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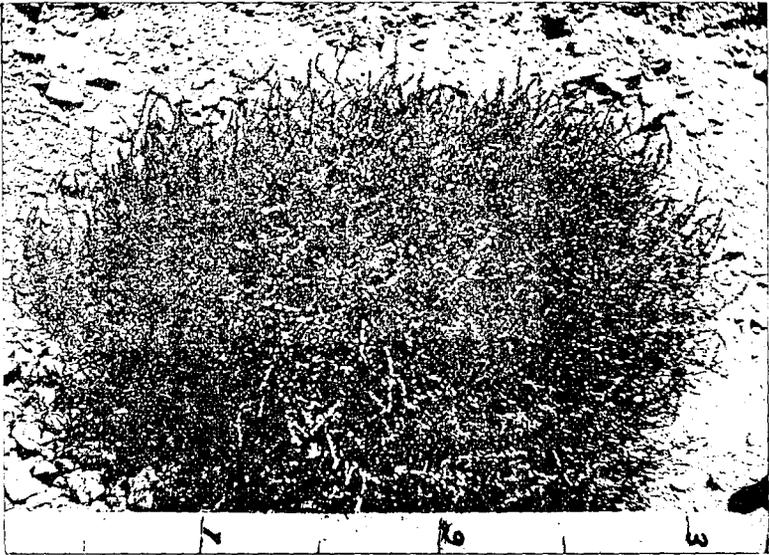
# Agricultural Experiment Station.

BULLETIN No. 33.

AGRICULTURAL DIVISION.

JULY, 1894.

THE RUSSIAN THISTLE OR RUSSIAN TUM-  
BLE WEED.



Mature Plant Photographed at St. Paul.

ST. ANTHONY PARK, RAMSEY CO.,  
MINNESOTA.

EAGLE JOB PRINT, DELANO, MINN.

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 The Bulletins of this Station are mailed free to all residents of the State who make application for them.

# The Russian Thistle, or Russian Tumble Weed.

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WILLET M. HAYS.  
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The Russian Thistle or Russian Tumble Weed (*Salsoliki, var. tragus*) was brought from Russia, probably with flax seed, where it is said to be a most serious pest. From a very small start, in ten or more years it had gotten a very strong hold in one or two counties in South Dakota; and in six years more it has rapidly spread by the aid of the wind so as to thoroughly infest and cover numerous South Dakota and several North Dakota counties and the great body of the advance is nearly to the western border of our own state. By the aid of the railroads coming eastward this pest has much more rapidly advanced upon us than its natural mode of traveling before the wind would enable it to do. It infests our state at various points and has even passed through our own state and is causing alarm by appearing at Madison, Wis., and at other points. It has shown its ability to travel, and to thrive in a variety of conditions by migrating southward through Iowa, Nebraska, and even into more remote states. In Nebraska it has been found in nearly thirty counties. Our railroad lines are dotted or fringed with the weed at many points, and around our stockyards and many of our large terminal elevator centers it has gotten a firm and dangerous hold. It is now so situated that it can very rapidly distribute from these many centers and from the many others sure to become infested by the further importation into our state, and if left uncontrolled it will soon become a common and pernicious weed. The great body of this weed invasion will come up-

on us through our western border before the winds which drive unhindered across our nearly treeless and fenceless western prairies. Likewise from the centers infested within the state will the winds roll these weeds into our fields, scatter seeds along our wagon roads and into every nook where a weed can thrive, will this pest find a place to center as a nuisance.

When young this tumble weed is an innocent appearing plant and will not compete strongly with grass and other plants for a place. In the early stage of its growth it is a soft, succulent kind of herbage not ungrateful to stock. But if given a roomy nook, as on a freshly made gopher mound, ample room in a field of breaking, or plenty of air and sun

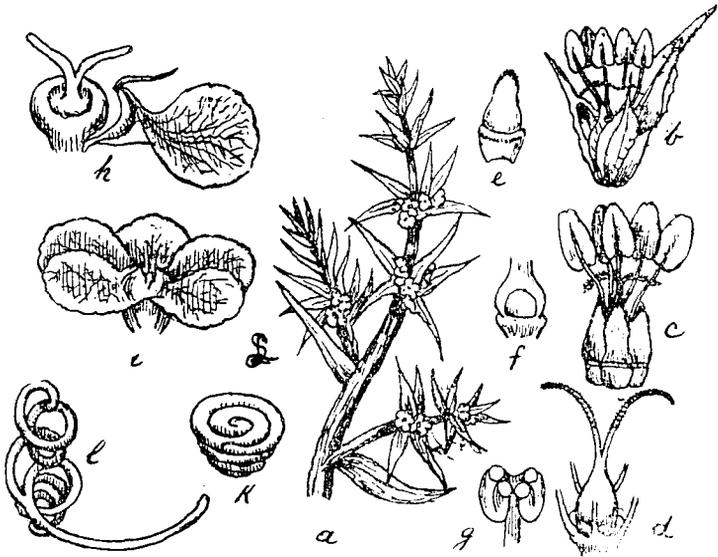


Fig. 1—*a*, flowering branch; *b*, flower, enlarged; *c*, flower, outer parts removed, showing male and female parts; *d*, female part alone; *e*, leaf protecting ovum; *f*, ovum; *g*, cross section of male part; *h*, enclosed seed; *i*, enclosed seed; *k*, seed; *l*, embryo with roots.—Lugger.

room along the wheel tracks in the highway, it grows as few other weeds ever grow.

It thrives in our richest soils and does nearly as well when drouth and hot winds choke most other weeds into very modest achievements. This tumble weed is like our common prairie tumble weed (*Amarantus alba*) in some of its characters. looks like it in tact from a distance when ma-

ture, grows in newly broken land or along roadways and is like it in its manner of tumbling before the wind. On closer examination the plant is found to be very different from the common tumble weed. When ripe its stems are much tougher and stiffer, enabling it to ride longer in the wind before being torn to pieces. At this stage of growth the slender, soft leaves born during its early stages have partly fallen off and at each joint on the stems are several leaflike spines, both strong and sharp. These are so rigid that horses legs are much injured by forcing them to pass through a growth of the nearly mature weeds. In the illustration herewith, made by Dr. Otto Lugger, drawings of parts of a stem, of flowers, etc., show the botanical features of the weed. The flower is in the axils of the leaf-like spines. The flower parts do not all fall off, but within them is developed the strange seed. This is simply a small, long-cylindrical-shaped seed or germ nearly the size of the shaft of a pin, forked at the lower or root end, and the whole coiled up into the form of a rather flat snail shell. Around this is a thin shell or covering, but no "meat" is laid up outside or around the germ as is the case in most seeds. The seed is greenish until quite ripe when it turns a dark brownish color and changes to a fairly hard seed. But the important fact is that the seed belongs to that class which is easily penetrated by water, will germinate readily and is not liable to live long in the soil, even if buried at some depth, as would such hard, oily seeds as mustard and clover.

Weeds large enough for good "tumblers" before the wind rarely grow among crops of small grain. They come from breaking, fallow ground, roadsides, freshly made mounds and like places where the native sod is temporarily destroyed and no strongly competing plants have as yet secured control. In fields of wheat, the plants are crowded out of their natural ovoid or spreading form of growth and grow more or less erect among the grain. They rarely grow tall, but if the grain has only a poor chance to thicken its clumps by "stooling," as was the case in the Dakotas during the dry June of last year, the weed grows in large numbers among the wheat, and in thin spots in the grain, produces some

large plants. In seasons where the moisture enables the wheat to grow vigorously during the early part of the season, most of the Russian Tumble Weeds grow only very small or are crowded to death. Where they grow one to two feet high and rather thick among the wheat it is difficult to drive teams through them, the spines causing great pain to the horses' legs; and the harvester oft-times can not cut through the hard weeds but must give way to the header which is run above the thistles taking only the heads of the grain. In rare cases the weeds grow as high as the wheat and even the header will not work. In cultivated crops, as potatoes and corn, the occasional weed left by the careless farmer is liable to develop into the most robust tumble weed two to five feet in diameter, and in a crop of thin wheat the masses of the thistle grow large and thick enough so as to be massed together by the wind into approved "tumblers" of large size.

The great fact that this weed can and does travel from one farm to another; from waste or government lands into the fields of careful husbandmen; from the corporate or public highways to adjacent or remote fields of the cleanly farmer, brings before our states and even the general government, a new condition—a sudden and imperative duty. The individual cannot deal with this foe any more than he can protect himself from yellow fever let loose in the streets. The power of the government to bring about a co-operative, enforced, systematic and comprehensive fight must be brought into use before the pest has spread from the present comparatively small infested areas to the entire country. And if the state, possibly with aid and co-operation of the general government, compels one man to prevent this weed from spreading from his lands, it assumes the responsibility of compelling every other land owner to likewise keep it in check, that he who complies with the law may accomplish his purpose and not merely spend labor and money and have the weed again come on his fields from surrounding lands. During a recent visit to the infested region in South Dakota, I found that many farmers were making heroic efforts to keep this weed out of their own lands but as the state does not

execute its law compelling others to do the same, these farmers are placed at a great disadvantage as their fields are constantly reinfested by the weeds being blown from roads, public lands and from the fields of other farmers.

This weed is not going to ruin Minnesota if it does gain entrance to every farm. But it is a good business proposition to invest enough of energy to prevent its ever getting a stronghold in the state. Every dollar spent on complete eradication will save hundreds in loss of crops and in the everlasting warfare which must be hereafter kept up if this pest is not subdued. A sharp, decisive contest is better than a weary, long-drawn fight which we can only bequeath to the coming generation. A successful fight would be a great and needed lesson in weed eradication.

Three alternatives are offered. First: Take no advantage from our association in organized towns, counties, states and nation, but allow each farmer to fight his own battles with the weeds blowing on his lands during most months of the year from surrounding fields, roads, etc. Second: Make and execute laws preventing the ripening of all weeds which grow large enough to be blown before the wind, and to prevent their being spread by such means as railroads and grain dealers. This plan would result in the weed spreading only very slowly to sections not now infested. If the law were faithfully executed, it would result in the farmer who strongly desired to keep his land clean of the weed being able to do so. The presence in all infested regions of small plants among grain and in other places where they would not develop into large weeds would, however, be a constant menace and source of trouble and expense. The seeds are rather light and have something of a wing which will enable the wind to carry them across snow in winter. Third: Make state laws under which, with some aid from the general government, the weed might, if possible, be completely eradicated. If practicable this plan would in the end be far more economical. Killing out the last plant of so widely distributed a weed would indeed be difficult. No one has yet investigated the subject enough to be warranted in say-

ing whether or not it is practicable, or not economy, to try to eradicate this pest as was done with pleuro-pneumonia in cattle. This whole matter should be carefully considered from a purely business standpoint and a plan devised whereby the states affected and even the general government could unite in enacting laws under which all individuals, corporations, and governing powers could co-operate to handle this weed in the most business-like and practical manner. A strong commission of men should be appointed to look up all the economic, the agricultural, the business and the legal aspects of the case and report suggestions of a general plan under which the law-making bodies of states and government could intelligently act. Recent careful study of the affected territory has made me a firm believer that the necessary energy and money to control, and possibly to eradicate, this weed could be expended by the farmers, the states and the general government to the advantage of all.

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#### HOW TO ERADICATE THE RUSSIAN TUMBLE WEED IN MINNESOTA AND PREVENT ITS GETTING ON OUR FARMS.

A year's experience will tell us how to meet the difficulties. No one has heretofore been able to fight this weed alone. *It is an annual, however, grows from the seed each year, and the plants are easily killed by means of the hoe, cultivator or any tool or implement which will uproot or seriously disturb them.* They are easily pulled up, and when turned under with the plow they die. The individuals are easily killed. *If all plants large enough to travel before the wind are kept from ripening, the weed will not be very hard to eradicate on each farm.*

By preventing plants from seeding for two years the pest would disappear. That might not be possible. But it looks reasonable that the plants could so nearly all be kept down for two years that occasional sources of remaining danger points could be found and looked after, and in a few years the land be freed entirely from the pest. The essential need is, not to allow any plants to mature seeds, especially

plants large enough to roll. The seeds already ripe in the land should be encouraged to germinate that they may be killed by plow, hoe, frost and other agencies. There is no easy "cure-all," no specific except eternal vigilance; brains for a plan and willing hands on the spot to do the work at the right time.

The methods enumerated below are along the line we must act—they are written before, not after, the execution of the work and apply to the section worst infested and to the scattering patches in Minnesota. They will suggest to the ingenious farmer and to the official, what he can do under his conditions.

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#### METHODS IN CULTIVATED LANDS.

(1) *The green manure fallow*, when large fields must be dealt with, is valuable if rightly managed, to kill Russian Thistle, and other weeds as well. Two plowings are necessary. The best way is to plow shallow in May or June and sow half a bushel per acre of millet or two bushels of oats and plow under when beginning to head out. The humus gotten into the soil will amply repay the cost of the seed for the green manure, though the thistles can be as effectively treated without the crop of green manure. After the last plowing the field should be gone over, with the hoe if necessary, to destroy stray plants.

(2) *Early fall plowing* of stubble done as soon as the grain can possibly be stacked or threshed will kill most of the weeds if great care is given to thoroughness and plowing before any seeds are ripe enough to grow.

(3) *The bare fallow* in some cases is the best means to use in cultivated lands. To make it the most effective the grain shocks of the previous crop should be stacked as soon as dry, not waiting to thresh out of the shock unless it can be done at once; and the stubble immediately plowed or even disked to kill unripe weeds or to bury ripe seeds that they may surely be induced to germinate. The land in most sections should the next season be twice fallow-plowed, once in June or July, and where necessary at or after harvest. As

practiced at present where the land lies from one harvest through the entire season, with only once fallow-plowing in midsummer, the bare fallow often is productive of the largest "tumblers" and spreads the weeds.

(4) *Annual hay crops* grown instead of green manure will likewise serve a good purpose and in sections where wild hay is no longer plentiful will pay as a crop. By very early fall plowing, then plowing shallow in spring and seeding to millet, oats, oats and peas, sowed corn, or other crop for cured forage, and again fall-plowing very early, the Russian Thistle will not have a chance to seed for two years, and will be practically killed out if no seeds are allowed to blow into the field.

(5) *Cultivated crops*, early fall plowing, fallowing, among which every stray plant not killed by means of the cultivator is destroyed by the hoe, is a very effective means of killing out Russian Tumble Weed and these crops, especially corn and potatoes, can be much extended with profit on our wheat farms, but poorly tended they are a source of infection. A few plants allowed room and cultivation will develop into the largest and most dangerous Tumble Weeds. Thorough work with the cultivator supplemented by complete hoe work up to the latter part of August will surely leave no plants with age enough to mature their seeds before frost.

(6) *Mowing and burning* the stubbles and weeds as soon as the grain crop is off and before the weed seeds are ripe is a valuable means where the weeds are thick and cannot be well turned under with the plow. This plan followed by one of the methods stated above would be effective. The Russian Tumble Weed and grain stubble will not as a rule burn readily in the fall, at least not until many of the seeds have ripened, unless first mowed and dried. In some cases they may be burned after mowing without raking, which is an advantage as seeds are thus destroyed which might have escaped the mower. In other cases they must be more or less raked into piles. Plants mowed before the seeds are quite ripe will probably hold their seeds more tightly.

(7) *Mow or hoe patches in the grain fields* where a poor stand of grain has allowed them to develop into large weeds. This is necessary to avoid trouble to teams and machines at harvest time, and also to prevent the development of large "tumblers" which if allowed to ripen may be blown about scattering the seeds. Generally the scythe will do the work. The hoe or even the horse mowing machine may at times be better.

(8) *Plow under poor grain crops for green manure* if they promise to pay but little more than the cost of harvesting and threshing and are filled with a thick growth of Russian Tumble Weeds. It sometimes pays to be heroic in this. The plowing can be done early when there is little pressing work to do. The green crop of hay and weeds will make much humus or fertility in the soil and a chance for double profits on the crop the next season. Sometimes green manuring and summer fallowing are objectionable means in dry, wind-swept sections on account of resulting blowing or drifting of the fine surface soil.

#### HIGHWAYS, RAILWAYS, GRASS LANDS, COMMONS, GROVES.

Total eradication outside of cultivated fields is not so easily accomplished as in the lands used for grain and hoed crops.

(9) *Infested highways* which have been shaped up with the elevating grader or the reversible road machine can be easily kept clean of the weeds by one or few dressings during the summer with the reversible road machine. Plants which escape this treatment can be cut with hoe. In some cases it will pay to "break and back-set" the roadway to kill out the weeds. The farmer can use this land for crops or it can soon be seeded down to grass, timothy, Kentucky blue grass, red top and white clover being the best mixture I can recommend. Road ditches should be built of such shape or form that they are not weed strongholds. Road officers should look sharply after the weeds in all highways and see that the farmers keep them from seeding along their lands or that the roads are kept free of weeds at the expense of the township. Farmers should be encouraged to farm the land to the wheel track along infested highways.

(10) *Along rough highways* and on the railway right of way "Breaking and back-setting," possibly followed by a year of bare fallowing, then the next year seeding to grass, will sometimes be the most economical measure. Usually the hoe thoroughly applied is the best remedy. The scythe leaves low lying branches uncut to ripen seeds. Our railway right of ways as well as our highways in all sections of country should be left in such shape, when being constructed, that they can be seeded to grasses which are easily mowed or "back fired" both to lessen the number of escaping fires and to abate the weed nuisance.

(11) *Pastures and meadows* whether native or wild need attention "Breaking and back-setting," then growing crops and treating as in 1 to 8 above is safest. In grass lands left undisturbed the hoe in the hands of careful men in August is probably the best means. A foreman on horse-back following and constantly inspecting the work of a gang of a dozen men could rapidly get over the prairie or tame pasture or meadow and do the work effectively, and cheaply as in a similar way we pull mustard. Prof. Bolley, of North Dakota Experiment Station, says: "A comparatively small force of workmen would suffice to destroy all weeds upon road margins and the wild lands of the worst infested townships in the state." Thus could the larger weeds which develop in gopher mounds, fire breaks and similar places on the prairies be destroyed, and the plants, kept small by the thick growth of grass, might thus be gradually eradicated.

(12) *Cities and towns in Minnesota* in which this weed has obtained a hold should, in the common interest, and in justice to the farmers who patronize them, at once take measures to prevent not only all large plants from blowing about and spreading the weed, but see that no seeds are ripened in the next years. Cities and towns are strongholds for this pest which the farmers cannot reach; and as towns are now centres from which the weed is spreading there is nothing improper in their taking the initiative. Every waste lot or block in every town or city should be broken and sowed to Kentucky blue grass and white clover. Aside from keep-

ing out this and other weed pests, such a practice would make our towns look much prettier and cleaner.

(13) *Prevention of spreading.* The greatest barrier to the spreading of the Russian Tumble Weed is the prevention of all plants growing large enough to roll before the wind. If every township can be so organized this summer as to prevent spreading by the wind, each farmer can successfully fight his own battles and all working together could in two or three years eradicate the weed. Railroads have helped to spread it. They should vigorously set about cleaning it off their right of way and out of their depot yards. Township road overseers and citizens should not hesitate to notify the railroad of the presence of the weeds on the right of way and in depot yards, and to see that the companies look after keeping their properties clean.

(14) *Fences catch the "tumblers"* and keep them out of the field. Wire fences serve a good purpose, though the weeds often pile high and blow over. Three rows of Russian Sunflower around a field inside the fence, rows three to four feet apart and seeds a foot or less apart in the row and well cultivated so as to grow tall and strong would make something of a hedge but are only temporary and not very promising. The heads make good feed for poultry and other stock while the stalks remain erect all winter. Willow hedges in double rows thirty feet apart, and cuttings a foot apart in the row make the best of hedges. A row or two of plums between the two rows of willows is suggested as an improvement. Hedges and timber belts, however, are the hardest place from which to rid out the last weed because hard to cultivate.

(15) *Ripe seeds should be burned* wherever it is possible to burn the field over or to burn piles of the weeds. Thus will it be possible to kill very many seeds in the spring or late in the fall. Wherever an opportunity offers in a strong wind in dry weather unusual efforts should be put forth to burn stubble and prairie grass. Mowing, raking, and then burning will also assist to kill many weeds. An iron drag with team hitched twelve feet away by means of a gas pipe cross-tree and chains or wires and dragged through the field of ripe

thistles, with fire burning the thistles caught in the drag as it is run along the side of the field and against the wind—is often the most practical way of burning ripe Russian Thistles.

#### GENERAL PRECAUTIONS.

Infested flax, millet and buckwheat seeds, or seeds of other crops harvested late in the fall after the Russian thistle has ripened, cause the spread of this weed. Farmers should carefully examine all seeds coming from a distance and discard all having seeds of this or any other noxious weed. As these seeds are rather light they can be nearly all cleaned out of most kinds of grain by using a common fanning mill with its blast and sieves properly adjusted.

*Railways and Individuals* handling grains, stock or other farm products from infested districts should be compelled to use care in cleaning cars at only certain places where the weeds may be destroyed and to use proper care in preventing the spread of this weed.

#### LAWS ARE NEEDED.

The two Dakotas have fairly good laws and Nebraska, Minnesota, Iowa and Wisconsin, and possibly other states, should each at the earliest possible opportunity enact laws making it obligatory for the proper officials of each township, city and county to see that this weed is controlled. As to whether it is practicable to entirely eradicate the Russian Thistle from the country there is a diversity of reasonable opinion. But that the state and general government owes to every farmer enough of protection that this seed may not be blown upon his fields from surrounding lands and roadways, all must admit. Whether it is wise for the government to aid the states in a trial at utter eradication is one question; the consideration of practical laws looking to preventing the ripening and blowing about of all weeds large enough to roll before the wind is another question. Any of these states refusing to do at least this much is not loyal to its own citizens nor careful of the interests of its neighbors. And the government to be loyal to one or two of its young states and their farmers may find it wise to give material support as well as its great moral support to laws looking to the eradi-

cation of this new pest. The individual farmer can fight his own battle if the state will provide so that he need not fight it over again the next year. It might be far cheaper in the end to entirely eradicate the weed than to continually fight it, as the farmer must be given a chance to keep his land clean if he is so disposed. With the weeds blowing upon his farm every year he must adapt his farming to the presence of this weed and the farmers in affected districts recognize this as a very serious pest. Real estate dealers, however, do not all recognize that this or any other disadvantage exists in their section of the country. Let the state make and execute a good law and three-fourths of our farmers, if not nearly all, would learn that total eradication on their own lands is economy. It would not be very difficult to execute a law preventing the ripening of all the large weeds. This would in the main stop the rapid spread of the weed and its entire eradication could be taken up in any section or in the entire country.

Every farmer should try to prevent the ripening of all "tumblers" on his lands and in the township and county. He should also favor and work for the making and the execution of some reasonable, comprehensive and efficient laws. Figures 2 and 3 show Russian Tumble Weed at stage when nearly ready to blossom and when all stray plants should be destroyed as recommended in sections 9 to 15.



Fig. 2—A young Russian Tumble Weed of spreading habit, over two feet across, photographed by Prof. Swen at St. Paul July 1st.

## Everyone should know the Russian Thistle.

Mounted dry specimens of Russian Thistle showing it as it appears in July and August--the months in which all plants in neglected places on roads, on breaking, in towns, etc., should be killed---will be sent free on application to all school districts, road overseers, railway section foremen and other officials responsible for killing noxious weeds.



Fig. 3—A Russian Tumble Weed of rather erect habit, 18 inches high and at age when spines are beginning to develop and the slender foliage is beginning to drop off. Photographed at St. Paul, July 1st, 1894.