and has a great hold on the ground. The stem is much branched (from 4 to 6 feet high) and rough, with broad rounded leaves, the lower surface lighter green than the upper. The flower heads occur in clusters and are pale in color. The flower receptacle, or involucre, as it is called, is composed of long spines, which are very adhesive, and do much injury to the wool of sheep. The seeds are brown, $\frac{3}{8}$ in. long and spotted with darker brown (Fig. 49).

Time of flowering, July-September.

Time of seeding, August-October.

Dispersal—Chiefly by animals carrying the seed from place to place.

The plant when burned yields a good quality of alkaline ash, equal to the potash; and a decoction from the roots is said to be equal to the juice of Sarsaparilla as a blood purifier, etc.

Remedy. Cut below the crown with a spud and burn the tops.

CANADA THISTLE, OR CREEPING THISTLE (*Cirsium arvense*, (L.), Scop.)

This weed was originally introduced from Europe, and hence incorrectly called Canada Thistle. It is a hardy perennial, with numerous underground stems which bear a large number of shoots. (See Fig. 50, illustrating two of these shoots.) The plant grows to a height of 1 to 3 feet. The leaves are narrow and long, deeply indented into very prickly, lobed segments. The leaf has a crimped appearance, and at the base slightly clasps the stem. The under surface of the leaf is woolly, the upper surface less so. It produces numerous heads containing flowers, which are 1 to 2 inches across and of a lilac-purple color. The flower is smaller than that of other thistles. The seed is grey, oblong, and about $\frac{1}{8}$ in. long, with slight longitudinal markings. Attached to the top is a conspicuous tuft of long hairs (the pappus) (Fig. 50). The seed is carried long distances by the wind. An average plant produces 3,500 seeds.

Time of flowering, June-August.

Time of seeding, July-September. Many plants produce no seed.

Dispersal—Chiefly by the wind.

Great care should be taken to prevent Canada Thistle from seeding.

Eradication. The Canada Thistle can be eradicated in several ways, if thorough work is done at the right time.

1st. By careful and persistent spudding, done in such a way as to prevent the plant from developing top above the ground.

2nd. By early after-harvest cultivation of stubble ground.

3rd. By the frequent introduction of hoed crops into the rotation.

4th. By the seeding much with clover, taking one or two crops of hay from the clover sod shallow early after harvest, and cultivating frequently throughout the fall.

5th. By summer-fallowing.

Assuming that all land should be plowed in the fall, we may outline briefly one or two methods of destroying thistles:

(1) *In stubble ground for spring crop.* Gang-plow shallow and harrow after harvest (immediately after the crop is off); and as soon as seeds have had

Fig. 48. Ragwort, Tansy Ragwort or Staggerwort (*Senecio jacobaea* L.).

Fig 40 Burdock (*Arietium minus*).

When the thistles begin to appear, cultivate thoroughly with a broad-share cultivator, the points or shares over-lapping far enough to cut all plants; and harrow and pull up and expose the plants that have been cut. Repeat the cultivation throughout the fall, and plow in the usual way, or, if possible, rib up with a double mould board plow just before the frost. This systematic cultivation from fall to winter will check thistles and other weeds very much, and when followed by a good crop (mangels, corn, turnips, carrots, beans or rape), properly cultivated, will not only clean the land, but put it into good shape for a crop of grain (oats, wheat, &c.), the next spring, which crop should be seeded with red clover.

2) *In sod (meadow or pasture) for spring crop.* After one or two, but not more than two, crops of hay or pasture, plow shallow (not more than four inches) early after harvest, say the 1st to the 15th of August, and harrow at once. Let it lie a couple of weeks, and then cultivate the same way it was plowed, two or three times deep, with a spring-tooth cultivator. After a while cross-cultivate a little deeper. If possible, cultivate a third, or even a fourth time, going a little deeper each time. Then, if you can manage to do so, rib it up with a double mould board plow the last thing in the fall. This will make a good foundation for any crop the following spring—grain, roots, corn or rape—and if the portion in hoed crop is thoroughly cultivated with horse and hand hoes, very few, if any, thistles will be left. The portion intended for rape must be kept clean by surface cultivation till ready for putting in the crop, say the last half of June or the 1st of July, after which it should be treated like other hoed crops.

Some recommend a crop of fall rye on land which is intended for rape the following summer, but the rye takes so much moisture from the soil in the spring that the rape after it is apt to be a poor crop, unless in favorable seasons.

If summer-fallowing is resorted to, it will be well not to plow any more than is necessary, but to rely on surface cultivation with the broad-share cultivator and the harrow, done in such a way as to cut the plants two or three inches below the surface, without bringing up any of the numerous rootstocks which run along a little lower down. It will also be well to keep the fallow covered part of the summer by growing some kind of green crop, say a crop of buckwheat, sowed rather thick and plowed under when coming into bloom. This will help to prevent the loss of nitrates which bare land suffers from washing, and will improve the soil by increasing the supply of vegetable matter in it.

When necessary at any stage in the above method of cultivating either stubble-ground or sod, say for mangels, use a grubber or subsoil plow to stir the soil to a greater depth than is reached by the surface cultivation.

CHICORY, OR WILD SUCCORY (*Cichorium intybus*, L.).

A perennial weed introduced from Europe, with long, deep tap-root, which when dried and ground up is used in adulterating coffee and as a substitute for it. The stems are almost leafless, from 1 to 3 feet high, much branched, slightly hairy and white in color. The leaves, spread out on the ground, are long, with irregular edges. The flower heads are numerous, occurring in clusters, without flower stalks, on the naked branches. The flowers are about $1\frac{1}{2}$ inches across, bright blue in color, and are usually closed by noon. The seed is about $\frac{1}{8}$ inch long, tapering to a blunt point, the opposite end having a fringe of minute hairs around the crown. The body of the seed is corrugated. An average plant produces about 3,000 seeds.

Time of flowering, July to October.

Fig. 50. Canada Thistle (*Cirsium arvense*).

Fig. 51. Chicory (*Cichorium intybus*).

Time of seeding, August to October.

Dispersal—Frequently as an impurity in clover and grass seed.

Remedy. Seldom troublesome in well cultivated fields. A short rotation of crops will soon cause it to disappear. Badly infested fields may be cleaned by deep, thorough fall cultivation, followed by a hoed crop the next season.

BARNABY'S THISTLE (*Centaurea solstitialis*, L.).

This plant is comparatively new to Ontario. Its home is in the Mediterranean region, but it has been introduced into most temperate climates with alfalfa, clover and other seeds. It has become scattered pretty well over Ontario as an impurity in alfalfa. It is a bushy-branched, annual weed from 1 to 2 feet high. The flowers are yellow and surrounded by conspicuous, stout, yellow spines about three-fourths of an inch long. The lower leaves are divided, the upper linear entire, and run along the stem at the base (decurrent). The plant being an annual and very conspicuous is not likely to become a bad weed.

FALL DANDELION (*Leontodon autumnalis*, L.).

An introduced perennial weed reported recently from several places in Ontario as occurring in hayfields. Leaves mostly basal, springing from a short, thick root-stock and resembling somewhat the leaves of the Common Dandelion. Stems branched, scaly and few flowered. Flowers about 1 inch across, bright yellow. Seed is $\frac{1}{4}$ inch long, brown, linear, ribbed lengthwise and bears a row of feathery bristles about its own length.

Time of flowering, July till frost; seeds ripe by August.

Dispersal—By seeds and by division of the crown.

Remedy. * "Badly infested fields should be brought under cultivation. Pasture lands that cannot be cultivated may be improved by severely raking the surface with a spring-tooth harrow and sowing the most vigorous grasses."

YELLOW GOAT'S BEARD, MEADOW OR WILD SALSIFY (*Tragopogon pratensis*, L.).

This is a weed common along roadsides, railway tracks, and in waste places in many parts of Ontario. No reports have been received of it persisting in cultivated fields. However, specimens are frequently sent into the Department of Botany for identification, as it is a very conspicuous plant both in flower and seed.

Yellow Goat's-beard is a perennial weed naturalized from Europe. It has a long slender tap root; an upright stem from 1 to 3 feet high; leaves keeled, long, narrow taper-pointed; large yellow flower heads, from 1 to $2\frac{1}{2}$ inches broad, which are succeeded by conspicuous spherical heads of downy seeds looking like very large dandelion seed-heads. The seeds are yellowish-brown, long and slender, somewhat spindle shaped, tapering to a slender beak which bears a tuft of hairy bristles; the surface is lined lengthwise and somewhat roughened with little projections. The whole plant is filled with a milky juice.

Time of flowering, from June to September.

Time of seeding, from July to September.

Remedy. This weed does not appear to stand cultivation, as it is seldom seen in fields which are under crop. If it becomes abundant in meadows or pastures, break

* "Farm Weeds." By G. H. Clark.

Fig. 52. Fall Dandelion (*Leontodon autumnalis*)

Fig. 53. Yellow Goat's-beard (*Tragopogon pratensis*).

these up and keeping them under cultivation for a year or two should cause it to disappear. Stray plants on roadsides, head-lands and waste places should be cut down enough to prevent them from seeding.

SALSIFY, OYSTER PLANT, PURPLE GOAT'S-BEARD (*Tragopogon porrifolius*, L.)

This plant, which is cultivated as a vegetable, is often found growing on roadsides and waste places. It is very similar to Yellow Goat's-beard except for the color of the flower-heads, which is purple instead of yellow.

THE PERENNIAL SOW THISTLE (*Sonchus arvensis*, L.).

This is by all means the worst weed in the Province of Ontario at the present time. It is found in almost every county, and upon almost every farm. So rapidly and so persistently is it spreading that in some parts of the Province it threatens to completely over-run the fields and drive out the farmer. In spite, however, of its rapid dispersal there are many who are not able to recognize this pest and who mistake it for its two comparatively harmless cousins, the Common Annual Sow Thistle and the Spiny Annual Sow Thistle. This should not be the case, as it is a very conspicuous weed, and differs markedly from the other two species. The Perennial Sow Thistle grows freely on a very great variety of soils, but is especially troublesome on rich, low, damp land. It appears the first year in a field in scattered patches consisting of young plants, each plant made up of a rosette of leaves lying close to the ground, and thus, when numerous, they completely cover it. These young plants have short underground root stocks and are comparatively easy to destroy. The second year a large stem bearing numerous leaves and flowers is produced and the root stocks grow along and send up quantities of new shoots. Once established in this manner, it is no easy task to destroy this pest.

The Perennial Sow Thistle (*Sonchus arvensis*) is a tall, coarse growing perennial with deep roots and numerous thick, underground stems or rootstocks, commonly spoken of as "roots." Upon these at intervals of a few inches are borne new plants which develop into new plants. The stem is smooth and hollow and the whole plant is filled with a bitter milky juice. The leaves are pointed, 4 to 12 inches long, deeply cut with the segments pointing backwards (runcinate), slightly prickly. The flowers, or, more correctly speaking, the heads of flowers, are about 1 to 1½ inches across, and bright orange in color. The involucre, or, as it is commonly called, the flower cup, and the peduncles or flower stems are covered with distinct, yellow, scabrous bristles. The seeds are dark reddish-brown in color, about 1/8 of an inch long, somewhat spindle shaped with blunt ends, and each surface bears a number of very deeply wrinkled, longitudinal ribs. Each seed bears at the top a tuft of silky hairs (pappus) which, when dry, acts as a parachute and enables the seed to be borne long distances by the wind.

POINTS OF DISTINCTION BETWEEN THE PERENNIAL SOW THISTLE AND THE ANNUAL SOW THISTLES.

1. The Perennial Sow Thistle is a taller, coarser growing plant than either of the other two Sow Thistles.
2. The Perennial Sow Thistle has numerous underground rootstocks while the annual species have only fibrous roots. (See illustrations.)

Fig. 54. Perennial Sow Thistle (*Sonchus arvensis*).

Fig. 55. Spiny Annual Sow Thistle (*Sonchus asper*).

3. The leaves of the Common Annual Sow Thistle are deeply cut and lobed and scarcely spiny. The leaves of the Spiny Annual Sow Thistle are almost entire, very prickly and often decidedly waxy. The leaves of the Perennial Sow Thistle are deeply cut, but not lobed, and slightly prickly. (See illustrations.)

4. The flowers of the Perennial are bright orange in color and about $1\frac{1}{2}$ inches across, while the flowers of the Annuals are pale yellow and less than $\frac{1}{2}$ inch in diameter.

5. The flowercups (involucres) and flower stems (peduncles) of the Perennial Sow Thistle are conspicuously covered with yellow glandular bristles, while those of the annual species are nearly smooth.

6. The seeds of the three species also differ as to shape and markings.

HOW THE PERENNIAL SOW THISTLE IS SPREAD.

The Perennial Sow Thistle is being rapidly and widely spread by means of its numerous seeds, which are blown far and wide by the wind, and to some extent by its abundant underground rootstocks which with remarkable rapidity spread through a field, sending up new shoots which soon entirely cover the ground and choke out all other vegetation. The rootstocks when broken up are often carried from field to field by harrow or cultivator. It has been estimated that an average plant produces 2,000 seeds. There are thousands of these plants going to seed on neglected farms, on road sides and in fence corners. Many more mature plants are harvested with the grain and their millions of seeds scattered at threshing times. Is it to be wondered that the Perennial Sow Thistle is becoming such a serious pest in Ontario?

METHODS OF ERADICATION.

These are discussed under the headings of General Suggestions and Detailed Methods.

GENERAL SUGGESTIONS.

1. Bear in mind that a few patches of Perennial Sow Thistle, if allowed to mature, may seed down a whole neighborhood. Therefore, take every precaution to prevent the seeding of patches in meadows, grain fields, fence corners, and on the road side.

2. Watch for the first two or three patches in the field and destroy them before the pest becomes established.

3. Be careful not to harrow or cultivate through patches and drag the underground rootstocks all over the field.

4. The Perennial Sow Thistle thrives most luxuriantly on rather low, damp land. Underdraining, therefore, will help to control it.

5. Sheep are fond of this weed, and, if turned on a field after harvest, will prevent it seeding and by their close cropping weaken the underground rootstocks.

DETAILED METHODS.

Several methods of exterminating the Perennial Sow Thistle are here outlined in detail. They have all been suggested by practical farmers. It is hoped that those who are looking for information on this subject will find among them a method suited to their own conditions.

Method No. 1. This method is suggested by Professor Zavitz, who found it effective in the eradication of Quack Grass. Cultivate the field until about the middle of June, running over it frequently with the cultivator so as to keep the tops down and thus weaken the "roots." Then apply manure at the rate of about 20 bushels per acre (12 good loads). Cultivate the manure in thoroughly and with a double mould plow slightly ridge up the land, making the ridges about 26 inches apart. On the ridges sow pasture rape at the rate of $1\frac{1}{2}$ lbs. per acre. It must be remembered that the right amount of rape should be sown, for if too little is sown the plants will not be thick enough to smother the weeds, and if, on the other hand, too much is sown the plants will be too crowded and not grow vigorously enough to keep ahead of the thistle. Sow the rape when the land is sufficiently moist to insure quick germination of the seed. If the rape is slow in starting the Sow Thistle will start in the rows and thus necessitate hand cultivation there. Cultivate every week or ten days until it occupies all the ground and makes further hand cultivation impossible. If, when the rape is cut or pastured, any Sow Thistles remain, the field should be ridged up the last thing in the fall and put in with a good crop the following year. This should not be necessary if a good stand of rape is obtained.

Method No. 2. This is a system of intensive cropping suggested by Professor Zavitz. As soon as a cereal crop is harvested, plow the land and give frequent cultivation until the first or middle of September. Then sow winter rye at the rate of about two bushels per acre. This can be pastured the following spring, or cut for hay or silage. As soon as the crop is off the land, put in rape, turnips, or buckwheat. The advantage of this system is that three crops are harvested in two years and the Sow Thistle fought at the same time.

Method No. 3. This method is recommended by Professor Day. Immediately after harvest gang-plow shallow and run over the field several times with the broad-swing cultivator. Later in the fall plow a little deeper, and continue cultivating every week or ten days as long as the season permits. Last thing before the ground freezes ridge up the land with a double mould board plow. The following spring give frequent cultivation up to the first of July, then sow pasture rape.

Method No. 4. This is a short rotation which has been recommended by several College Institute workers. Clover is followed by a crop of grain, then clover again. The clover is cut in June, and the land plowed about four inches deep and given frequent and thorough cultivation during the rest of the summer. The following spring a grain crop is sown, seeding down with clover. For best results the grain crop should be one which can be cut early enough to prevent the thistle from coming in.

Method No. 5. Directly after harvest plow the land lightly, and then give frequent cultivation as long as the season permits. The following spring gang-plow the field in summer fallow until it is time to sow fall wheat. The summer fallow which is effective must be a *bare fallow*. The field must be cultivated thoroughly and frequently, with the object of keeping the tops down and breaking up and bringing to the surface of the ground as many of the "roots" as possible. The gang-plow should occasionally be run over the field in order to insure the cutting of the roots. Bare summer fallow has given excellent results on the College farm in seasons when other methods were at best only partially effective.

Fig. 56. Annual Sow Thistle (*Sonchus oleraceus*).

Fig. 57. Prickly Lettuce (*Lactuca scariola*).

ANNUAL SOW THISTLE, COMMON SOW THISTLE, OR MILK THISTLE (*Sonchus oleraceus*, L.).

An annual weed introduced from Europe. It grows 2 to 3 feet high, has fibrous roots and leafy stem, and is not quite so large or coarse as the Perennial Sow Thistle. The leaves are much lobed, and have short, soft spines. Each head is many-flowered; but the "flowers" are small, about $\frac{1}{2}$ in. across, and of a pale yellow color. The seeds are brown, dull or roughened, and about $\frac{1}{8}$ in. long, with 5 longitudinal ridges finely wrinkled crosswise, and attached to the top is a large tuft of fine hairs united at the base.

Time of flowering, June-August.

Time of seeding, July-August.

Dispersal—Chiefly by the wind.

Remedy. Cultivate stubble-ground and sod early after harvest and throughout the fall as for Canada Thistle (see Fig. 56). Follow with hoed crop, preferably corn or roots, and cultivate thoroughly throughout the growing season. Use the cultivator, instead of the plow, after roots or corn; sow a crop of grain and seed with clover; if practicable, pull the weeds by hand out of the grain crop; take on one or two crops of hay or pasture, and again break up the sod, plowing, harrowing and cultivating as for Thistle.

PRICKLY LETTUCE (*Lactuca scariola*, L.)

Prickly Lettuce is a native of the old world, and has invaded this Province both from New York and Michigan. It is a winter annual; it springs from seeds in the fall, and survives the winter. The plant grows to a height of $3\frac{1}{2}$ feet; the stem is leafy and usually smooth; the leaves are oblong and slightly pointed, often clasping at the base; the under surface of the midrib of the leaf is spiny: Heads are numerous and yellow.

Time of flowering, July-September.

Time of seeding, August-October.

Dispersal—By means of its seeds, which are provided with a pappus or tuft. An ordinary plant may produce 8,000 seeds.

Remedy. The best methods of destroying the weeds are: 1. To mow repeatedly as it comes into bloom, or earlier. 2. To cultivate thoroughly with a hoed crop. By this method the seeds in the soil will be induced to germinate. They should not be covered deeply in plowing. Mature plants should be cut down and the seed left the seeds be blown about and scattered by the wind.

Farmers should be careful to buy only clean clover, millet and grass seeds, and the weed inspector should insist on the fulfilment of the law, and have all fence corners, roadsides, and waste lands cleared of the pest.

WILD LETTUCE, SOUTHERN THISTLE, OR TRUMPET-MILKWEED. (Erroneously called Prickly Lettuce.) (*Lactuca canadensis*, L.).

An annual or biennial plant with a leafy stem, which may attain a height of seven feet. The leaves are deeply lobed, terminating in an acute point, and have stalks or petioles, the lower ones being smaller than those near the top of the stem. The stem branches at its summit into a compound flower-cluster. The flowers are small, yellow in color, and open only a few at a time. The seed is dark brown.

Fig. 58. Wild Lettuce (*Lactuca canadensis*.)

Fig. 59. Paint Brush (*Hieracium aurantiacum*, L.).

color, flat and oval, with longitudinal ribs and a threadlike beak at the apex, and possesses a small white tuft of hair.

Time of flowering, June-October.

Time of seeding, July-October.

Dispersal—Chiefly by the wind.

Remedy. Where there is not much of it, pull and burn before ripening. Where this cannot be done, use the same method as for Mustard.

PAINT BRUSH, DEVIL'S PAINT BRUSH, OR ORANGE HAWK WEED. (*Hieracium aurantiacum* L.).

This is another weed which is gaining ground in Ontario. It has been common for some time in the eastern part of the Province, but is now reported as being found as far west as Oxford County. It has been found in the vicinity of Guelph for many years. It is being dispersed as an impurity in clover seed, and by means of its tufted seeds, which are blown about by the wind. It is a serious pest when it gets into meadows and pastures, as it spreads rapidly by runners and soon crowds out the grass. Careful watch should therefore be kept to prevent its establishment upon the farms of Ontario.

It is a perennial weed of European origin, and produces slender runners, which lie near the surface of the soil. The leaves are all basal, and lie close to the ground, forming a rosette. They are broad y-lanced-shaped, from 2 to 6 inches in length, the flower is orange red in color, about 2-3 of an inch in diameter, and borne in clusters on the top of a simple, nearly leafless stem from 12 to 18 inches high. The seeds are provided with tufts of down. When found in clover seed, however, the down is usually absent. They are torpedo shaped, about 1-12 of an inch long, and ridged lengthwise. Ripe seeds are dull jet black in color, unripe seeds deep red.

Remedy. Paint Brush is but a shallow-rooted perennial, and readily succumbs to cultivation. Infested meadows and pastures should be broken up and put under a short rotation of crops. Salt at the rate of $1\frac{1}{2}$ tons per acre is recommended for the destruction of this weed. It should be scattered over the patches so as to fall on the leaves. It is claimed that it destroys the Paint Brush and improves the grass. Our results do not seem to justify this statement.

KNOW THE WEEDS.

It is very important that those engaged in farming should get to know the worst weeds and the weed seeds most frequently found in commercial seeds. This they can do with a little trouble. Strange weeds should be sent to the Botanical Department here for identification, and a collection of the most common weed seeds should be secured for reference and comparison.

WEED IDENTIFICATION AND SEED TESTING.

The Department of Botany is at the service of farmers, gardeners, seed merchants and others in the identification of weeds, weed seeds, plant diseases, grasses and economic plants. Clover and other farm seeds are tested and reported upon as to purity absolutely free of charge. Plant specimens and samples of seeds should be carefully packed and addressed with postage prepaid to the Botanical Department, Ontario Agricultural College, Guelph, Ontario.

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