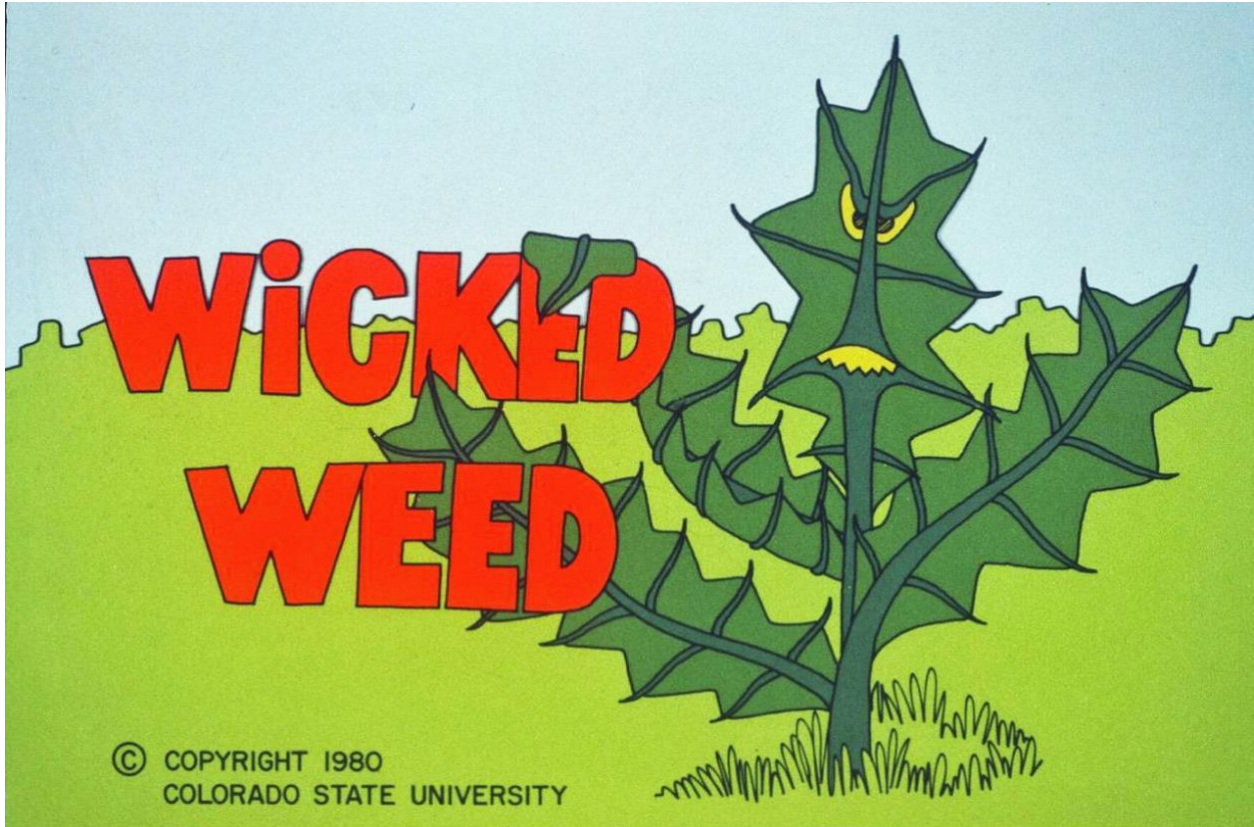


WICKED WEED



## WICKED WEED

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## INTRODUCTION

To be fully conversant with a subject, it is mandatory that one understand its basic concepts and at least some of its jargon. The most basic concept in Weed Science is embodied in the term “weed.” Weed scientists have a clear understanding of the term but it is not shared by all. Their definition is that a weed is a plant growing where it is not desired (1). While this definition is clear, it leaves the burden of specific identification, and responsibility for definition, with man. It is we who determine when a particular plant is growing in a place where it is not desired. The Oxford English Dictionary (3) defines a weed as an “herbaceous plant not valued for use or beauty, growing wild and rank, and regarded as cumbering the ground or hindering the growth of superior vegetation.” The role of man is again clear because it is we who determine use or beauty and which plants are to be regarded as superior. It is important for weed scientists to remember the fundamental role of human attitudes in determining which plants are weeds. Obviously, weeds are plants and plants do not have consciousness nor do they claim rights. Humans do, and we can assign rights to plants and serve as their counsel in determining their right or lack thereof to exist in our environment.

What is it about a plant that makes it weedy? Most people recognize a weed when they see one whether it’s in a golf course, a corn field, or a rose garden. But what characteristics do these plants share that makes them weedy? Simply defining a weed is not sufficient to answer the question of why a particular plant is a weed. What is it that makes some plants so capable of growing where they are not desired? Why are some plants so difficult to control when they exist where we don’t want them? What are their modes of antagonism and survival?

Not all weeds share all undesirable characteristics that can be assigned to some weeds but all weeds have at least some of the following characteristics.

- Weeds have the ability to reproduce at a very young age. Redroot pigweed can flower and produce seed when less than 8 inches tall. Most crops cannot do this.
- Weeds mature quickly. Canada thistle can mature seed within 2 weeks of flowering. At temperatures above 80°F Russian thistle seeds germinate within 90 minutes after wetting. This weed would spread more than it does except that the seed must germinate in loose soil because the coiled root unwinds as it pushes into the ground and it is unable to do so in hard soil.
- Many weeds have dual modes of reproduction. Most weeds are angiosperms and capable of reproducing by seed. Many also produce vegetatively and have become some of our most serious weed problems.
- Weeds are capable of growing under adverse conditions. The ecologist would say that they possess environmental plasticity.
- Weeds exhibit resistance to detrimental environmental factors. Most crop seeds will rot, if they do not germinate within a short period of time after planting. Weed seeds resist decay for long periods of time in soil.
- Weed seeds exhibit dormancy or dispersal in time. This mechanism allows them to escape the rigors of the environment and germinate when conditions are most favorable for their survival.

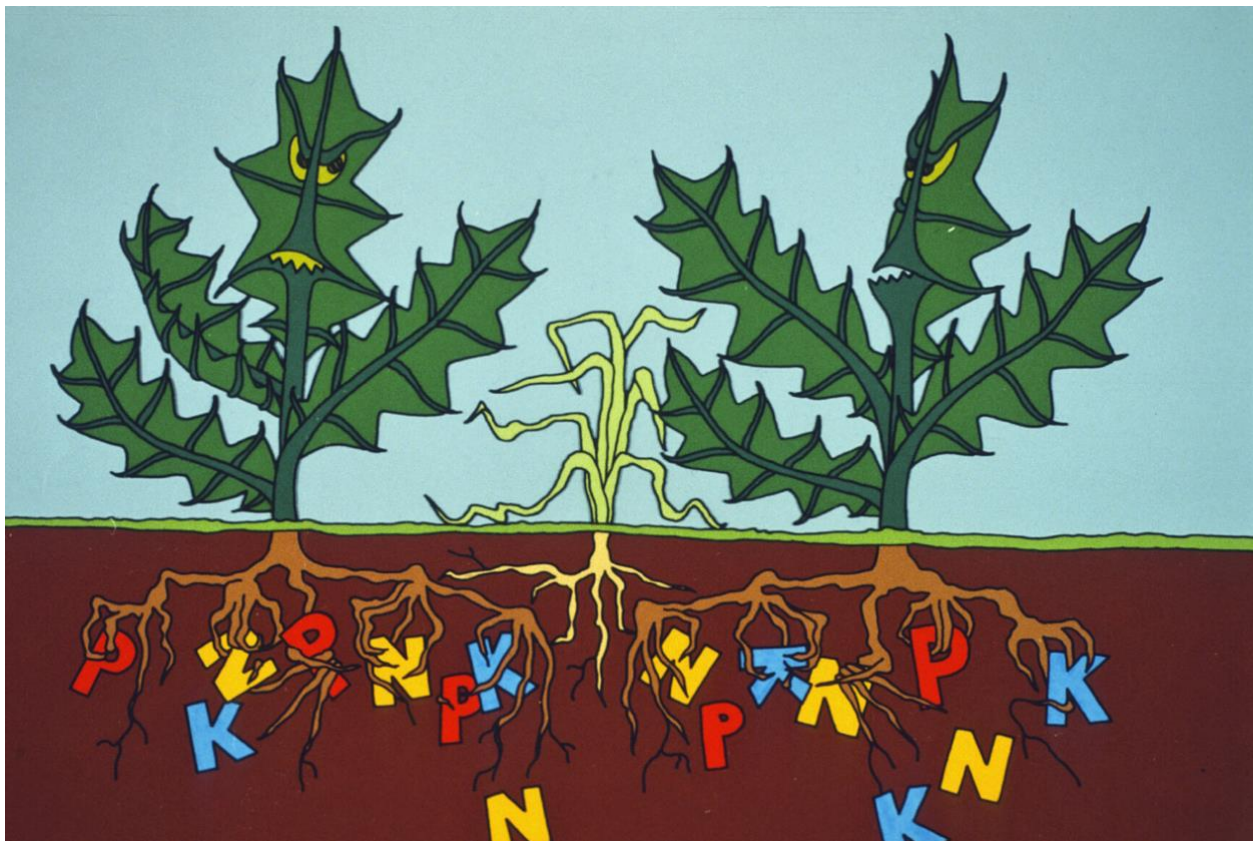
- Weeds often produce seeds of the same size and shape as crop seeds making physical separation difficult and giving them the ability to be spread by man.
- Some annual weeds are capable of producing more than one generation per year.
- Each generation is capable of producing large numbers of seeds per plant.
- Many weeds have specially adapted dispersal mechanisms for their seeds which are varied and effective.
- Roots of many weeds are able to penetrate soil to great depths and therefore exploit large soil masses. While most rhizomes exist in the upper foot of soil, Canada thistle rhizomes routinely penetrate 3 to 6 feet, and field bindweed has been observed at 10 feet and below and can generate new plants from deep in the soil. Roots and rhizomes are also capable of adding many feet of growth per year.
- Roots and rhizomes of perennials have large food reserves enabling them to withstand the rigors of the environment and intensive cultivation.
- Many weeds have adaptations that repel grazing such as spines, taste, or odor.
- Weeds have great competitive ability for nutrients, light, and water.
- Weeds are ubiquitous. They seem to exist everywhere, and the practice of agriculture inevitably leads to a contest between the grower and the weeds.
- Weeds often resist all types of control including resistance to herbicides.

If you found a plant with several of these characteristics, it still might not be a weed because it wouldn't be in the right place or its particular combination of characteristics might make it, in fact, desirable as a ground cover or simply as a pretty wild plant. Definitions usually include some mention of trouble with crops, harm to people, or other detrimental aspects. Most people do not consider plants to be bad. They are bad and assigned the descriptive and pejorative term "weed" because of something they do to us or to our environment. If they were just there, we probably would not be concerned about them because their effect would be negligible or non-existent. The nature of the many harmful effects of weeds is the subject of this bulletin. That harmful effects exist is not in question. It is important that those who wish to understand weeds have an understanding of the general nature of these effects. We have designed a character called "wicked weed" to assist in identifying the harmful aspects of weeds and show the reader in cartoon form, rather than with endless words, what it is that weeds do that makes them undesirable.

From the agricultural perspective we are concerned about weeds because they compete with crop plants for nutrients, light, and water. If they did not do so, we could probably tolerate their presence in the crop environment. Competition is a purely physical process. With few exceptions, such as the crowding of tuberous plants, when grown too closely, an actual struggle between competing plants never occurs. Competition arises from the reaction of the one plant upon the physical factors about it and the effect of the modified factors upon competitors. Plants do not compete so long as the water content, the nutrient material, and the light are in excess of the needs of both. When the supply of any one necessary factor falls below the combined demands of the plants, competition begins.

## COMPETITION FOR NUTRIENTS

In natural environments plants rarely grow alone because nature seems to favor communal life for plants. Nature unfortunately does not recognize the human categories of domesticated plant, or the inalienable rights of man. In natural environments, living organisms are engaged in relentless competition with peers and other organisms. Desirable plants do not escape the struggle for existence. Farmers know that it is impossible to sow a crop without the certainty that weeds will appear. Weeds require the same nutrients that crop plants require. Moreover, weeds are very effective competitors for these nutrients often obtaining them at the expense of the desired plant. It takes roughly equivalent amounts of nitrogen and phosphorous to grow a pound of dry matter whether it be in a wheat or barley crop or in one of the several broadleaf weeds which can infest those crops. Corn grown with redroot pigweed was found to have up to 50% lower nutrient content than weed-free corn (4). Weeds usually absorb fertilizer faster and in relatively larger amounts than crops and therefore succeed and compete well.



## COMPETITION FOR LIGHT

Carbon assimilation, or photosynthesis, by green plants produces carbon compounds from carbon dioxide and water with oxygen formed as a by-product. In this process, cells absorb and transform light energy into chemical energy which is bound in products and intermediates and becomes available for the plant's functional needs or for animals and man. Photosynthesis occurs primarily in plant leaves and a heavily shaded plant suffers reduced photosynthesis leading to poor growth, a smaller root system, and a reduced capacity for water or mineral uptake.

Competition for light may occur whenever one leaf blocks off light from another leaf, either on the same, or a different plant. A solitary plant, free from any competition, may have its lower leaves so shaded that they die. While competition for water or nutrients may occur within a plant, rarely is it of this intensity.



## COMPETITION FOR WATER

Water is an essential factor in the growth and function of plants. Its deficiency restricts the growth of many crops and its presence or absence commonly determines geographic limits of crop production. Water is often the primary factor limiting crop production in many of the world's arid areas. It may be assumed that those who have known, from the advent of farming, that crops yield more under favorable moisture conditions. Knowingly or unknowingly, farmers have adapted seeding rates to moisture conditions. In other words, optimum density will be lower in a dry environment than in a wet one.



## WEEDS HARBOR INSECTS

Weeds harbor insects which can directly attack crops or serve as vectors of crop diseases thereby increasing the opportunity for these plant pests to persist in the environment and reinfest crops in succeeding years. For example, the Colorado potato beetle is harbored in black nightshade and buffalobur. The sugarbeet leafhopper is a vector of curly top disease of sugarbeets and is harbored by Russian thistle. Many nematodes which infest crop plants are also harbored by weeds.



In addition to direct attack on crops, insects are a primary means of dispersal for many pathogen organisms. The causal agent of aster yellows is carried by a leafhopper from lettuce to broadleaf plantain during harvest and then back to lettuce after it emerges. Several aphids carry potato virus Y from weeds. Leaf roll disease of potatoes is caused by leaf roll virus which is transmitted by an aphid that overwinters in the egg stage, on peaches, plums, and chokecherries. Thus, desirable ornamentals become undesirable weeds because they shelter an insect vector of a viral disease.

## WEEDS AND DISEASE

The role of weeds as hosts for other pest problems is not confined to weedy species that exist on the periphery of crop fields and serve as hosts when the crop is not present or solely as sources of reinfestation. The problem is evident during the cropping season from weeds in the crop. Volunteer wheat is a primary host of western wheat streak mosaic virus. The effect of its presence can be seen in disease transmission up to one-quarter mile from the volunteer stand. Another illustration is the spread of potato blackleg disease and potato soft rot by *Erwinia* bacteria which are harbored by several weeds.



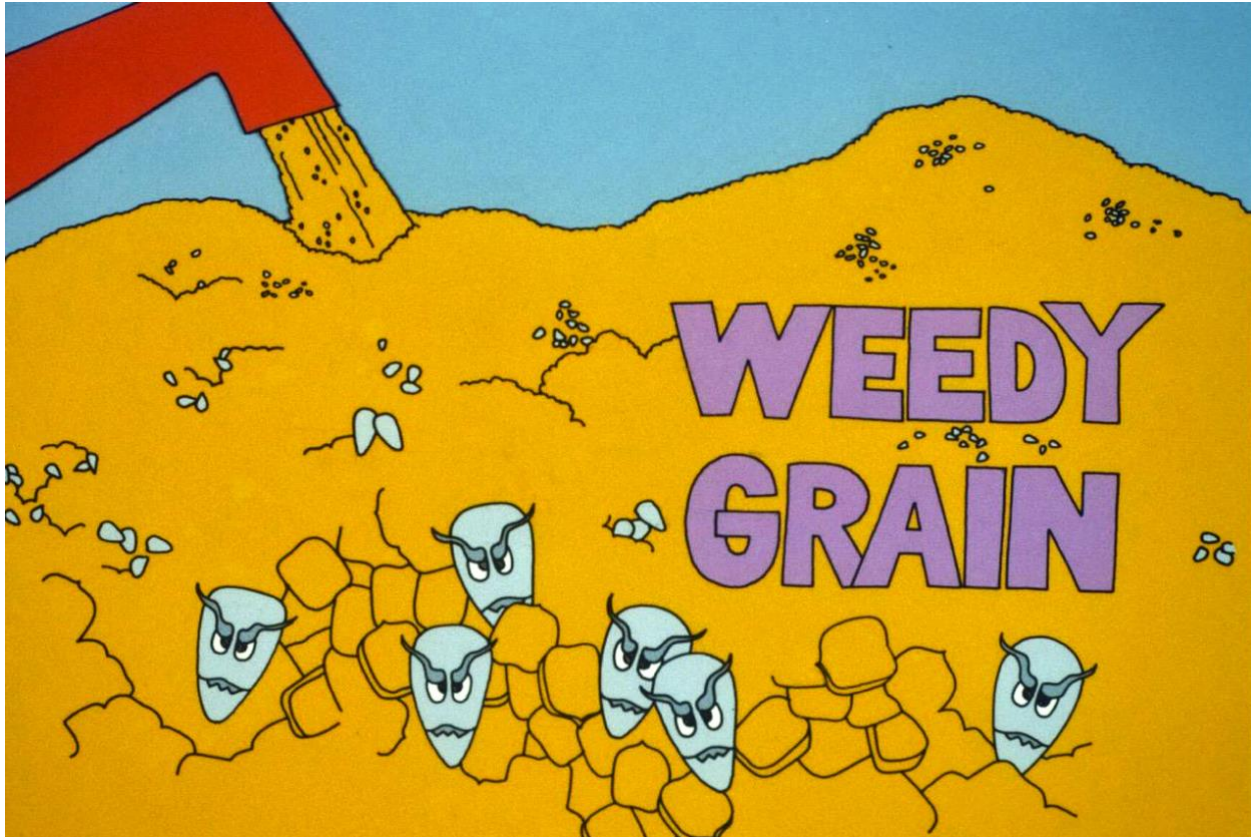


## WEEDY HAY

Weedy hay is a particular problem because weeds usually mature first or are unpalatable and reduce the total nutritional value of hay. In addition, of course, weeds reduce the yield of the more desirable plants grown for hay.



Most growers are familiar with the effect of weed seeds in grain crops and the resultant decrease in quality and subsequent losses from dockage and cleaning costs. The presence of weed seed in grain crops also results in perpetuation of the problem when the grain seed is replanted. A particularly bad problem is the presence of wild onion or wild garlic in wheat. Seeds and aerial bulblets of these weeds are similar in size to wheat grains and are difficult to physically separate from wheat. They impart a definite onion flavor to flour made from the grain and an onion odor to milk after cows have grazed on the plants in pastures or eaten feed containing the weed seeds. Another weed which affects the quality of a product near to the hearts of many Americans is the wild oat which infests many acres of small grain crops, most notably spring wheat and barley. Wild oats infests barley which is used for feed and for malting purposes and in the latter case, any brewer will verify that wild oats make lousy beer. Weeds also reduce the quality of crops grown specifically for seed. The purchases of hybrid or certified seed, expects to receive a high quality product that will give high yields and not be contaminated with weed seeds when planted.



Weed seeds in grains, such as wild oats in wheat or barley or black nightshade in beans, lead to increased costs due to the necessity of cleaning the weed seeds from the grain. Failure to clean can lead to a loss in quality, dockage losses to the seller, or even loss of the grain if it should heat in storage because of weed seeds and associated plant material. If a harvested crop has large amount of weed seeds associated with it, it is usually safe to assume that crop yield was reduced in the field from weed competition, some additional quality was lost because weeds were at harvest, and harvest was more difficult.



## PASTURE WEEDS

The picture really needs no explanation. Cows, like people, prefer good uncontaminated food. A diet of weeds or a diet interspersed with an occasional bite of weeds is not what the cow or any other grazing animal wants. The animals will not produce as much meat or milk when forced to graze on weedy pasture.



## MECHANICAL DAMAGE

Weeds like puncture vine and sandbur are perhaps best known for the undesirable characteristics shown in this picture. The sharp spines on their seed pods are strong enough to penetrate tires and shoe leather. Anyone who has encountered some of these in their bare feet will quickly recognize the pain and damage that they could do to the tender tissues of an animal's mouth. These weed seed pods and others, like cocklebur and burdock, can become entangled in sheep's wool detracting from the cleanliness and saleability of that product.



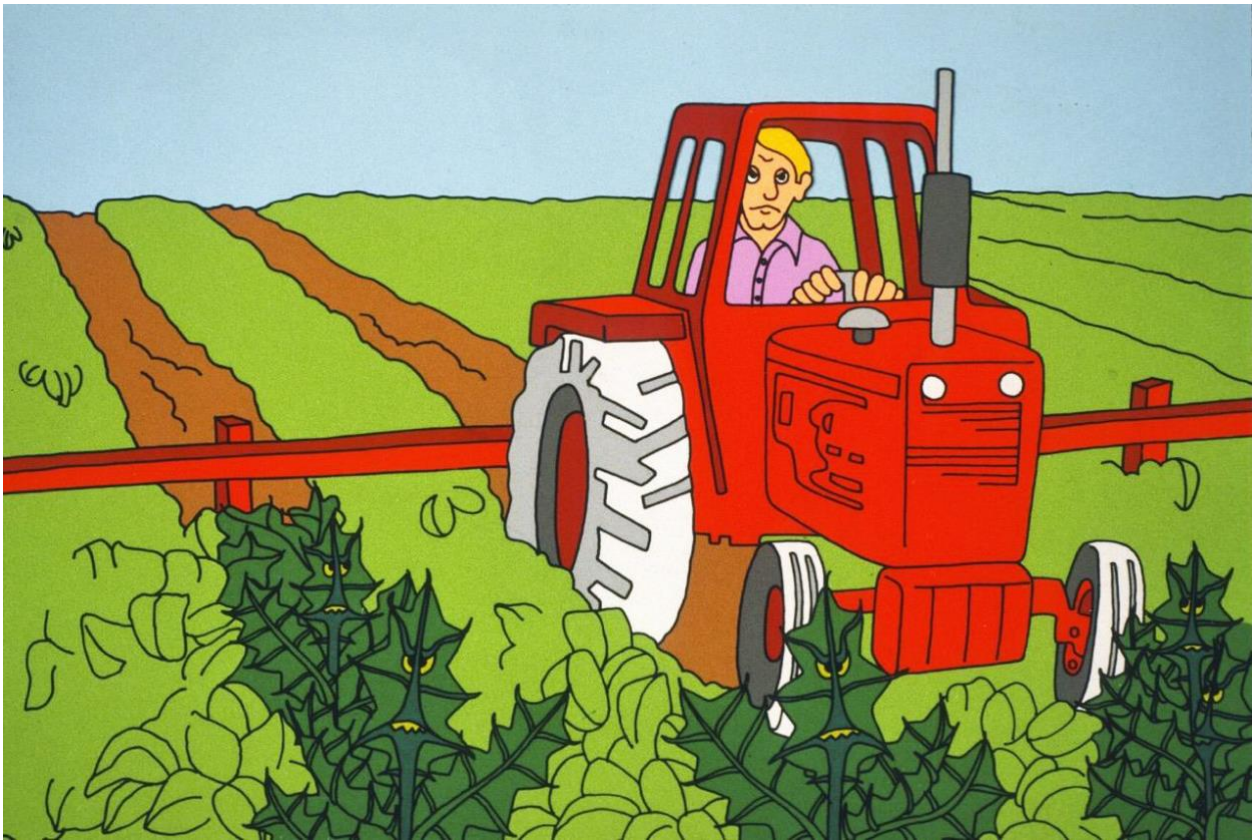
## POISONING

In addition to mechanical damage weeds also can poison animals leading to death. Many acres of western rangeland are infested with larkspur which causes cattle deaths each spring and summer. Cattle seem to like and even relish larkspur. In early growth stages, as little larkspur as 0.5% of an animal's weight ingested within an hour can lead to toxicity and 0.7% may be fatal. Loco weeds and crazyweeds are the most important poisonous range plants in the United States. All ruminants are apparently susceptible to loco poisoning but only when great amounts are consumed over periods of weeks or even months. Horses can also be poisoned by weedy plants. Some weeds cause photosensitization or excessive sensitivity to light in sheep and cattle.



## INCREASED PRODUCTION COSTS

We are interested in weeds because they do things to us or our products, and also (and perhaps most importantly) because they increase production costs. Any weed control operation from hand hoeing to the most sophisticated synthetic organic herbicides and application technology costs money. While one must grant that these costs are often necessary to prevent serious crop losses or prevent crop failure, if the weeds weren't there in the first place, there would be no cost. Unfortunately, the absence of weed competition is rare and the costs of weeds and the costs of their control must be included in calculating the profit or loss from most farming operations and the resultant cost of food. It has been estimated by several weed scientists that the cost of tillage of cultivated land may equal as much as 15% of the value of the crop and much of the tillage is necessitated by the need to control weeds.



## WEEDS AND IRRIGATION

Weeds interfere with necessary water management in areas of irrigated agriculture. Passage of water through main, lateral, and field ditches is impaired by weeds growing in and along these ditches. Weeds consume water intended for crops and result in water loss by seepage, evapotranspiration, and reduced speed of drainage from cropland.



The presence of weeds in irrigation ditches in fields not only impairs movement of water and reduces the amount of water available to the crop but the water itself serves as a medium for spreading the weed.

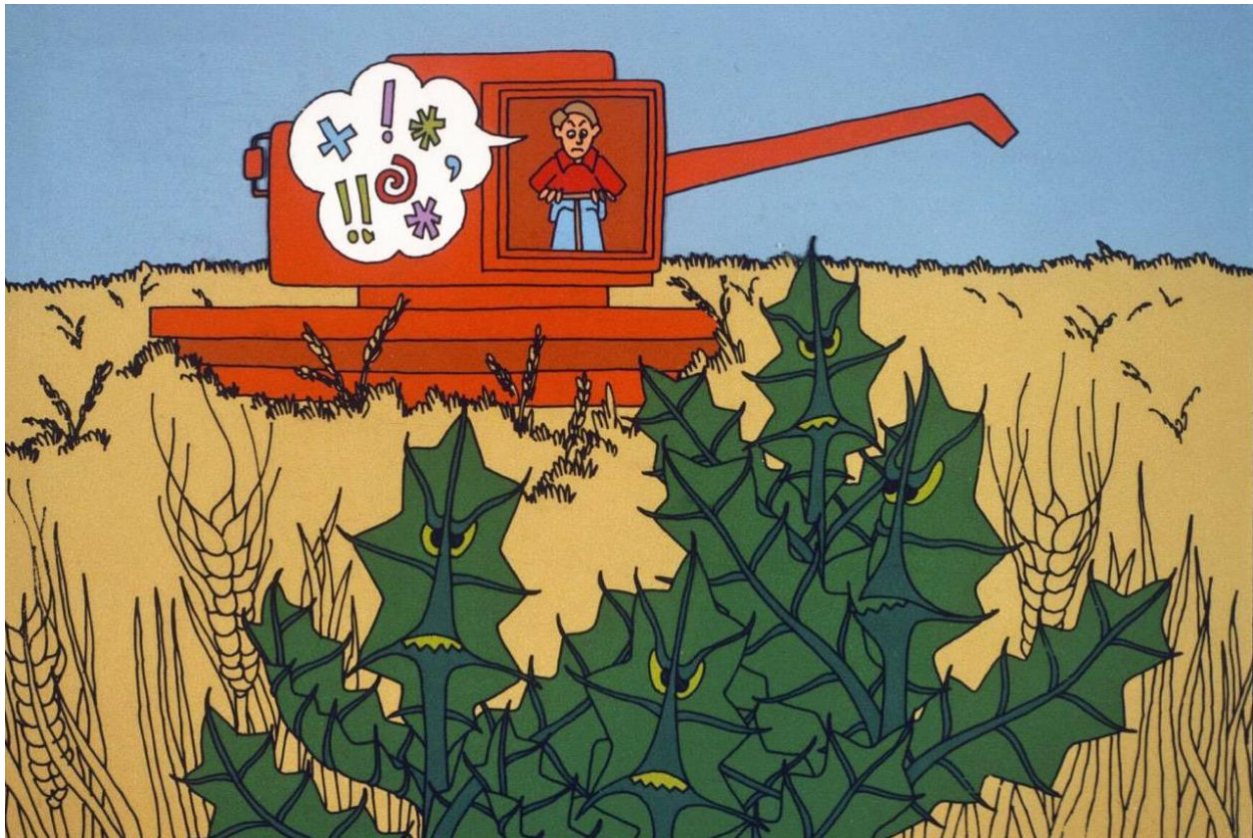




Growers often do not realize how much water is required to grow a plant. It takes about 36 gallons of water to produce one pound of dry matter in a redroot pigweed plant, 90 gallons to produce one pound of sunflower, and 81 gallons to produce a pound of barnyard grass. This compares to 60 gallons to produce a pound of dry matter in wheat and 42 in corn.

## WEEDS AND MACHINERY

Anyone who has tried to combine or harvest a crop that is full of weeds can appreciate the extra wear and tear they cause to machinery and the machine operator. The extra bulk of plant material that passes through the system causes machinery to break down more frequently and wear out sooner. Such costs will usually not be attributed directly to weeds because weeds are not recognized as contributors to the costs of machinery breakdown, repair, or replacement.



Wear and tear on machinery can only be appreciated by one who has had to climb down and clean out the machine so harvest could proceed. Weeds are indeed ubiquitous and they can plug things up and attack from every conceivable angle.



## WEEDS AND PEOPLE

Those not directly associated with agriculture may most often think of weeds in the context of plants that impair human health. Many people would choose poison ivy as their most unwanted plant. The swelling and itching after contact are always bothersome and can be very serious leading to more than mild discomfort. The rash can be caused by contact with any portion of the live plant or with smoke from fire in which the plant is burned. Most people are quick to put poison ivy or poison oak in the category of wicked weeds after they have disturbed their picnic or camping trip. These plants are not the only common plants which are poisonous. All parts of water hemlock, buttercups, poison hemlock, and jimson weed can cause symptoms of poisoning and can even be fatal if consumed.



## “HAY” (WEED) FEVER

One who is not experienced with the miseries of runny noses, sneezing, and watery eyes cannot fully appreciate the animosity the hayfever sufferer may develop toward wicked weeds.

Ragweed is a common cause of hayfever in many parts of the United States. Sagebrush is a leading cause in the western United States.



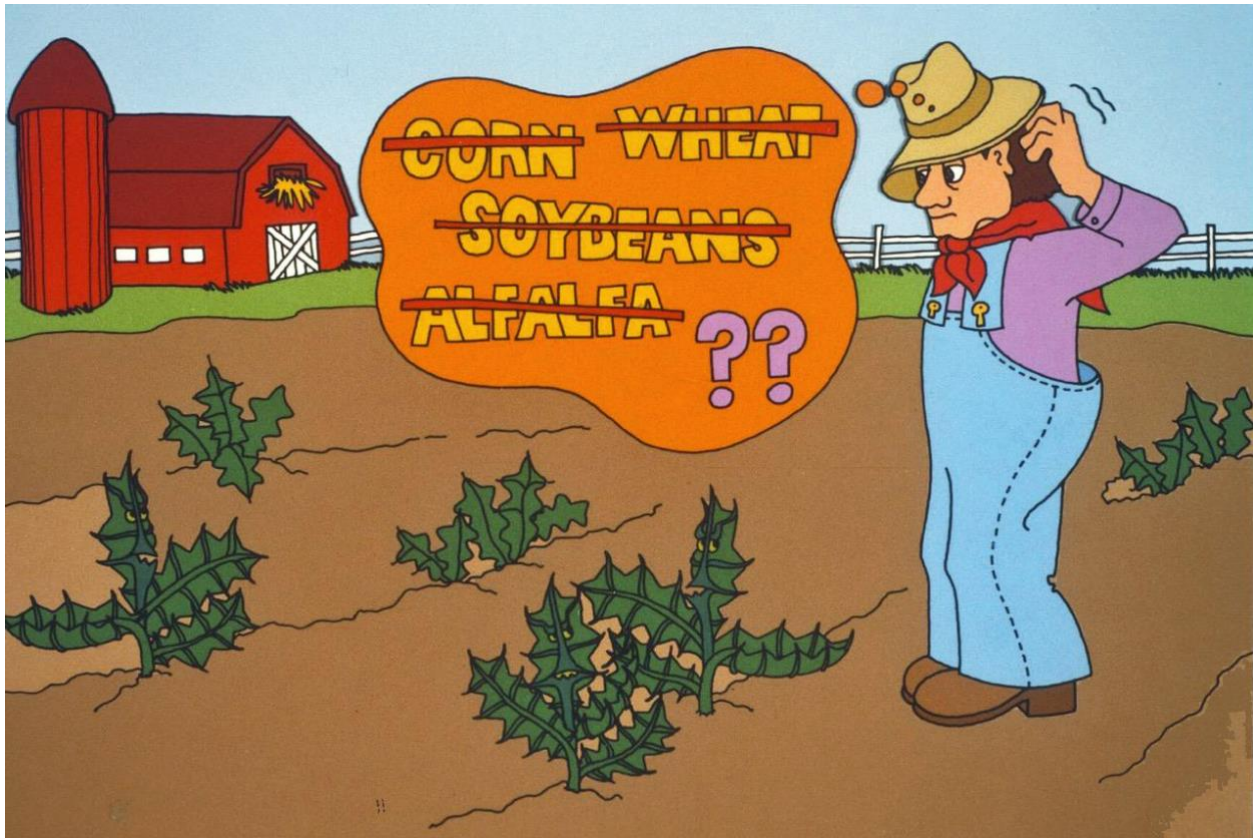
## RECREATION

Interference with the flow of water for irrigation of agricultural crops and the use of water ways by the weed as a way to move in space are important. The role of weeds as “spoilers” of recreation areas is of equal importance to some people. Weeds can affect our ability to fish, swim, boat, or float in many bodies of water intended primarily for recreation. While we often think of weeds only in terms of their role in agriculture, we should not forget their effect on other portions of our environment.



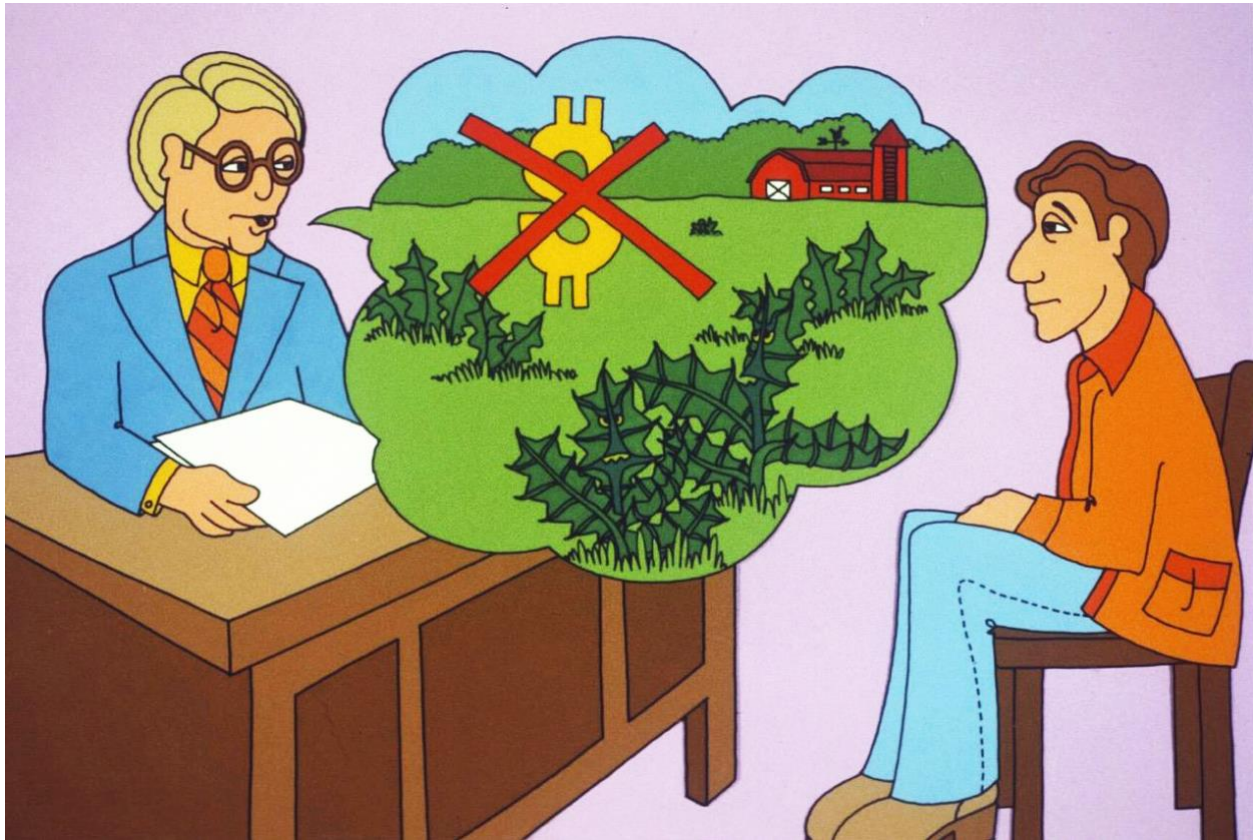
## CROP ROTATION

The presence of some weeds in farmers' fields can reduce or even eliminate the farmer's ability to grow some crops. Parasitic weeds, like witchweed, and dodder eliminate some crops from the rotation because their yield will be reduced severely by the presence of the parasitic weed. Large infestations of field bindweed or Canada thistle also may affect the farmer's ability to grow some crops.



## LAND VALUE

In a similar way, parasitic weeds and aggressive perennial weeds can reduce the value of farmland. What prospective buyer will knowingly buy land and pay the going market rate when the land produces excellent weeds and therefore poor crops? Until the weeds are controlled, the value of the land will be decreased in the eyes of a potential buyer and also in the eyes of a banker who would either not make a loan or loan less on the land because of the presence of weeds.





## AESTHETIC VALUE

Finally, weeds are not pretty. They make property look bad and less desirable. They are aesthetically unpleasing. A weedy front lawn and garden are not as attractive as one that is well kept. Weedy public areas, whether they be the median on an interstate, a bus stop, or a public park are not as attractive as those where the weeds have been controlled. Thus, we return to human attitudes which determine what plants are weeds, and when and where their weediness is expressed.



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