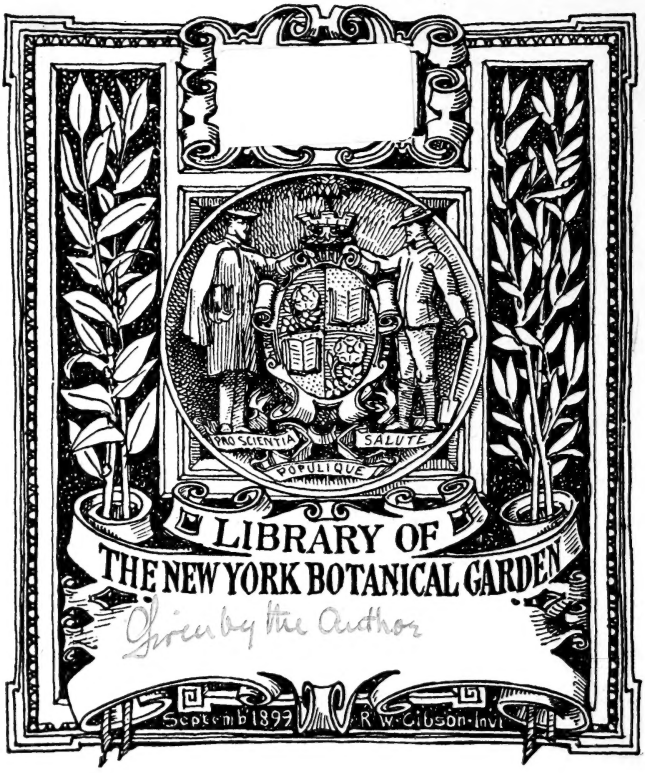
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Weeds of Montana

By J. W. Blankinship.

[Issued September 10, 1901]

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MONTANA AGRICULTURAL

EXPERIMENT STATION

...OF...

THE MONTANA COLLEGE OF AGRICULTURE.

WEEDS OF MONTANA.

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Montana Experiment Station.

Bulletin No. 30. **June, 1901.**

WEEDS OF MONTANA.

J. W. BLANKINSHIP, BOTANIST.

I. GENERAL STUDY OF THE WEED FLORA.

INTRODUCTION.

In the study of the economic features of a new state like Montana, where relatively little has been done toward a systematic biological survey of its natural productions, the botanist is seriously handicapped by the lack of available scientific collections to represent the different species of plants in the state and to show their relative abundance and distribution. Practically all this flora is of economic import, either to benefit or injure the industries of man. The forests are utilized for wood and lumber; the shrubs serve as forest nurseries, the herbs and grasses for forage. Many are capable of economic cultivation for their fruit, for shade or for ornament, while others are harmful and need restraint. Parasitic fungi attack our crops and greatly reduce the yield; many plants are poisonous to stock and cause extensive loss; some ill-flavor the milk of cows or the honey of bees; while the spines of cacti and the awns of grasses seriously injure the mouth of stock, and weeds mar our yards and highways and compete successfully with growing crops.

In order to combat these pests intelligently or to make the best use of the native plants in our industrial life, it is necessary to know their life history, their habits and their distribution within the state, and these facts can be secured only from a representative

collection of the species in a herbarium and from the study of the different plants in the field. Without this data, it is impossible to draw accurate conclusions as to the abundance and utility or harmfulness of any economic group. Although much has now been done at this Station toward securing the necessary collections of the native flora and in the study of the economic conditions of the various parts of the state, any present treatment of a large economic group, like the weeds, must of necessity be very imperfect, as large and important sections of the state are nearly unknown scientifically and several large agricultural districts have not been visited.

The study of the weeds of any region must include the sources of infection and the means by which they spread over the country when once introduced, as well as the adaptation of native plants to conditions of tillage and habitation and the means to be adopted for their restraint and eradication. The subject is of special interest in a new state like Montana, where the population is relatively scant and the agricultural districts are widely separated from each other and often from direct weed infection from abroad and where the distribution and composition of the native flora is rapidly changing, owing to the increased settlement and effects of grazing immense herds of stock over the uncultivated portions. It is also desirable to make note of the present status of these weeds in the state in order to observe their future history. Many introduced species are unsuited to our climatic conditions and die out or maintain a precarious existence here, so that they may well be disregarded as a source of danger. Others that appear harmless in the Eastern states may here develop most dangerous habits and require the combined efforts of a community, or even the aid of the state, to check their spread or effect their destruction. It is the object of this paper to present a summary of our present knowledge of the weeds of this state, to indicate the most dangerous introductions and suggest means for their restraint or eradication. It is hoped that farmers, stockmen and others interested, will send this Station specimens of any plant found troublesome or threatening to become a pest in their vicinity, so that the species may be determined, its habits studied and timely warning given to other parts of the state, that prompt

steps be taken to effect its extermination should it prove a serious danger. All the plates used are from the Division of Botany of the Department of Agriculture at Washington by whose kindness we are able to give a fair representation of many species which would otherwise be difficult to describe.

GENERAL CHARACTERISTICS OF WEEDS.

Of the various groups of plants troublesome to man, the weeds are of prime importance because of their abundance and general distribution, and from their unceasing struggle with the farmer for the possession of the fields. The *weeds* are that group of troublesome plants, which promptly occupy soil on which the native vegetation has been greatly weakened or destroyed by the operations of man and his domestic animals and which grow and flourish under conditions of habitation, cultivation, travel and pasturage, and occur but rarely removed from these conditions. They are objectionable because they tend to crowd out plants more desirable in our lawns, meadows and pastures, because they render our yards, streets and waysides unsightly and spread thence into our gardens and fields, where they choke out the growing crops and rob them of needful food and moisture, and because their seeds, mixed in the grain used for food by man and stock are unpalatable, or even hurtful. Yet, in most of their characteristics, weeds differ from cultivated plants only in their lack of economic value and their greater hardiness, and the cultivated plants themselves, under favorable conditions, not infrequently escape and become pernicious weeds, like the carrot, radish and turnip in certain sections of the Union.

But there are certain characters and adaptations of weeds, which enable them to grow and spread faster than other plants and give them a peculiar relation to civilized life.

Their habit of occupying lands denuded of their natural vegetation renders them free from all competition except among themselves. They have often wide-spreading basal leaves and spreading or prostrate branches, which enable them to crowd aside other plants, or their vigorous growth permits them to overtop and shade out more slow growing species. They are usually protected against herbivorous animals by growing within fenced

enclosures or in streets and lanes, where there is less pasturage. Those found in meadows and pastures are frequently acaulescent (stemless), like the dandelion and plantain, while along streets and highways they are often prostrate, as in the case of pigweed pursley, knotgrass, vervain, carpet weed, and wild tomato, a habit which puts them beyond the reach of most grazing animals. Many have bitter or poisonous secretions or excretions which cause them to be avoided by animals, and others develop spines, prickles or stinging hairs for the same purpose. A considerable number of weeds are able to germinate on and penetrate with their roots the packed soil of street and roadside and to withstand the excessive dryness of the later summer, when many other plants would die under similar conditions.

But one of the most remarkable characters of weeds is their wonderful power of reproduction. Many annuals begin blooming almost as soon as they are out of the ground and produce seed until the frosts of autumn, not rarely going through several generations in a single season, while the number of seeds produced by a single plant often mounts up into hundreds of thousands. With most other plants the season is far advanced before they attain maturity, or their period of fruiting is limited to a short season in early spring and the number of seeds produced is relatively small. The seeds of many weeds are also remarkable for their vitality, and are often able to germinate a dozen or more years after being exposed to ordinary soil conditions, and it is this property which renders the sunflower, wild oat, wild mustard, pigweed pursely, wild tomato, tumble-weed and others so difficult to exterminate when they have once become established. A number of species are more or less fleshy so that they are able to take root again after being dug up, or are at least able to mature the seeds already set, and this habit makes them palatable for stock and thus aids in the distribution of their seed. The large fleshy roots of the dandelion and docks are difficult to kill while the underground stems of the wild morning glory, the Canada thistle, sheep-sorrel, milk-weed, wild liquorice, &c., not only spread the parent plant, but are even aided by the processes of cultivation.

But weeds also labor under certain disadvantages. Nearly all species are desirable food for stock, of which they take advantage

to scatter their seeds. By far the larger part are annuals and are hence unable, when left to their own resources, to long compete with the more enduring native species. Biennials are particularly weak, being unfitted for the annual upturning of the soil in cultivation or for extended contests with the perennial species, finding their natural conditions only in waste places and along highways. Weeds must also contend in unceasing passive warfare with man, whose interests they endanger, but who provides them with conditions best suited for their growth.

MEANS OF DISTRIBUTION.

Weeds, like other plants, are dependent upon physical agencies for the distribution of their seed, but rely more largely upon man and domestic animals for this aid. It may be well to enumerate a few of the principal means thus employed.

A considerable number of species depend upon the wind to scatter their seeds and such weeds produce feathery, hairy or winged seeds or have their seed envelopes so modified as to aid in such dissemination. Among these are the thistles, fireweed, dandelion, milkweed, sow-thistle and rag-weed (Erigeron), while the docks, pennycress and orache are likewise assisted by their winged fruit pods and appendages. Again, a group of plants called "tumble-weeds," adapted particularly to the plains, grow in large globular clusters and have the curious habit of breaking loose from the ground in the winter and are then rolled about over the country by the wind, scattering their seeds throughout their course. We have here the tumble-weed (Amaranthus albus), the tumbling mustard (Sisymbrium altissimum) and the Russian thistle (Salsola Kali Tragus), while the tumble-grass (Panicum capillare) is found to some extent eastward.

Another large class depends more particularly upon the water for seed transportation and such seeds have light, water-proof envelopes, which enable them to float for considerable distances before saturation. Indeed, the seeds of nearly all weeds are thus distributed to a greater or less extent, but the sunflower, the horse-weed (Iva), wild mustard, pigweeds and the sweet clover seem to depend mainly upon irrigation for their spread, and the docks come largely under the same class.

A third class requires the agency of animals to assist their migration. Some of these have hooked, barbed or awned fruit which cling to the fur and wool of stock and hence are particularly injurious to the wool industry of the state. Among them may be mentioned the cuckleburs, beggar-ticks, wild liquorice, buffalo-bur, spear-grass and foxtail. The weeds so common along streets and highways, in yards and pastures, are distributed mainly by the mud of passage, which adheres to the feet of animals and the wheels of vehicles, while the adhesiveness of a considerable number is further increased by developing a gummy secretion from their outer coat or envelope to assist in the process. These seeds are usually small and frequently depend in part upon water for their extension. Those with mucilaginous envelopes are the plantains, shepherd's purse, bird-seed (Lepidium), Matricaria, Monolepis and Euphorbia, while the sticky contents of the berry of the wild tomato serve a similar purpose. Many of these weeds are edible and have small seeds with impervious coverings, which enable them to withstand the various processes of digestion and they are thus scattered in the offal of animals. Hence barn-yard manure is a prolific source of weeds and always tends to restock our fields with these pests.

But the agencies above enumerated tend only to scatter weeds already established in a community, while foreign species come in chiefly through the agency of man, and it is against these introductions that we are able to guard most effectively. A large number of these imported weeds first reach us through the railways traversing the state, being transported in merchandise, in hay and in the bedding of stock cars and these seeds are dropped en route or in the transfer of goods at the several stations. Hence, it is a matter of common observation that new weeds are frequently first observed along the railways and in the vicinity of such stations. The Russian, the Canada and the Scotch bull thistles seem to arise mainly from this source.

It is probable that the chief means of foreign infection is through the importation of impure seed. New weeds are constantly appearing in our fields and gardens traceable directly to this source and all such weeds should be promptly exterminated before they secure a foothold.

A great part of the weeds of the grain fields, besides providing for independent distribution, ripen their seeds at the same time as the cultivated grains and depend upon the farmer to exercise like care in planting them again. Hence it is necessary, if these weeds be kept out of our fields, that all seed sown be first carefully winnowed, and thus the farmer may later be saved much labor and expense in their extermination, or in the reduced yield from the grain planted. The cockle, sunflower, wild oat, and wild mustard are largely distributed in the seed planted and these are counted among the worst weeds in the state. Garden and lawn seeds are notoriously contaminated and the most troublesome weeds of the East are thus imported, particularly the dandelion, plantain, chickweed, sow-thistle, ragweed, Canada thistle and many others equally troublesome.

ORIGIN OF OUR WEED FLORA.

Some plants in every country acquire the weed habit by adaptation to meet certain conditions, which have resulted in the destruction of the normal vegetation over areas more or less extensive and of fair permanence. Under natural conditions such denuded soil is found in cases of forest fires, landslides and floods. The first two are of infrequent occurrence and the areas effected are soon re-covered, mainly with wind-disseminated species. The floods resulting from melting snows and spring rains are fairly regular in time and permanent in place, so the alluvium deposited each season affords a fertile and permanent ground for the growth and reproduction of the seeds transported in the water. It is these native alluvial weeds, of which the annual sunflower and the horseweed (Iva) are examples, that spread so readily to our fields and gardens with the water used in irrigation and there become permanent pests.

To an appreciable extent, too, weed conditions are afforded by the soil excavated about ant hills, gopher burrows and prairie-dog towns, and here flourish in abundance such species as *Krinitzkia crassisepala*, *Echinospermum Redowskii*, *Plantago Patagonica*, *Malvastrum coccineum* and *Cleome integrifolia*, which now find themselves equally well adapted for growth in yards, streets and waste places. But man in his various pastoral, agricultural and

commercial operations, is the chief agent in providing conditions suitable for weed growth.

The occupation of a country by nomadic tribes or a pastoral population essentially disturbs the previously existing balance of native vegetation in that region. The native species are killed about the temporary camps and habitations and the pasturage of flocks and herds tends to reduce or even exterminate many of the more nutritious forage plants and to introduce others, which take the place of those destroyed. A large proportion of the weeds of the Plains probably owe their wide distribution to the Indian and the buffalo, and the stockgrowing industry has merely continued and extended the conditions previously prevailing.

The change in the flora following the settlement of a country by an agricultural population is relatively much greater, owing to the increase of population and the extent of the changes produced by cultivation, travel and commerce which facilitate the introduction of many foreign species.

Thus the weeds of any particular region are of two kinds native (or indigenous) and introduced, the latter coming in from other regions adjacent or remote. It is often desirable to separate these two groups, as it is manifestly impossible to prevent the introduction of species already a component part of our flora, while the foreign species may be prevented from securing a foothold, exterminated, or confined to certain limited sections already invaded.

In the older and more densely populated states it is often difficult to distinguish the introduced plants from the native species without long study and careful comparison over an extended area, and systematic botanists are often lax in this discrimination. In a new state like Montana, the problem is greatly simplified because of the sparsity of settlement and because the sources of weed infection are relatively few and easily traced. Even here many introductions pass as native species by reason of their abundance in certain sections and our uncertainty as to their natural distribution, yet there are certain rules by which we may form a fairly correct judgment as to whether a given species is native or introduced. In general, other conditions being the same, we may infer that a species is introduced if—

1. It is most abundant at the supposed point of introduction, decreases in numbers departing therefrom and is wholly absent in distant or isolated localities.

2. It does not occur in isolated localities growing wild under natural conditions and forming an integral part of the indigenous flora, or is known to be a recent introduction into such localities.

3. It is sporadic in localities widely separated and is much more abundant or occurs in greater perfection in another region from which its introduction may be inferred through known agencies.

4. It is normally found occupying localities in which the native vegetation has been weakened or destroyed by the presence of man and his domestic animals and is rare or lacking in the country adjacent.

The source of its introduction is (1) from a region of its known occurrence adjacent or remote, or (2) from the direction of its greatest abundance in the state, or (3) from the usual source of seed importation into the state, or of travel through it.

Judged by these criteria, the following species may be considered indigenous, although a number (here starred *) by their present restricted distribution in the state and the fact that their bounds are being still extended, indicate that they are of comparatively recent introduction and may best be termed "subindigenes," while a few (†) are doubtful.

I. ANNUALS.

*Amaranthus albus, L.
*A. blitoides, Wats.
*Chenopodium glaucum, L.
*Cleome integrifolia, T. & G.
Draba nemososa, L.
*Dracocephalum parviflorum, Nutt.
*Echinospermum Redowskii, Lehm.
*Euphorbia glyptosperma, Engelm.
*Franseria Hookeriana, Nutt.
*Ellisia Nyctelea, L.
*Helianthus annuus, L.
†H. petiolaris, Nutt.
†Iva xanthiifolia, Nutt.
*Krinitzkia crassisepala, Gray.
*Lepidium apetalum, Wild.
†Monolepis chenopodioides, Moq.
*Plantago Patagonica, Jacq.
†Sisymbrium incisum, Engelm.
*Solanum triflorum, Nutt.

II. BIENNIALS.

Cnicus eriocephalus, Gray.
*Gaura parviflora, Dougl.
*Grindelia squarrosa, Dunal.
*Hordeum jubatum, L.
†Oenothera biennis, L.

III. PERENNIALS.

†Achillea Millefolium, L.
Artemisia Ludoviciana, Nutt,
*Cnicus undulatus, Gray.
Epilobium angustifolium, L.
Gaura coccinea, Nutt,
Glycyrrhiza lepidota, Pursh.
Helianthus Nuttallii, T. & G.
Iva axillaris, Pursh.
*Lactuca pulchella, DC.
*Lepachys columnaris, T. & G.
Lupinus pusillus, Pursh.
Lupinus sericeus, Pursh.
Lygodesmia juncea, Don.
*Malvastrum coccineum, Gray.
Platago Asiatica, L.
*Rumex salicifolius, Weinm.
*Verbena bracteosa, Michx.

This would give the composition of our weed flora as

	Native.	Introduced.	Total
Annuals	19	66	85
Biennials	5	9	14
Perennials	17	16	35
	41	93	134

It thus appears that more that two-thirds of the weeds already noted in the state are of foreign origin and may be kept out of districts in which they are not already established, while, unless preventive measures are taken, the number of such introductions will be greatly increased.

The species enumerated below appear to be extending gradually westward from the Plains.

Allionia nyctaginea, Michx.
Amaranthus albus, L.
A. blitoides, Wats.
Cerastium nutans, Raf.
Cleome integrifolia, T. & G.
Cnicus undulatus, Gray.
Echinospermum Redowskii, Lehm.
Euphorbia marginata, Pursh.
Franseria Hookeriana, Nutt.
Gaura parviflora, Dougl.
Grindelia squarrosa, Dunal.
Helianthus annuus, L.
Iva xanthiifolia, Nutt.
Hordeum jubatum, L.
Krinitzkia crassisepala, Gray.
Lepachys columnaris, T. & G.
Lepidium apetalum, Willd.
Monolepis chenopodioides, Moq.
Panicum capillare, L.
Plantago Patagonica, Jacq.
Solanum triflorum, Nutt.

A few species are coming into the state from the Pacific coast:

Artemisia biennis, Willd.
Chenopodium capitatum, Wats.
Echinospermum deflexum, Lehm.
Epilobium paniculatum, Nutt.
Madia glomerata, Hook.
Madia filipes, Gray.
Matricaria discoidea, DC.
Rumex salicifolius, Weinm.
Sisymbrium incisum, Engelm
Xanthium spinosum, L.

The following, supposed to be natives of tropical America, are now common over much of the Eastern United States, and, with many of the weeds of the plains, are probably our inheritance from the prehistoric American civilizations.

Amaranthus chlorostachys, Willd.
A. retroflexus, L.
Ambrosia artemisiæfolia, L.
A. trifida, L.
Erigeron Canadensis, L.
Solanum rostratum, Dunal.
Xanthium Canadense, Mill.

All the other species enumerated in this paper, with two or three doubtful exceptions, are from the Old World and have reached us mainly from the Eastern States.

THE ROOT SYSTEM.

The root system is of great importance as indicative of the life duration of a species and hence must be taken into account in fixing upon methods for weed extermination.

An *annual* plant germinates, bears fruit and perishes in a single season, while a *biennial* bears only a tuft of leaves the first year and fruits and dies the second. A *perennial* species lives and bears fruit for many years in succession. The roots of annuals are tender and of about the same size as the stem; bienniais are usually tender and often thickened and fleshy, but are sometimes difficult to distinguish from annuals, otherwise than by observation, while a number of weeds appear to be either, as emergency requires. Perennials usually have thick, woody, deeply penetrating roots, or long underground stems, or tubers, which enable them to endure indefinitely. The weeds in cultivated ground are mostly rapid-growing annuals, or perennials with fleshy or tuberous roots or rootstocks; those of pastures and meadows are perennials almost exclusively and cannot withstand cultivation.

CLASSIFICATION BY SITUATION.

Weeds may be grouped roughly by means of the localities they affect and the causes that make them objectionable.

I. Weeds of Yards, Waysides, and Waste Places.—These are often tall and unsightly or tend to spread to adjacent fields and gardens. They replace the native plants exterminated by the feet of man and the domestic animals and the wheels of vehicles.

Their seeds usually are spread by the mud of passage or by the wind. The following species may be enumerated as more or less common in these situations:

Amaranthus albus, L. ..... "Tumble-Weed."
A. blitoides, Wats. ..... "Pigweed-Purseley."
Ambrosia trifida, L. ..... "Horseweed" (Eastern.)
A. artemisiaefolia, L. ..... "Ragweed."
Anthemis Cotula, DC. ..... "Dogfennel."
Arctium Lappa, L. ..... "Burdock" (true), rare.
Artemisia biennis, Willd. ..... "Wormwood."
Atriplex patula hastata, Gray. .....
Arenaria serpyllifolia, L. ..... "Sandwort," rare.
Brassica campestris, L. ..... "Kale." "Wild Mustard."
Brassica nigra, Koch. ..... "Black Mustard;" a rare escape.
Bromus racemosus, L. .....
B. tectorum, L. .....
Capsella Bursa-pastoris, Moench. ..... "Shepherd's Purse."
Chenopodium album, L. ..... "Pigweed," common.
C. Botrys, L. ..... "Jerusalem Oak," common where introduced
C. capitatum, Wats. ..... "Red Pigweed," westward.
C. hybridum, L. ..... "Maple-leaved Goosefoot."
Cleome integrifolia, Torr. & Gray. ..... "Indian Pink," frequent in sandy soil.
Cnicus arvensis, Hoffm. ..... "Canada Thistle," rare.
C. lanceolatus, Willd. ..... "Scotch Bull Thistle."
Echinospermum deflexum Americanum, Gray. ..... "Beggar Ticks."
E. Redowskii, Lehm. ..... "Tickseed."
Ellisia Nyctelea, L. .....
Epilobium paniculatum, Nutt. ..... "Cottonweed."
Erigeron Canadensis, L. ..... "Ragweed," rather infrequent.
Euphorbia marginata, Pursh. .....
Franseria Hookerania, Nutt. .....
Helianthus annuus, L. ..... "Sunflower," common east of the Divide.
Hordeum jubatum, L. ..... "Foxtail Grass," common.
Iva xanthiifolia, Nutt. ..... "Horseweed," common.
Lactuca Scariola, L. ..... "Prickly Lettuce."
Lepidium apetalum, Willd. ..... "Birdseed," common.
Madia glomerata, Hook. ..... "Tarweed."
Marrubium vulgare, L. ..... "Horehound," infrequent.
Matricaria discoidea, DC. ..... "Rayless Dogfennel," frequent.
Monolepsis chenopodioides, Moq. ..... "Poverty Weed," common.
Panicum capillare, L. ..... "Tumble-grass," frequent eastward.
Plantago major, L. ..... "Plaintain," infrequent.
Polygonum aviculare, L. ..... "Knotgrass," common.

Rumex crispus, L....."Curly-leaved Dock," frequent.
Rumex salicifolius, Weinm....."Willow-leaved Dock."
Salsola Kali Tragus, Moq....."Russian Thistle."
Sisymbrium incisum, Engelm....."Tansy Mustard."
Sisymbrium officinale, Scop....."Hedge Mustard," infrequent.
Solanum rostratum, Dunal....."Buffalo Bur," infrequent.
S. triflorum, Nutt....."Wild Potato," common.
Taraxacum officinale, Weber....."Dandelion," common.
Tragopogon porrifolius, L....."Salsify," infrequent.
Urtica gracilis, Ait....."Stinging Nettle," frequent.
Verbascum Thapsus, L....."Mullein," in some localities common.
Verbena bracteosa, Michx....."Vervain."
Xanthium Canadense, Mill....."Cuckle-bur," infrequent.

II. Weeds of Lawns, Meadows and Pastures.—These are usually perennial and are obnoxious because they are not only unsightly, but tend to crowd out the more desirable grasses. The seeds of many of these are wind disseminated; some appear to come in with the seed sown. In hay fields they materially injure the quality and selling power of the product.

Achillea Millefolium, L....."Millfoil, Yarrow." Common.
Cnicus eriocephalus, Gray....In mountain meadows.
Cnicus undulatus, Gray....."Thistle." Common.
Grindelia squarrosa, Dunal....."Rosin Weed." Common in pastures.
Hordeum jubatum, L....."Foxtail Grass." Common in low ground.
Lepachys columnaris, T. & G....."Coneflower," pastures.
Plantago Patagonica gnaphalioides, Gray....."Woolly Plantain." Pastures.
P. major, L....."Plantain." Troublesome in lawns.
Rumex Acetosella, L....."Sheep-sorrel."
Taraxacum officinale, Weber....."Dandelion." Frequent in all situations.

III. Weeds of Gardens and Cultivated Grounds.—These are the pests against which the farmers wage incessant warfare, as they tend to crowd out the cultivated plants. By far the greater part of these are annuals, probably importations, recent or remote. Seven are perennials with long creeping rootstocks, all native species (the Canada thistle excepted), while two are often biennials.

A. ANNUALS.

Amaranthus albus, L....."Tumble-weed." Abundant in loose soil.
A. blitoides, Wats....."Pigweed-Pursley." Common with the last.

A. retroflexus, L.....“Careless Weed.” Common in gardens and rich soil.
A. chlorostachys, Willd.....Much less frequent; confused with the last.
Artemisia biennis, Willd.....“Wormwood.” Frequent in many places.
Capsella Bursa-pastoris, Moench.....“Shepherd’s Purse.” Common in gardens.
Chenopodium album, L.....“Pigweed.” Common in cultivated ground.
C. glaucum, L.....A weed not infrequent in gardens.
Cnicus undulatus, Gray.....“Thistle.”
Draba nemorosa, L.....Common.
Erigeron Canadensis, L.....“Ragweed.” frequent.
Helianthus annuus, L.....“Sunflower.” One of the worst weeds in the state.
Iva xanthiifolia, Nutt.....“Horseweed.” Common east of the Divide.
Lepidium apetalum, Willd.....“Birdseed.”
Monolepis chenopodioides, Moq.....“Poverty Weed.”
Polygonum Convolvulus, L.....“Wild Buckwheat.”
Solanum rostratum, Dunal.....“Buffalo-bur.”
Solanum triflorum, Nutt. .....“Wild Potato.”
Sonchus asper, Vill.....“Sow Thistle.”

B. PERENNIALS.

Artemisia Ludoviciana, Nutt.....“White Sage.”
Cnicus arvensis, Hoffm.....“Canada Thistle.”
Epilobium augustifolium, L.....“Iron-weed.” In mountain regions.
Glycyrrhiza lepidota, Pursh.....“Wild Liquorice.” In low ground.
Lactuca pulchella, DC.....“Milk-weed.”
Lupinus sericeus, Pursh.....“Lupine.” Persistent in new ground.
L. pusillus, Pursh.....“Little Lupine.” Root tuberous.
Lygodesmia juncea, Don.....“Wild-asparagus.” Plains.

IV. Weeds of the Grain-Fields.—Mostly annuals fruiting at the same time as the grain; the thistle is a biennial and sheep-sorrel and Gaura are perennial with creeping root-stocks. These from their size, rapidity of growth, or undue multiplication tend to choke out the grain in which they grow and are difficult to repress on account of the fact that, after seeding, about the only way to get at them is by hand-pulling, a slow and expensive process.

Avena fatua, L.....“Wild Oats.” Common all over the state.
Brassica Sinapistrum, Boiss.....“Wild Mustard.” Very bad in many localities.
Bromus secalinus, L.....“Cheat.” Troublesome in some places.
Camelina sativa, Crantz.....“False Flax.”
Cleome integrifolia, Torr. & Gray.....“Indian Pink.”

Euphorbia glyptosperma, Engelm....."Spurge."
Gaura coccinea, Nutt.....
Helianthus annuus. L....."Sunflower."
Iva xanthiifolia, Nutt....."Horseweed."
Lactuca pulchella, DC....."Milkweed."
Rumex Acetosella, L....."Sheep Sorrel."
Polygonum Convolvulus, L....."Wild Buckwheat."
Saponaria Vaccaria, L....."Cockle."

II. PRACTICAL CONSIDERATIONS.

METHOD OF ERADICATION.

1. Crop Rotation—It will be seen from the foregoing lists that our weeds, troublesome in cultivation, fall naturally into three groups: (1) weeds of grain fields, (2) of meadows and (3) of cultivated ground and that our yards, roadsides and waste places are the chief sources of local infection. The natural method for the suppression of weeds then must be by crop rotation, as the growth of one kind of crops tends to restrain or destroy the weeds peculiar to the other two groups. Therefore, when our grain fields become foul with the sunflower or wild oats, they should be put in timothy, alfalfa or clover till the weeds have been crowded out; or the land may be cultivated in some root crop like potatoes, rutabagas, &c., and the weeds destroyed by frequent cultivation. Unfortunately, here in Montana, the climatic conditions limit this crop rotation almost to cereals and hay-lands, as maize can be grown profitably in but few parts of the state and root crops and garden truck can not be planted over any great area, on account of the expense and labor involved and the certainty of swamping the market.

2. Summer Fallow.—Where it is desired to grow a grain crop as continuously as possible, it is hardly profitable to seed down in timothy, alfalfa or clover for a single year, and, as extensive cultivated crops, such as are grown in the Mississippi valley, are not here feasible for the reasons stated, in many parts of the state a system of summer fallow has been adopted, which consists usually in plowing under the weeds late in May or June before they have matured and then going over the soil once or twice afterwards with a disk or cultivator to prevent the new growth attaining any size. This effectually reduces the growth of the annual weeds so troublesome to grains and materially increases the fertility of the soil, but the loss of income from the fallowed land and the expense of cultivation, far offset any advantages thus derived, while, unless the land is disked after plowing, it is often worse seeded in weeds than before. It is much more profitable either to seed down foul wheat lands in some hay crop or in grain suitable for pasturage and thus secure some return from the land while the weeds are being killed.

3. Pasturage. There are some weeds like the sunflower, wild oats, and wild mustard, which are very difficult to clear out of land, when once they have a good foothold. For such weeds, and other of like nature, a very effective and profitable method of eradication is to sow the land down in some grain suitable for pasturage, such as rye or oats, or in clover or mixed grains, and to keep this closely cropped by sheep, so that no weeds that come upwill have any chance to mature seed. Two or three years of successive pasturage in this manner should effectually clean the worst infested lands. Other kinds of stock will do, but they are more prone to exercise selection and permit the growth of the less edible varieties. Sheep clean off all alike.

4. Special Methods.—In some cases special methods may be employed with advantage. Hand-pulling is frequently possible in small fields or patches of grain infested with the sunflower, wild mustard, tumbling mustard, etc. This may be done by boys under competent supervision, and is best undertaken when the weeds first come well into bloom and before they have matured any seed. The bright yellow flowers serve as guides to the location of each individual and their absence clearly marks the strip

cleared. The work should not be left till the seeds begin to mature, else it will be necessary to remove the plants pulled to prevent them from re-seeding the ground cleared. This method is slow and expensive, especially here in Montana where labor is such a desideratum, and it can rarely be employed with economy.

In a few instances hand weeding is practically the only method available. This will apply particularly to weeds affecting lawns and meadows. The broad-leaf plaintain can only be dug up one plant at a time, and this is also true of the dandelion and thistles, but with the last two a chisel-like instrument ("spud") with a four foot handle may be employed to cut them off just below the crown of leaves and is usually found effective.

There are a few species of weeds which are particularly difficult of extermination on account of the spread of underground stems. A few of our native species exhibit this tendency to a greater or less extent, such as the Poverty Weed (Iva axillaris), the Wild Liquorice (Glycyrrhiza lepidota), the Milk-weed (Lactuca pulchella), the Wild Asparagus (Lygodesmia juncea), the Iron-weed (Epilobium angustifolium), and the Lupine (Lupinus sericus), but these usually disappear after a few years cultivation and persist only in specially favored localities, where they may be treated like the next. But it is from a few foreign introductions that the chief trouble arises and these should be exterminated before they have become firmly established. The Canada Thistle is the worst and a law has been enacted to enforce its destruction in the state. It is established in many places along the railroads and is frequently imported with garden seed. It is found only in small patches and appears to show little disposition to spread by seed in this state. The most effective method to get rid of it is probably to dig it up, removing every particle of the root-stocks and then await growth to indicate the location of any root remnants in the soil. Its growth can be restricted by keeping it cut down, but this will scarcely exterminate it. It can be smothered out by building straw or haystacks over the spots affected, or by covering with manure dumps, and it may often be killed by plentifully sprinkling salt or kerosene over the freshly cut stumps. Sodium arsenite is more effective, but also more expensive.

The wild Morning-glory (Convolvulus arvensis) and the Sheep-

sorrel (Rumex Acetosella) are nearly as difficult to eradicate and much worse to spread than the Canada thistle, but fortunately they have as yet appeared in but few localities in the state. They should be treated in much the same way as the Canada thistle above. For lawn weeds which tend to spread and crowd out the grasses, such as dandelion, plantain, chickweed (Cerastium vulgare), rosin-weed (Grindelia squarrosa) and others of like nature there is nothing we can do more than to dig them up by hand, or treat them with chemicals, which also will kill the grass around. The process is slow but the areas affected are usually not large. Walks and driveways can be kept clear by the aid of salt, kerosene, arsenite of soda, or some of the various chemicals sold by seedsmen. Much time and labor can be saved, if it be remembered that the streets, roadsides and waste places are the natural storehouses for the growth and propagation of weeds and that these places must be kept clear, or at least the weeds must be kept from seeding in them, if the yards, gardens and fields adjacent are to be free from these pests.

The Russian thistle, of which so much has been said and written, does not appear to exhibit such dangerous characteristics in this state. I have found it nowhere in any abundance except in the Milk River and Yellowstone valleys, and there as well as in all other places observed it is confined to the railway grades and waste places about the towns. It makes no headway against the native vegetation and has not yet, in any case noted, invaded cultivated land. Nevertheless, its wide advertisement as a most dangerous pest must be based upon its tendency to invade grainfields and cultivated ground and it is comparatively little trouble to prevent it from securing a footing in any locality, if taken when it first appears and every plant be uprooted, piled and burned. It is possible that it may yet prove a valuable forage plant for the arid regions, and instead of a most dangerous, immigrant, it may prove a valuable addition to our native vegetation.

The Scotch bull thistle is not nearly as dangerous as the dandelion and sheep-sorrel, the wild oats, the wild mustard, tumbling mustard and the sunflower. It is very rare in the state, occurring mostly about railway stations and towns, in no considerable quantity except in the Flathead valley in the vicinity of Demers-

ville, where it has proven a dangerous pest. It should be dug up or cut off below the crown of the root before it blooms. It is not a perennial like the Canada thistle and only needs to be kept down for a year or two and prevented from seeding. It should not be allowed to become established in any locality and any person permitting it to grow on his land should be prosecuted under the law now in force.

A great difficulty in the extermination of weeds is the fact that the seeds of many species will lie in the soil for several years without losing their vitality and when turned up to the surface will germinate and produce a new crop of weeds in ground which is considered cleared. It is for this reason that several years of diligent culture is necessary before a field can be cleared of such weeds as the sunflower, wild oats and wild mustard and it is for this reason that summer.fallow, unless followed by cultivation, will result in seeding the field with weeds more than before. A field can not be cleared of noxious weeds until all the seeds can be caused to germinate and then killed.

There is no question but that the injury done the growing crops in this state by the growth of weeds amounts to many hundred thousand dollars every year and yet there is no systematic method devised for their eradication. Each man tills his own fields with little regard to the growth and distribution of weeds from infected localities; and no combined attempt is made to stamp out the pests in such affected areas. If we treated contagious diseases it this way, it would be utterly impossible to stay the deadly epidemics. Isolation and united effort is made against such diseases in every community, and a similar effort against weeds would certainly be successful in this state, where the agricultural communities are naturally more or less isolated from each other.

The only feasible method then for combatting weeds in Montana where few of the more dangerous and troublesome species have yet more than secured a foothold, is by the organization of the farmers into districts designated by the valley or irrigation system and the appointment or election of a competent weed inspector for each district, whose duty it shall be to keep a lookout for the appearance of any new or dangerous weeds in his district and to cause the eradication of such pests as may already be es-

tablished, and this inspector shall have similar powers to road supervisors to call for a certaim amount of aid from each farmer to be used in the common interest of stamping out these pests from infected localities, or to compel individuals to clear their lands of such pests.

It would thus be possible to hold one man responsible for keeping down these noxious weeds, while now the responsibility is fixed upon no one and the interests involved are certainly as great, if not greater, than in the maintenance of a good road system. It should also be made the duty of the road supervisors to keep the weeds cut or plowed under along the different public highways within their jurisdiction. Unless some effort of this kind is soon made, the labor of the farmer will be greatly increased.

THE WEED LAW NOW IN FORCE IN MONTANA.

[Penal Code, Approved March 18, 1895.]

"§1197. Be it enacted that the weeds known as the Canada thistle, the Scotch bull thistle and the Russian thistle are hereby declared to be a common nuisance for all the purposes of this Act.

§1198. Any person or persons owning any lands within this State, or occupying or having control of any lands, whether within the plat of towns, villages or cities, or otherwise, within this State, knowingly permitting or suffering any Canada, Scotch bull or Russian thistle or thistles to go to seed upon any land or lands thus owned, occupied or under control of such person or persons shall be deemed guilty of supporting and maintaining a common nuisance, and upon conviction thereof in any court of competent jurisdiction, of the offense, shall be punished by a fine not exceeding fifty nor less than five dollars.

§1199. In case any person or persons, railroad or other corporation, owning or occupying any lands within this State, under his or her or their control, as the case may be, shall refuse or neg-

lect to destroy any Canada, Scotch bull or Russian thistle or thistles growing or standing upon any land or lands so owned, occupied or controlled, on or before the fifteenth day of August, it shall be the duty of the county commissioners, road supervisors, or other person or persons having control of the public highways, streets or alleys where any such thistle or thistles may be found growing or standing, to immediately destroy or cause the same to be destroyed, and pay therefor at the same rate that is paid for road labor; and every supervisor or other person hereinbefore authorized to destroy said thistles shall keep a correct account of all moneys paid out for that purpose, and charge the same to the person or persons or corporation owning, occupying or controlling the land or lands upon which such thistle or thistles were destroyed, and the person or persons or corporation owning, occupying or having control of such lands shall be liable in a civil action for the amouut so charged against them and costs of suit;

Provided that if any supervisor or other person having, under authority of this Act, destroyed any of the said thistles, and is unable to find the owner of the land, or is unable to collect such money, the same shall be paid by the authorities of the town, village, city or county where such thistles were destroyed; *and provided further*, that in case any railroad company becomes chargeable under the provisions of this Section, the supervisors of the township where same has become chargeable may certify to the same to the county attorney of their county, whose duty it shall be to bring and prosecute a civil action against the railroad company for the amount so charged and costs of suit aforesaid.

§1200. It is hereby made the duty of every person having knowledge of any Canada, Scotch bull and Russian thistle or thistles growing or standing upon the lands of another to immediately destroy the same, or give the person owning or occupying such lands immediate notice thereof."

III. ANNOTATED LIST OF MONTANA WEEDS.

In order to note the introduction and spread of weeds in this state, and to give the farmer some idea as to the names of the weeds troublesome in any particular locality and facilitate their destruction, if dangerous, the following enumeration of the known weeds of Montana, with brief popular descriptions of the more troublesome species and notes of their origin, occurrence and dissemination is appended. In case of doubt, specimens of any weed with flower or fruit and leaves should be sent this Station for determination.

In a general work of the nature of this bulletin, it seems desirable, in the main, to use the older, more conservative nomenclature and to adopt the wider limitation of species, not necessarily because they are better or more accurate, but because they are more easily understood by the ordinary reader and are more readily found in the usual works of reference. For the same reason technical terms have been avoided as far as possible, and the popular names of plants have been employed wherever it could be done without ambiguity. Yet, as common names are frequently used here, for two or more very different species, or for different plants in other sections of the Union, as in the case of the pursely, cucklebur, horseweed, ragweed, milkweed, ironweed, poverty-weed, &c., it is necessary to make the scientific name the basis of classification and description. Hence the plants hereafter enumerated are arranged alphabetically according to their scientific names, but the index of popular names appended will enable these to be used with equal facility.

A few terms need explanation. Flowers and fruit are arranged in a *spike* when they form a close slender column like those of the plaintain and timothy; they form a *panicle* when they are scattered on slender stalks, like the oat, and they are called a *head* when they are aggregated in a dense cluster, as in the case of the clover and the sunflower.

In the list below the weeds most troublesome in the state are printed in **black letter** and the rare introductions are starred (*).

1. ACHILLEA MILLEFOLIUM L. WILD TANSY; MILFOIL.

A perennial plant about two feet high with finely divided leaves and white flowers in a level-topped cluster. Frequent in pastures and meadows, where its bitter herbage makes it distasteful to stock.

2. AGROSTEMMA GITHAGO, L. CORN COCKLE.

A purple-flowered annual occasional in grain fields, but hardly troublesome here, as it is in the East. Noted in but few localities. It has narrow leaves and fewer and more scattered flowers than is the case with the ordinary cockle (Saponaria Vaccaria) and is silky hairy throughout.

Fig. 1. Amaranthus albus, L. Branch ½ natural size.

3. ALLIONIA NYCTAGINEA, Michx.

A tall (2 to 4 feet high), smooth, much-branched perennial with heart-shaped opposite leaves and clustered purplish flowers. Occurs as a weed in gardens in the extreme eastern part of the state (Calais and Wibaux) and promises to spread westward.

4. AMARANTHUS ALBUS, L.

TUMBLE-WEED.

A widely-spreading annual weed, common in loose or cultivated ground. It begins blooming in early spring and produces seed all the season. It is killed down by the first heavy frost and the large globular mass breaks off from the root and is driven about by the wind, scattering its seeds throughout its course. Apparently native east of the Divide. Hybridizes with the next. [Fig. 1].

5. AMARANTHUS BLITOIDES, Wats. PIGWEED-PURSLEY.

A prostrate-growing, reddish annual, closely related to the preceding and much resembling the eastern "purseley" (Portulaca oleracea, L.) Common in waste places and roadsides east of the Divide and not infrequent as a weed in cultivated ground. Forms mats sometimes three feet in diameter; apparently native.

6. *AMARANTHUS CHLOROSTACHYS, Willd. PIGWEED.

Closely resembling the next in habit and appearance and popularly confused with it, but its fruiting spikes are long and slender and it is much more rare in gardens and waste places. At Columbia Falls and Troy; here apparently coming in from the West.

7. AMARANTHUS RETROFLEXUS, L. PIGWEED; CARELESS WEED.

A fleshy annual common in our gardens and imported from the East in garden seed; shows little tendency to spread to fields except in rich and moist situations. These four species of amaranth are easily uprooted and should not be allowed to seed in our gardens. They should be piled, dried and burned to prevent the seeds matured from re-seeding the ground from which they have just been removed.

8. AMBROSIA ARTEMISIÆFOLIA, L. RAGWEED; HOGWEED.

An annual weed, one or two feet high, with opposite many-divided leaves and slender, green-flowered terminal spikelets. This is now coming in from the East along the railways. Frequent on the Great Northern from Havre eastward and occasional as far west as Kalispell. Often abundant in waste places, but with little disposition to take to fields and gardens.

9. AMBROSIA PSYLOSTACHYA, DC. CREEPING RAGWEED.

Occurs occasionally in the eastern part of the state, but has not yet been found very troublesome. It is very similar to the one above, but has long perennial rootstocks which make it difficult to eradicate.

10. AMBROSIA TRIFIDA, L. Horseweed; Tall Ragweed.

A large annual with opposite three-lobed leaves and flowers very similar to the two above. It is here rarely more than two or three feet high, and is found occasionally with leaves entire. Like A. artemisiæfolia it is coming in from the Mississippi valley along the railways and is found principally in waste land about the stations, but in low situations is spreading to adjacent fields and gardens. Extends as far west as Havre and Savoy on the Great Northern and to Bozeman on the Northern Pacific. Infrequent except eastward. Seeds disseminated by water and in mud. [Fig. 2.]

Fig. 2. Ambrosia trifida, L.

11. ANTHEMIS COTULA. DC.

Dog Fennel; Mayweed.

An annual ill-scented weed about a foot high, with a level-topped mass of white-rayed flowers; leaves alternate and finely divided. Not infrequent in waste places in nearly every part of the state and shows some disposition to spread and become troublesome as it does in the more humid climate of the eastern states.

12. *ARCTIUM LAPPA, L. Burdock.

A coarse biennial about three feet high, with large leaves and purple flowered heads disposed in a many-branched terminal panicle each surrounded with a bur-like involucre. A European introduction common in the eastern states, but noted here only at Libby, Thompson Falls, Plains and Big Timber, along roadsides and

in waste places, where it shows a strong disposition to spread and become troublesome to the sheep industry.

13. *ARENARIA SERPYLLIFOLIA, L.

A small, inconspicuous annual two or three inches high, or prostrate, of European origin, well established about the streets and waste places at Columbia Falls, but not otherwise noted in the state.

14. ARTEMISIA BIENNIS, Willd. WORMWOOD; IRONWEED.

An annual or biennial coming in from the west, two or three feet high, with a slender, reddish stem, finely divided leaves and a narrow terminal spike-like panicle of inconspicuous flowers. Becoming common in streets and waste places about the larger towns and thence spreading to the highways and neighboring fields, where it is beginning to be a troublesome pest.

15. ARTEMISIA LUDOVICIANA, Nutt. WHITE SAGE.

A native perennial sage with long creeping rootstocks which tend to persist in new ground and meadows and is often difficult to eradicate.

16. *ATRIPLEX HORTENSIS, L, ORACHE.

Escaped from cultivation, particularly the ornamental variety *atrosanguinea*, Hort. Not infrequent in yards and waste places about Helena and Bozeman, but not likely to become troublesome. An annual much resembling its relative the Lamb's-quarter.

17. ATRIPLEX PATULA HASTATA, Gray.

An annual much resembling and often confused with Lamb's Quarter; occurring along streets and in waste places; apparently introduced from the East. Occurs occasionally in nearly every part of the state but is rarely troublesome in cultivated ground.

18. AVENA FATUA, L. WILD OATS.

This is one of the most common, if not the worst weed in the state. Introduced from the Old World, but now common throughout most parts of arid America where oats have been cultivated. The wild oat differs from the cultivated variety in its usual ranker growth, deeper color of the foliage, more diffuse panicle, earlier

Fig. 3. Avena fatua, L. Fruit, natural size.

ripening and prompt shelling of the fruit, its black hull (flowering glume), hairy at base and with a twisted awn and in its smaller and lighter seed. Its fecundity, rapid growth and self-seeding qualities soon enable it to take a field sown continuously in any kind of grain and the persistent vitality of its seed in the soil makes it difficult to eradicate. It can best be combatted by sowing down infested fields in clover, timothy or alfalfa, or by close pasturage by sheep for several years of such fields, planted in some annual grain suitable for forage. There is a general belief among farmers that the wild oat often originates as a degenerate form of the cultivated variety with which it seems to intergrade, and, while it is propagated in general from its own seed, its general occurrence and abundance in fields sown in oats throughout the arid region seems to favor the idea of such reversion. Moreover, the cultivated oat is supposed to have been derived from the wild species, and several authenticated instances are known of the production of the tame varieties from the wild form by cultivation and reversion under suitable climatic conditions is much more probable, as is certainly the case with many other cultivated plants, such as the radish, carrot, turnip, mustard and parsnip, which in many places readily revert to the wild form and become troublesome weeds. [Fig. 3.]

19. **BRASSICA CAMPESTRIS** L. KALE; WILD TURNIP.

An annual closely resembling and usually confused with the wild mustard (Brassica Sinapistrum, Boiss.), but is smooth throughout and is rarely so common or troublesome as the latter species, though occasionally found in grain fields and waste places. Its smooth, bluish stem and upper leaves, sessile and clasping, easily distinguish it from the two below.

20. *BRASSICA NIGRA, Koch. BLACK MUSTARD.

An occasional escape from gardens, but nowhere troublesome or difficult to restrain. Rarely persistent.

21. **BRASSICA SINAPISTRUM,** Boiss. WILD MUSTARD; CHARLOCK.

Resembling the B. Campestris above, but is more or less hairy throughout. One of the worst weeds of the state, fairly taking many of the grain fields in low land. Should be combatted like the wild oat and the sunflower. Hand pulling may be employed when it occurs only in small patches. Every effort should be made to prevent its introduction into a community and combined action should be taken to clear infested fields, as the seeds appear to be spread largely by irrigation. [Fig. 4.]

Fig. 4. Brassica Sinapistrum, Boiss, ¼ natural size.

22. BROMUS RACEMOSUS, L.

An annual Brome-grass not infrequent as a weed in fields and waste places; commonly confused with the next, which it closely resembles.

23. BROMUS SECALINUS, L. CHEAT; CHESS.

Differs from the last in its more diffuse panicle and its larger and flatter spikelets. Not rare in agricultural districts of the state and often a very bad weed in grain fields in the Flathead valley.

24. *BROMUS TECTORUM, L. DOWNY BROME-GRASS.

A small annual grass with long-awned pendulous spikes well established at Columbia Falls and Missoula, in streets and waste places and promises to spread into other parts of the state. Introduced from Europe.

25. **CAMELINA SATIVA,** Crantz. FALSE FLAX.

An annual with light yellow flowers and a pear-shaped pod of the Mustard family and resembling somewhat the cultivated flax. A frequent and occasionally troublesome weed in grain fields throughout the state. Usually imported in the grain seed sown.

26. **CAPSELLA BURSA-PASTORIS,** Moench. SHEPHERD'S PURSE.

A common annual of yards, gardens and waste places. Blooms throughout the season. A foot or two high with white flowers and a triangular pod. A European introduction. Seeds develop a mucilaginous coat when wet and thus facilitate their dispersion.

27. *CERASTIUM NUTANS, Raf.

A small inconspicuous chickweed with sticky foliage and curved pods notched at the orifice. Occasionally introduced from the East. In waste places infrequent.

28. *CERASTIUM VULGATUM, L. MOUSE-EAR CHICKWEED.

Found very troublesome in lawns at Kalispell, where it forms patches and crowds out the grass and its perennial habit makes it difficult to exterminate, except by digging up and removing every plant. Also in waste places at Thompson Falls and Borax; coming in from the West.

29. **CHENOPODIUM ALBUM,** L.
LAMB'S QUARTER.

A common and troublesome annual in waste places and cultivated ground in nearly every part of the state. It fairly takes uncultivated fallow land in many localities. An Old World species. [Fig. 5]

30. *CHENOPODIUM BOTRYS, L.
JERUSALEM OAK.

A bitter, ill-smelling annual from Europe locally established in waste places at various points in the state, and seems well adapted to our climate. Resembling the preceding species in size and appearance, but the leaves are more deeply lobed.

Flg. 5. Chenopodium Album, L. ⅛ nat. size.

31. CHENOPODIUM CAPITATUM, Wats. Strawberry Blite. Red Pigweed.

An annual weed in yards and waste places coming from the west along the railways; rare east of the Divide. Somewhat like the Lamb's Quarter, but the fruit is in red globular clusters resembling the strawberry.

32. CHENOPODIUM GLAUCUM, L. Oak-leaved Goosefoot.

A prostrate or spreading annual much resembling the Poverty-weed (Monolepis chenopodioides), frequent in low grounds by roadsides, in alkali places and occasionally troublesome in gardens and cultivated ground. Possibly native here, although it has the habit of a true weed.

33. CHENOPODIUM HYBRIDUM, L. Maple-leaved Goosefoot.

Another of the introduced Pigweeds, two or three feet high and with a widely spreading panicle of fruit, found occasionally in waste places about the towns along the railroads. Its leaves have little resemblance to those of our native maple. It is probably truly indigenous nowhere in America.

34. *CHRYSANTHEMUM LEUCANTHEMUM, L. Ox-eyed Daisy.

A European perennial found troublesome in the Eastern states. Apparently persistent in meadows here in a few isolated localities in small numbers, and showing no disposition to spread. Imported in grass seed from the East.

35. *CICHORIUM INTYBUS, L. Chicory.

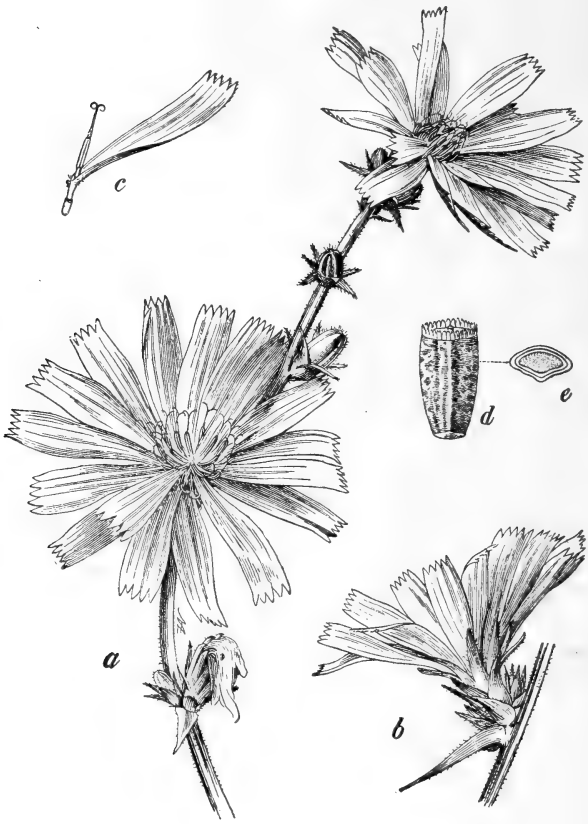

Fig. 6. Cichorium Intybus, L. Flower natural size.

A tall, widely branching European perennial with large blue flowers which close in the afternoon, related to and somewhat resembling the lettuce. A few specimens seen near Holt, in the Flathead region; but observed nowhere else in the state. This weed is adapted to growth in dry situations and should not be allowed to become established in the state, lest it become a dangerous pest. [Fig. 6.]

36. **CLEOME INTEGRIFOLIA,** Torr & Gray.

INDIAN PINK; STINKWEED.

A native annual about two feet high with 3-foliate leaves and pink flowers, often troublesome in sandy soil. Frequent in grain fields and waste places east of the Divide and now spreading westward along the railways, where it threatens to become a bad weed.

Fig. 7. a. Cnicus arvensis, Hoffm. Plant one-fifth.

37. **CNICUS ARVENSIS,** Hoffm

CANADA THISTLE.

A perennial European species with long creeping rootstocks most difficult to extirpate. Very similar to our native thistles, but the heads are much smaller and the plants tend to grow in clumps or patches, never scattered. Infrequent as yet in the state but becoming established along railroads and in waste places. Occurs at Helena, Bozeman, Libby, Craig and Demersville. Can be eradicated only by persistent digging, by smothering with straw, manure heaps, &c., or by choking out with a rank growth of clover. Attack on first appearance and do not permit it to become established. One of the three plants outlawed in this state. [Fig. 7.]

38. CNICUS ERIOCEPHALUS, Gray. MOUNTAIN THISTLE.

A tall unbranched thistle with a mass of heads aggregated at the top of a thick, hollow, leafy, stalk, frequent in mountain meadows and pastures above 5,000 feet altitude. Rarely so abundant as to be troublesome.

Fig. 7. b. Cnicus arvensis, Hoffm. Leaf and head about natural size;

39. **CNICUS LANCEOLATUS,** Willd. SCOTCH BULL THISTLE.

The second outlawed weed of the state. A European biennial sparsely introduced along the railroads of the state, but nowhere observed to be troublesome except in the Flathead valley about Demersville. It is easily destroyed by digging up the plants before they bloom and should not be allowed to secure a foothold. The plant is very similar to our native thistle described below, but has much less of the cottony tomentum on the under side of the leaves and the leaves and heads are exceedingly prickly with long yellow spines. [Fig. 8.]

40. **CNICUS UNDULATUS,** Gray. FIELD THISTLE.

The common thistle of the plains and valleys throughout the state and troublesome in many places, particularly in fallow land, old fields, pastures and meadows, replacing C. eriocephalus below 5,000 feet; biennial, or sometimes apparently perennial with deeply penetrating roots. A tall, branched thistle with scattered heads and leaves covered with a dense cottony tomentum.

41. *CONVOLVULUS ARVENSIS, L. Wild Morning-glory.

A European perennial vine similar to the cultivated morning-glory, but with small white flowers; occasionally established in

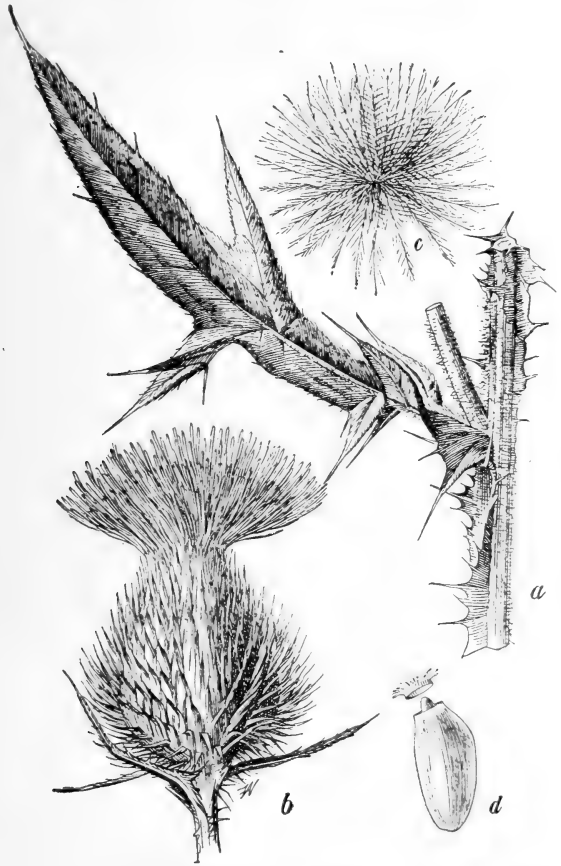

Fig. 8. Cnicus lanceolatus, Willd. Leaf and head natural size.

gardens and waste places; quite as difficult to exterminate as the Canada thistle and should be treated like it. Noted at Manhattan, Helena, Missoula, Flathead Lake, Kalispell, Bozeman and Crow Agency.

42. *CUSCUTA EPITHYMUM, Murr. ALFALFA DODDER.

Specimens of this species have come in from Livingston reported as troublesome in alfalfa fields. It is a golden yellow parasitic vine on alfalfa and the clovers; imported from Europe, where it is often a most pernicious weed. The infested spots should be mowed closely and the plants burned when dry; they should not be allowed to seed as it may be difficult to clear the field of the parasite. A native species of dodder (*Cuscuta arvensis*) also occurs sparingly on the clovers and alfalfa in this state, but is not apt to take the fields like the European species. [Fig. 9.]

Fig. 9. Cuscuta Epithymum, Murr. Plant natural size.

43. *CYNOGLOSSUM OFFICINALE, L. HOUND'S TONGUE.

A European biennial established in waste places at Big Timber.

44. DRABA NEMOROSA, L. FIELD DRABA.

A small annual of the Mustard family with yellow flowers and spreading pods, native of this region but inclined to multiply and grow rank in gardens and waste places.

45. DRACOCEPHALUM PARVIFLORUM, Nutt. DRAGON-HEAD.

An annual plant with dense square stems, opposite leaves and a terminal flowering spike inclined to frequent streets and waste places and occurs occasionally in cultivated ground. Doubtfully native here.

46. ECHINOSPERMUM DEFLEXUM AMERICANUM, Gray. Beggar Tick.

A slender annual one or two feet high, widely branching above and with small blue flowers and slender racemes of reflexed burs. At Deer Lodge and Helena (Rydberg), Box Elder Creek, on the Ft. Peck Reservation, Arlee, Plains and abundant and troublesome in the streets, highways and waste plaees about Kalispell, where it is rapidly spreading into the country adjacent. It threatens to become a bad pest throughout the state. Certainly an introduced species in this region and doubtfully native in America.

47. ECHNOSPERMUM REDOWSKII, Lehm. Tickseed; Beggar Ticks.

A native annual resembling the preceding, but is smaller and has fewer erect fruit; common in loose soil about gopher hills, ant hills and prairie dog towns. A common weed in waste places throughout the Yellowstone region and in many places east of the Divide, but more rare westward. Occurs here as the varieties *occidentale*, Wats, and *cupulatum*, Gray, the latter much more rare.

48. ELLISIA NYCTELEA, L.

A small, diffusely branched, spreading annual with deeply lobed leaves and inconspicuous flowers. Not infrequent in low grain fields and waste places. Rarely abundant enough to be troublesome. Doubtfully native here.

49. EPILOBIUM ANGUSTIFOLIUM, L. Ironweed; Fireweed.

A tall, slender plant, about three feet high with a terminal raceme of large purple flowers, blooming about the first of August. Common in the foothills and mountains and the large perennial rootstock is often difficult to kill out in new ground.

50. EPILOBIUM PANICULATUM, Nutt. Cotton Weed.

A tall and very slender, smooth, widely branching annual with inconspicuous leaves and small red flowers, spreading eastward from the Pacific along the railways and principal lines of travel. Common along streets, highways and waste places in the western part of the state; the cottony seeds are distributed by the winds.

51. ERIGERON CANADENSIS, L.

RAGWEED; FIREWEED; HORSEWEED.

A slender, hairy annual with narrow leaves and a large terminal broom of greenish flowers and cottony fruit imported from the eastern United States. Becoming frequent in waste places, gardens and grain fields, and a serious pest in the Flathead valley. Size varies from a few inches to several feet; seed spread by the wind.

52. EUPHORBIA GLYPTOSPERMA, Engelm. CARPET WEED.

A small, much branching annual, lying flat on the ground and forming circular carpets a foot or more in diameter. Apparently native but frequent by roadsides and in grain fields and waste places; rarely troublesome.

53. EUPHORBIA MARGINATA, Pursh. SNOW ON THE MOUNTAIN.

An annual, one to two feet high, with milky juice and upper leaves white margined. In waste places and along railway grades from Miles City to Glendive. Coming in from the eastward. Reputed poisonous.

54. FRANSERIA HOOKERIANA, Nutt.

An annual weed very much like the Ragweed (Ambrosia artimisiæfolia), but with fruit of conspicuous burs. Frequent in sandy soil along highways and in streets and waste places in many parts of the state east of the Divide. Possibly native, although it has all the habits of an introduced weed.

55. GAURA COCCINEA, Nutt. BUTTERFLY WEED.

A native perennial with long, deeply penetrating rootstock, frequent in new ground and occasionally found in grain fields and fallow land, mainly as the variety *glabra*, T. & G. Leaves narrow, flowers white or rose-colored, turning to scarlet in fading.

56. GAURA PARVIFLORA, Dougl.

A tall, hairy annual or biennial, two or three feet high, with small flowers and long, slender spikes of spindle-shaped fruit, occasionally troublesome in grain fields and waste places in the Missouri river region. Apparently introduced from eastward.

57. GERANIUM CAROLINIANUM, L. CRANE'S-BILL.

The typical form occasional in waste places; the form *G. Bicknellii*, Britt. not infrequent in waste places in many parts of the state.

58. *GERANIUM PUSILLUM, L.

Well established as a weed in fields and waste places about St. Ignatius, Flathead Reservation, and at Plains.

59. GLYCYRRHIZA LEPIDOTA, Pursh. WILD LIQUORICE; CUCKLEBUR.

A native perennial in low ground with pea-like leaves and bearing clusters of burs very like those of the true cucklebur (Xanthium). Its long, creeping, underground stem makes it difficult to eradicate from new land, and it is frequently abundant and troublesome in meadows and pastures. Persistent cultivation or digging seems to be the only remedy other than close pasturage.

60. **GRINDELIA SQUARROSA,** Dunal. ROSIN-WEED; WILD ARNICA.

A biennial doubtfully native in this region. About 18 inches high with a stiff stem and many heads of yellow-rayed flowers covered with a gummy secretion. Common in the plains and valleys east of the mountains and spreading westward. More frequent along roadsides and waste places and troublesome in meadows and pastures, where it is difficult to eradicate after having once obtained a foothold. Stock rarely will eat it in any situation. Just being introduced in the Flathead and Bitter Root valleys by roadsides and should be exterminated before it becomes established. Old settlers say the plant has come into much of this region since the advent of civilization and there seems now to be a steady advance westward, although its distribution is effected mainly by the conveyance of its seeds in the mud on the feet of animals and the wheels of vehicles and in hay.

61. **HELIANTHUS ANNUUS,** L. SUNFLOWER.

An annual weed, three or four feet high, with large notched leaves and large yellow-rayed heads three inches in diameter, common everywhere east of the Divide and one of the worst weeds in

grain fields and cultivated ground. Occasional along the railways in the western part of the state, but not troublesome there except in the Bitter Root valley. It is confined to one or two small areas in the Flathead valley and shows small disposition to spread in the absence of irrigation, but if the farmers are wise they will stamp out this pest at once, lest it become as troublesome there as it has in other parts of the state. Seeds seem to be distributed largely by irrigation and in the mud adhering to to feet and to the wheels of vehicles. Its seeds seem to lie in the ground many years before losing their vitality and it can best be combatted by sowing the infected fields in some annual grain suitable for forage and pasturing with sheep for several years.

62. HELIANTHUS NUTTALLII, T. &. G.

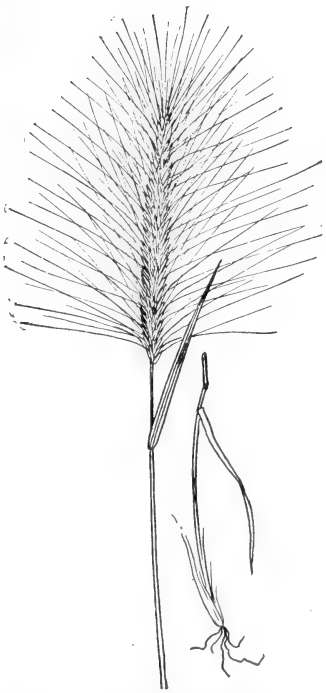

Fig. 10. Hordeum jubatum, L. Natural size.

A native perennial sunflower, more slender and with narrower leaves than the last; roots tuberous and with frequent underground stems. Usually in small patches, and can best be destroyed by pulling or digging after irrigation. Often troublesome in grain fields and low ground in the western part of the state.

63. HELIANTHUS PETIOLARIS, Nutt.

An annual very like and commonly confused with *H. annuus* above and frequent in dry, sandy situations in the Milk River and Yellowstone valleys. It has smaller heads than the common sunflower (H. annuus) and narrower, entire leaves.

64. HORDEUM JUBATUM, L. Foxtail; Squirrel-tail Grass; Slough-grass.

An annual or biennial grass with a large, bushy spike of fruit, whose long

awns when ripe pierce the lips and tongue of stock and cause extensive ulceration. A common weed in pastures and waste places seemingly introduced from the east; doubtfully native. It makes little headway against the native vegetation, but tends to become established in low ground wherever that vegetation has been disturbed or kept down by close pasturage. Said to make fair hay, if cut before heading out or after the head breaks away in August. It may be killed out in most situations by plowing it under in June or by seeding the fields in grain for a few seasons. It is also doubtful if it can make much headway against a good stand of clover, timothy or alfalfa. [Fig. 10.]

Fig. 11. Iva xanthiifolia, Nutt. Plant 1-12 natural size; leaf and fruit ½.

65. *HYOSCYAMUS NIGER, L.

BLACK HENBANE.

A coarse European annual or biennial established in waist places at Billings (E. V. Wilcox), Big Timber, and rarely about Bozeman. Poisonous.

66. *HYSSOPUS OFFICINALIS, L. HYSSOP.

A sage-like perennial with narrow leaves and clustered blue flowers, occasionally escaped from gardens. Roadsides in Flathead valley, rare.

67. IVA AXILLARIS, Pursh.

BAZZLE-WEED; POVERTY-WEED.

A native perennial a foot or two high growing in clumps or forming extensive patches in low ground, particularly in alkaline soil. Its long creeping underground stems make it most difficult to eradicate. Probably best combatted by seeding down in meadow.

68. **IVA XANTHIIFOLIA,** Nutt. CARELESS-WEED; HORSE-WEED; GIANT RAG-WEED.

A tall, coarse native annual, three to six feet high, with large, heart-shaped toothed leaves opposite on the smooth stem. This is one of the worst weeds in the Gallatin valley, by roadsides, in waste places and cultivated ground, and is not intrequent in low ground east of the Divide, but apparently rare west of it. Its small, black seeds seem to be distributed wholly by water and the mud of passage and so it is not apt to be very troublesome except in irrigated districts. [Fig. 11.]

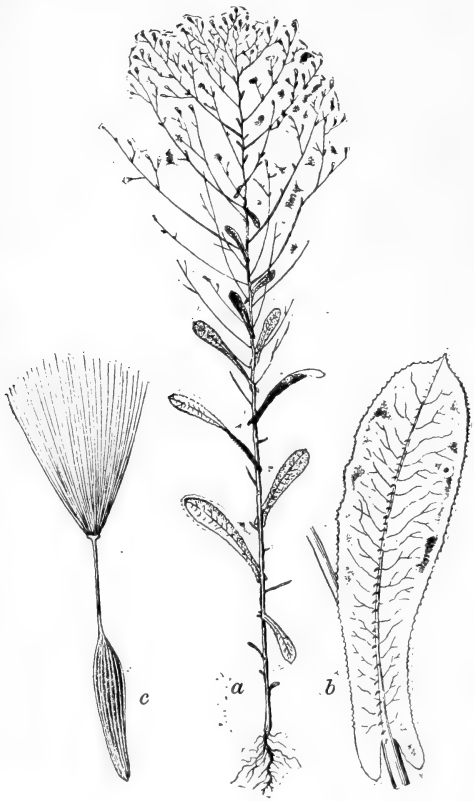

Fig. 12. Lactuca Scariola, L. a, 1-9; b, natural size; c, enlarged.

69. KRINITZKIA CRASSISEPALA, Gray.

Frequent in loose soil with *Echinospermum Redowskii* in the Yellowstone region; apparently not west of the Divide.

70. **LACTUCA PULCHELLA, DC.** MILKWEED; WILD LETTUCE.

A native perennial of the lettuce family common in all situations throughout the eastern part of the the state; leaves smooth, often with long, slender teeth; flowers blue, closing in the afternoon. In low ground the long underground rootstocks makes its extirpation difficult. The black seeds with a tuft of hairs at apex are distributed by the wind.

71. LACTUCA SCARIOLA, L. Prickly Lettuce; Chinese Lettuce.

A European biennial resembling the preceding species, but the flowers are light yellow and the leaves are prickly-fringed and not lobed, and have a curious habit of twisting to the vertical with a tendency toward a north and south direction, like a "compass plant." A most pernicious weed introduced along the railroads in nearly every part of the state but most frequent from Missoula west and south and worst about Plains and Hamilton. It should be destroyed in the localities in which it is established and not permitted to spread and increase the number of our already too numerous European pests. [Fig. 12.]

72. *LAMIUM AMPLEXICAULE, L. Dead Nettle.

A European annual introduced with garden seed from the east and well established near Ennis. A prostrate or creeping plant resembling the Ground Ivy, having small, rounded, opposite leaves with purple flowers in the axils. Unlikely to become troublesome except in irrigated gardens.

73. *LEONURUS CARDIACA, L. Motherwort.

A European perennial well established in waste places about Missoula, and one or two other points in the state.

74. LEPACHYS COLUMNARIS, T. & G. Cone-flower.

A native perennial of the plains region, one or two feet high, with rough divided leaves and long-stalked flowers with a dark columnar disk and drooping yellow rays. Spreading westward and often troblesome in meadows, pastures and waste places, particularly in dry sandy soil.

75. LEPIDIUM APETALUM. Willd. Bird-seed; Pepper-grass.

A small acrid-tasting annual a few inches to a foot high, frequent in dooryards, waste places and cultivated ground. Doubtfully native, although well distributed throughout the plains region. Seeds become mucilaginous when wet and thus facilitate their distribution by animals.

76. LUPINUS PUSILLUS, Pursh. Dwarf Lupine.

A small bulbous-rooted perennial, less than a foot high, with a long-stalked seven-foliate leaf and spike-like racemes of blue flowers, frequent in sandy soil in the Yellowstone and Milk River regions, and often troublesome in grain fields and cultivated ground. Native.

77. **LUPINUS SERICEUS,** Pursh. Lupine; Prairie Beans.

A native perennial common in dry ground throughout the state. Like the last but larger, one to three feet high. Persistent with long, creeping rootstocks in new ground and difficult to exterminate except by digging or long cultivation.

78. LYGODESMIA JUNCEA, Don. Wild Asparagus; Skeleton-weed.

A slender-stemmed branching native plant, one or two feet high, apparently leafless, with purplish flowers and long penetrating rootstocks, often troublesome in cultivated ground in the region east of the Divide. [Fig. 13.]

79. *MADIA FILIPES, Gray. Small Tarweed.

A small, slender Pacific Coast tarweed, which has reached our borders along the railways in the western part of the state. Well established in waste places about Troy, Libby and Thompson Falls. Annual.

80. **MADIA GLOMERATA,** Hook. Tarweed.

Another Pacific Coast annual similar to the last but much larger, about two feet high, with sticky, ill-smelling herbage and terminal clusters of inconspicuous flowers. In waste places, pastures and along roadsides eastward as far as Bozeman and appears to be rapidly spreading eastward in the state.

81. *MALVA PARVIFLORA, L. Running Mallow.

A small annual European mallow, noted in waste places about Conrad on the G. F. & Can. Ry. (R. S. Williams), Thompson Falls and Plains.

Fig. 13. Lygodesmia juncea, Don. Plant natural size; b-e enlarged.

82. MALVASTRUM COCCINEUM, Gray. WILD HOLLYHOCK.

A small native perennial about six inches high, with divided leaves, and brick-red flowers, not infrequent in waste places eastward, and often persistent in new ground; hardly large enough or sufficiently abundant to be troublesome.

83. MARRUBIUM VULGARE, L. HOREHOUND.

A white-woolly European perennial, one or two feet high, with opposite, roundish leaves, and the flowers and fruit clustered in the axils of the upper leaves. Seeds disseminated by the bur-like calyx. This has been found to be one of the worst weeds in Idaho and Utah, and is becoming very troublesome in streets, roadsides and waste places along the railroad from Missoula westward, but rare elsewhere in the state. Coming in from the west.

84. MATRICARIA DISCOIDEA, DC. RAYLESS DOGFENNEL.

A Pacific Coast annual resembling the dog-fennel (Anthemis Cotula) and similarly ill-scented, but without the white rays and much smaller. Frequent in streets and waste places and along highways throughout the western part of the state. Introduced from the west and rapidly spreading eastward.

85. MELILOTUS ALBA, Lam. SWEET CLOVER; WHITE MELILOT; HONEY CLOVER.

An annual or biennial, three to six feet high, frequent in many places along irrigation ditches and in waste places, particularly in the Yellowstone valley, where it has been found most troublesome. Much resembles alfalfa, but is taller and more slender and has white flowers, while its value as a forage plant is questionable. It appears to grow best in alkali ground. Introduced from Europe. Seeds appear to be scattered by water and in hay.

86. *MELILOTUS OFFICINALIS, Willd. YELLOW MELILOT.

Like the preceding, but with yellow flowers. In waste places at Helena (F. D. Kelsey), White Sulphur Springs (R. N. Sutherlin), and Miles City. Infrequent.

87. MONOLEPIS CHENOPODIOIDES, Moq. POVERTY WEED.

A native annual prostrate or ascending with green inconspicuous flowers and abundant fruit; fruiting throughout the season,

much resembling *Chenopodium glaucum*. One of our most troublesome weeds in yards, gardens and waste places.

88. *NASTURTIUM ARMORACIA, Fries. Horse Radish.

In waste places an occasional escape from cultivation.

89. *NEPETA CATARIA, L. Catnip.

A well-known European perennial becoming established in waste places at Helena (F. D. Kelsey), Columbia Falls, Holt, Thompson Falls, Plains and a few other places in the state.

90. ŒNOTHERA BIENNIS, L. Yellow Evening Primrose.

A slender biennial three or four feet high with yellow flowers and spindle-shaped fruit about an inch long, introduced along the railroads and highways in most parts of the state and frequently so common as almost to appear native in low ground (O. depressa, Greene and Onagra strigosa, Rydberg).

91. PANICUM CAPILLARE, L. Tumble-Grass.

A hairy annual grass with a widely spreading panicle of fruit easily detached when ripe; occurs occasionally in fields and waste places particularly in the Plains region. Here doubtfully native.

92. *PANICUM CRUS-GALLI, L. Barnyard Grass.

An introduced annual rare in fields, yards and waste places; here usually prostrate and spread by irrigation. At Ulm (R. S. Williams), Bozeman, Malta and Chinook.

93. *PANICUM SANGUINALE, L. Crab-Grass.

Occasionally imported from the east in grass seed, but shows little or no disposition to spread. Noted at Great Falls and Bozeman.

94. PASTINACA SATIVA, L. Parsnip.

Often escapes from cultivation and is found occasionally in old fields, waste places and along irrigation ditches.

95. PLANTAGO ASIATICA, L. Native Plantain.

The common plantain in ditches and low ground by roadsides and in waste places, apparently native.

96. PLANTAGO MAJOR, L. PLANTAIN.

A European perennial abundantly introduced in lawns, pastures and waste places about Deer Lodge, Columbia Falls, Bozeman and most of the larger towns and cities of the state. Like the dandelion, it is difficult to eradicate from lawns except by digging. It should not be allowed to secure a foothold in a community. This species is very difficult to distinguish from the one above, except that it is smaller and more smooth, has shorter and more abrupt spikes of fruit, central dehiscence of the capsule and a more pestiferous habit of frequenting lawns, yards and waste places.

97. PLANTAGO PATAGONICA GNAPHALIOIDES, Gray. RIBGRASS.

A native annual of the plains region, frequent in dry ground and with a decided tendency to crowd out the grasses in pasture land, when close cropped. The variety *aristata*, Gray, occurs with the other form but is much less frequent. This has been quoted as a weed from this state, but has value as a forage plant. The seeds of all these plantains becomes mucilaginous when wet, adhere to everything they touch and so are easily transported in the mud of passage.

98. *POA ANNUA, L.

A small annual grass from Europe, a few inches high in streets and waste places at St. Ignatius, Columbia Falls and a few other places in the state, but of no special importance.

99. POLYGONUM AVICULARE, L. KNOTGRASS; YARDGRASS; GOOSEGRASS.

An introduced annual forming carpet-like patches in yards, waste places, streets and along highways, often trailing for several feet. It has a smooth, wiry stem, small leaves and inconspicuous flowers. Common in beaten ground throughout the state; mainly in the coarser, blunt-leaved form (P. littorale, Link.), though both occur.

100. POLYGONUM ERECTUM, L.

An introduced weed very similar to the last, but is usually

erect and with broad oval leaves. Noted at Bozeman, Malta, the Ft. Peck Reservation near Calais, Forsyth and Glendive.

101. POLYGONUM CONVOLVULUS, L. WILD BUCKWHEAT.

A climbing or trailing vine with heart-shaped leaves and buckwheat-like fruit common in yards, waste places and cultivated ground in the settled parts of the state. An annual introduced from Europe and the East and now become one of our worst weeds.

102. POLYGONUM LAPATHIFOLIUM, L. SMARTWEED.

A smooth annual with swollen joints and small terminal spikes of purplish or white flowers, one to three feet high. Introduced about waste places, gardens and in cultivated ground; not infrequent.

103. POLYGONUM PERSICARIA, L. SMARTWEED.

A not infrequent introduction in wet places, but hardly troublesome. Like the last, but lower and with thicker and more brightly colored spikes.

104. *PORTULACA OLERACEA, L. PURSELEY.

A brittle, fleshy annual with small yellow flowers, forming broad mats. This eastern pest has appeared in gardens occasionally, introduced with garden seed, and grows vigorously in irrigated ground. Not likely to be more than locally troublesome, but should be exterminated in every case lest it become established and difficult to control. Noted in gardens and in waste places at Bozeman, Ennis, Craig, Forsyth and Glendive.

105. RUMEX ACETOSELLA, L. SHEEP SORREL.

A perennial one or two feet high with small leaves, having ear-like lobes on each side near the base and a strong acid taste, and with slender terminal naked sprays of small green flowers or fruit. Forms patches in meadows, pastures and waste land, spreading by means of long underground rootstocks, and, like the Canada thistle, very difficult to exterminate after it gets established. This is going to be one of the worst weeds in the state, as it is well adapted to our climatic conditions and has a footing in many places over the state, particularly westward. It has fairly taken

Fig. 14. Rumex Acetosella, L. Plant natural size; 1 and 2 enlarged.

some grain-fields in the Gallatin Valley and is bad in several parts of the Flathead Valley, while it is common along the railroad from Missoula westward, apparently coming in from the Pacific coast. This should be included among the outlawed weeds of the state. [Fig. 14.]

106. RUMEX CRISPUS, L. CURLY-LEAVED DOCK; BURDOCK.

A large perennial dock established in streets and waste places about most of the larger towns of the state but not as yet common or very troublesome. The large thick roots must be removed by digging.

107. RUMEX SALICIFOLIUS, Weinm. WILLOW-LEAVED DOCK.

A coarse weed like the last but with narrower leaves; frequent along roadsides, in waste places and pastures. Apparently introduced from the west; possibly indigenous.

108. SALSOLA KALI TRAGUS, Moq. RUSSIAN THISTLE.

An introduced annual with little or no resemblance to a thistle. It has awl-shaped leaves, a green stem, striped with red, and prickly fruit-bracts, becoming hard and spiny in age; flowers and fruit small and inconspicuous. It often forms a large globular mass a yard or more in diameter, which finally becomes detached and is rolled about by the wind like the tumble-weed. It favors sandy or alkali soil for growth and frequents railway grades, streets and waste places about towns and cities; seems to make no headway against the native vegetation in the open fields and plains. This is one of the three outlawed weeds of Montana and doubtless well deserves to be included in the list, but, as far as my observation goes, it has not yet become a pest here in cultivated ground, although well scattered over the state, and hardly deserves the bad reputation given it. In its younger growth it makes fair forage and is occasionally cut for hay, so that it may yet prove a valuable forage plant adapted to alkali situations, where little else will grow. Well scattered in the Milk River and Yellowstone

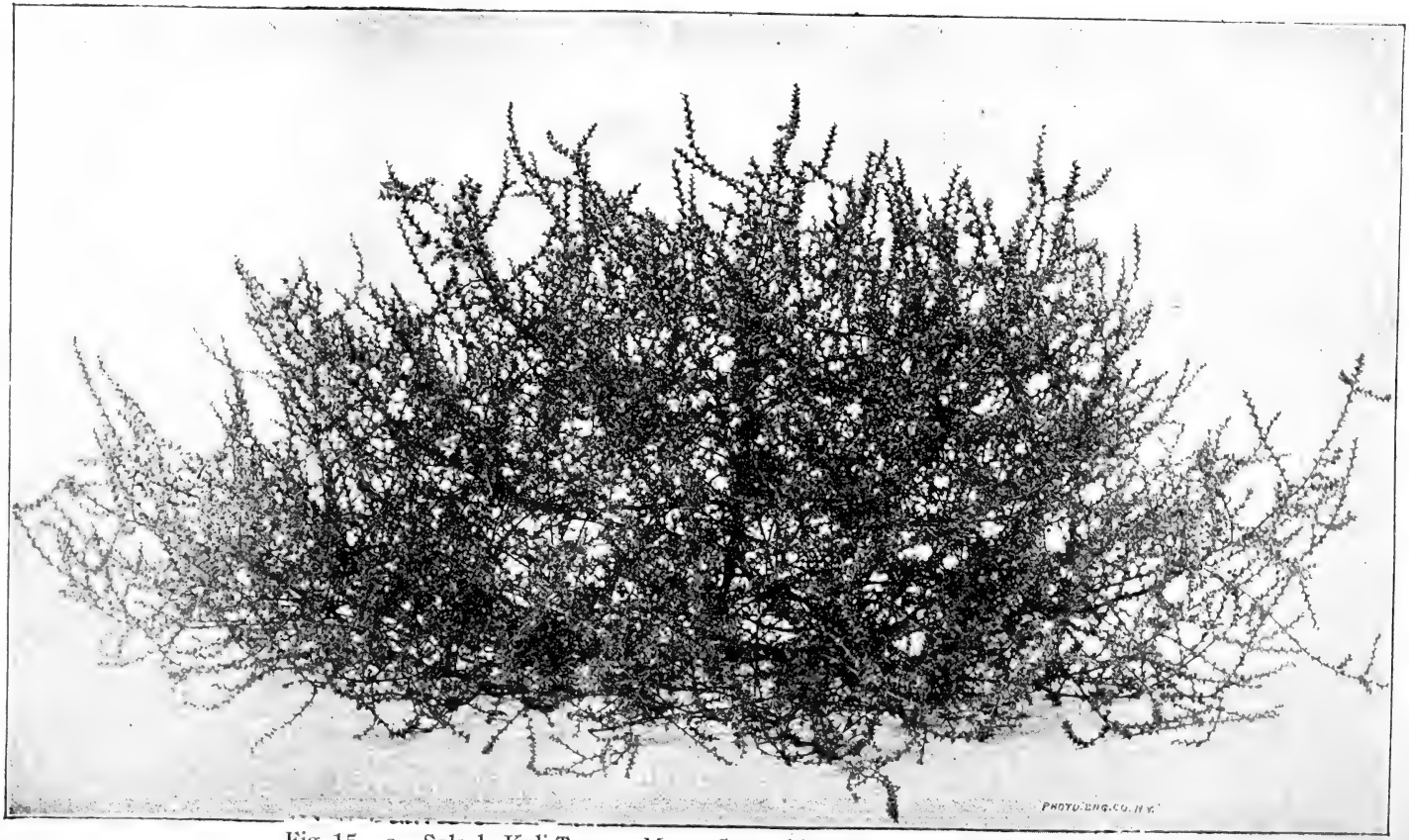

Fig. 15., a. Salsola Kali Tragus, Moq. General habit of growth. 1-12 nat. size.

Fig. 15 b. Salsola Kali Tragus, Moq. Seedling and branch natural size; flower and fruit enlarged.

regions; at Missoula and Helena and reported from Manhattan, Livingston, Billings, Cinnabar, Great Falls and at points along the railway in Silver Bow and Beaverhead counties. It is easily uprooted with a hoe and should be piled into heaps and burned when dry, as the smallest plants bear fruit and will serve to restock the soil, if simply dug up and left. Mowing the plants, as is frequently done, is of little aid toward their extermination, as the stubs remaining will bear enough fruit to replant the soil for the ensuing season. It is better adapted to the conditions existing in the Milk River and Yellowstone Valleys than elsewhere in the state and may there prove a serious menace to the agricultural interests, but should be exterminated wherever found, as the law requires. Seeds distributed principally by the railways, irrigation ditches and mud of passage. [Fig. 15 a and b.]

109. **SAPONARIA VACCARIA, L.** Cockle; Cow Cockle.

A smooth European annual, one or two feet high; with opposite, clasping leaves and conspicuous pink flowers terminating the level-topped spread of branches. A common and pernicious weed in grain fields in the eastern part of the state, but rare westward. It should not be allowed to secure a footing in regions not yet infected and may be hand-pulled where the plants are few or its distribution limited. Usually introduced and spread in the grain seed and, apparently, by irrigation. [Fig. 16.]

110. *SENECIO VULGARIS, L. Groundsel.

An annual, about a foot high, with divided leaves and inconspicuous heads of flowers, somewhat resembling a thistle. In waste places at Columbia Falls and Big Timber. From Europe.

111. *SILENE NOCTIFLORA, L. Catchfly.

An introduced annual noted in fields and waste places about Bozeman. An herb one or two feet high, with sticky hairs, opposite leaves and white flowers. Unlikely to become troublesome in this state.

Fig. 16. Saponaria Vaccaria, L. Plant about one-half natural size.

112. SISYMBRIUM ALTISSIMUM, L. Tumbling Mustard.

Fig. 17a. Sisymbrium altissimum, L. a and d ⅓; b and c natural size.

A European annual of the mustard family, two or three feet high, with upper leaves narrow or finely divided and the lower broader-lobed, and having a widely branching, level-topped spread of yellowish flowers and slender fruit pods two or three inches long. This has been found to be a most pernicious weed in Canada north of this state and is extending southward. Specimens have been collected at Great Falls, Helena, Central Park and Belgrade, and it is fairly taking the grain fields in some parts of the Bitter Root and Flathead valleys. It should not be allowed to secure a footing in any agricultural section, as its enormous fertility, tumbling habit, and special adaptation to our climate will probably make it far more dangerous to the farmer than any of the weeds already outlawed in the state. [Figs. 17 a and b.]

113. SISYMBRIUM INCISUM, Engelm. Tansy Mustard.

A slender annual of the mustard family, one to three feet high, having small, yellow flowers, short spreading pods and finely divided leaves. Common along roadsides, in grain fields and waste places. Has the appearance of a native in some parts of

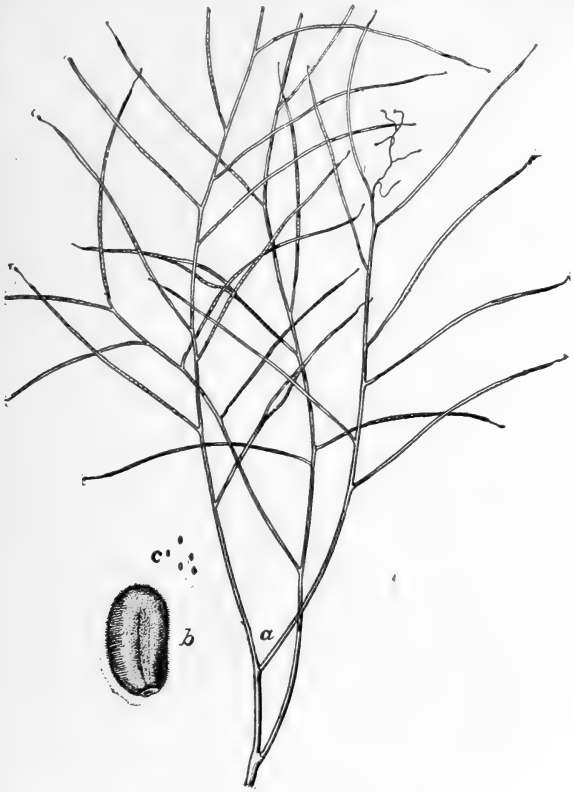

Fig. 17b. Sisymbrium altissimum, L. Fruit
¼ natural size; b enlarged.

the state east of the Divide, but is local in its distribution. Seeds scattered by water and in mud.

114. *SISYMBRIUM OFFICINALE, Scop. HEDGE MUSTARD.

Another introduced annual, occasional in waste places, but not likely to become troublesome. At St. Ignatius, Troy, Helena, Bozeman and Missoula.

115. *SOLANUM NIGRUM, L. DEADLY NIGHTSHADE.

An introduced annual in waste places at Columbia Falls (R. S. Williams), and Selish (V. K. Chesnut).

116. SOLANUM ROSTRATUM, Dunal. BUFFALO BUR.

A prostrate annual, with yellow flowers and a bur-like fruit, thickly covered with long, yellow spines. Coming into the state from the east along the railways and becoming troublesome in yards, waste places and cultivated ground. At various points along the Yellowstone, Missoula, Box Elder Creek, Glasgow and Culbertson. It should be killed out in all localities before it becomes a pest. It spreads slowly, but holds well where established.

117. **SOLANIUM TRIFLORUM,** Nutt. WILD TOMATO; STINKWEED.

A prostrate spreading annual with lobed leaves, small white or pale blue flowers and numerous green, many seeded berries. Frequent in gardens, waste places and cultivated ground throughout much of the region east of the Divide. The host of the Colorado potato beetle. Doubtfully native. [Fig. 18].

118. **SONCHUS ASPER,** Vill. SOW THISTLE; YELLOW THISTLE.

A thistle-like annual with spiny clasping leaves and yellow flowers; two or three feet tall. Introduced from Europe by way of the eastern states and now frequent and often troublesome in gardens and cultivated ground, particularly about Bozeman and Kalispell. Seeds feathery and scattered by the wind.

119. *SONCHUS OLERACEUS, L.

Very similar to the last and commonly not distinguished from it. It is more slender, less prickly and has cross-ribbed seeds. It occurs with the other species, but is far less frequent.

120. *SPERGULA ARVENSIS, L. FIELD SPURRY.

An annual introduced from the Old World with slender, branching stems and numerous clusters of thread-like leaves. In grain fields at Bozeman but not elsewhere noted.

121. *STELLARIA MEDIA, Smith. CHICKWEED.

A small, spreading annual naturalized from Europe, in yards and waste places; occasional about Bozeman and other towns of the state.

122. *SUCKLEYA PETIOLARIS, Gray.

A prostrate annual, very much resembling the pigweed-pursely (Amaranthus blitoides, Wats.) but with larger and more orbicular

Fig. 18. Solanum triflorum, Nutt. Branch natural size.

leaves. It has as yet been noted in this state only in the Milk River region and, as far as my observation goes, only in a single locality in the town of Glasgow. Its abundance and decided weed habit may hereafter make it a pest in that region. Although the type locality, it is doubtless introduced here from the southern plains.

123. *SYMPHYTUM OFFICINALE, L. COMFREY.

A large coarse European perennial sparingly introduced in waste places about Bozeman.

Fig. 19, Taraxacum officinale, Weber. Plant about ¼ natural size.

124. TARAXACUM OFFICINALE, Weber. DANDELION.

A perennial of European origin, with a long, deeply penetrating root which makes it difficult to eradicate. It has a cluster of lobed ground leaves from which arise the slender flower stalks with yellow flowers and round balls of plumose fruit, which are carried long distances by the wind. One of the worst weeds in the state in lawns, waste places and pastures about the larger towns,

and can be exterminated only by cultivation or by digging; the latter is most effective when the roots are cut off just below the crown of leaves during the flowering season. Apparently well distributed in the state about towns. [Fig. 19.]

125. *THLASPI ARVENSE, L. Pennycress.

An introduced annual of the Mustard family much resembling the birdseed (Lepidium apetalum) but having larger pods. Occasional in grain fields and waste places.

126. *TRAGOPOGON PORRIFOLIUS, L. Salsify; Oyster-plant.

In gardens and waste places; not infrequently escaped from cultivation.

Fig. 20. Urtica gracilis, Ait. Branch ¼ natural size.

127. *URTICA DIOICA, L.

A perennial nettle about barnyards and in waste places in the Koutenai region. Infrequent. Apparently here, coming in from the west.

128. URTICA GRACILIS, Ait.

Stinging Nettle.

A tall slender unbranched perennial with green fruit clusters in the axils of the upper leaves, and with stinging hairs. Not infrequent in streets and waste places and along highways in the region east of the Divide, but sparsely introduced westward. Usually regarded as native, but in this state its habit is wholly that of an introduced species and occurs only where its seeds may have been transported in hay, water or mud from points of settlement. [Fig. 20.]

129. VERBASCUM THAPSUS, L. Mullein.

A thick, woolly-leaved biennial with a tall (two to six feet) unbranched stem and a terminal spike of yellow flowers. An introduced plant well established in many places about the state in fields and waste places and by roadsides. Most troublesome from Missoula south and west along the railroads. Common in the Flathead valley near Columbia Falls, along the Missouri below Craig and occasional in the Gallatin valley near Bozeman. Seems well adapted to our climatic conditions and is liable to become a serious pest.

Fig. 21. Xanthium Canadense, Mill, Branch ⅓; bur natural size.

130. VERBENA BRACTEOSA, Michx. Trailing Vervain; Vervain.

A perennial, native in the region east of the mountains. It forms broad mats along roadsides, in yards and waste places. A prostrate and bristly hairy plant with small blue flowers along the ends of the branches.

131. VERONICA PEREGRINA, L.

A small annual not infrequent here as a weed in grain fields and cultivated ground, but hardly troublesome.

132. *VERONICA BYZANTINA, B. S. P.

A small weed occasionally introduced in garden seed, but has not yet become well established. Noted at Bozeman.

133. XANTHIUM CANADENSE, Mill. Cocklebur.

A coarse annual with heart-shaped leaves and clusters of burs in their axils. Locally established along ditches and in low

ground in many parts of the state and seeds spread by stock and by irrigation. Rarely troublesome here in cultivated land. [Fig. 21.]

134. *XANTHIUM SPINOSUM, L. Thorny Cucklebur.

Specimens of this weed have been sent in from the vicinity of Victor and the plant is said to be well established about sheep camps in the Bitter Root region, probably brought in from the Pacific Coast with imported sheep. It has burs like the preceding but the leaves are more lobed and white beneath with long, three-divided yellow thorns in the axils. It should not be allowed to secure a footing in the state lest it become a serious pest to the wool industry and to agriculture.

ADDENDA.

135. *ERODIUM CICUTARIUM, L'Her. Alfilaria; Pin Clover.

A prostrate or spreading, much-branched annual with finely divided leaves and rose-colored flowers; fruit similar to that of the Geranium. Well established in waste places at Thompson Falls and Plains and is a fair forage plant. Imported from the Pacific Coast.

136. *MADIA SATIVA, L. Tall Tarweed.

Resembling M. glomerata, but is a taller plant (2 or 3 feet high) with heads terminating slender scattered branches. Frequent along roadsides and waste places at Thompson Falls, coming in from the Pacific Coast.

137. *VERBASCUM BLATTARIA, L. Moth Mullein.

A smooth slender biennial 2 to 4 feet high with a cluster of toothed basal leaves and a terminal raceme of white (rarely yellow) flowers. Established along the railroad at various points west of Missoula and exhibits a strong disposition to spread. Noted at DeSmet, Weeksville and Thompson Falls.

138. *VICIA SATIVA, L. Vetch.

A European pea established along the railroad at Plains and its growth here would indicate that it might be profitably employed as a forage plant, as it is in Europe.

SUBJECT INDEX.

Figures Refer to Pages.

GENERIC INDEX OF SCIENTIFIC NAMES.

INDEX OF POPULAR NAMES.