



DON'T SHOOT THE MESSENGER

The Truth About Weeds - Friend OR Foe?

- If we look at the origin of the word "weed", we find the Anglo-Saxon word, "weod" which means "little herb". Herbs are good plants used for healing and beneficial uses. Weeds are also intended for healing...healing of the soil. "Weeds and Why They Grow"
- Weeds are often called "Pioneer Plants", as their job in nature is to colonize poor bare soil, to provide a quick cover to prevent soil erosion.
- Most weeds are annual species that produce lots of seeds that will live a long time in the soil (dormant) waiting for the right conditions to sprout.
- A study in England found counts of seeds between 900 to 3,000 per square foot on cropland!
- Weeds are "opportunistic", able to sprout and grow quickly, even in bad weather conditions; hence they often get a jump on crops or flowers.
- Weeds help improve the soil:
 - roots grow deep loosening hard compacted soil
 - bring up useful minerals from deep soil layers
 - they scavenge and conserve nitrogen that might otherwise wash away
 - when roots and tops die, they add valuable organic matter to the soil
 - weeds make good cover crops (in 6 weeks can produce 1 ton of dry organic matter)
 - weeds prevent erosion

- Some weeds are extremely nutritious (more nutritious than common vegetables) for both livestock and humans.
- Weeds serve as food for many forms of wildlife from butterflies to deer.
- Many weeds provide essential pollen and nectar that beneficial insects require to complete their diet.
- Many weeds are useful as herbs or sources of medicine, dyes or sources of tasty wild foods.
- The most troublesome weeds are imported from different countries and have run wild since the natural predators that kept them in check are not available.
- Most importantly weeds are teachers. Weeds tell us about the soil conditions (indicators). All species of plants have certain environmental conditions that must be met for them to grow (soil type, moisture, nutrients, climate, etc.), weeds are no different.
- Effects of synthetic fertilizer and lime, tillage, and method of recycling of crop residues and other organic matter tend to create soil conditions favorable to weeds! Other synthetic chemicals (pesticides, herbicides, fungicides, etc.) make the condition worse, resulting in more weeds.
- Many weeds only grow on soils with something wrong with them. These weeds are good indicators of soil conditions. For example:
 - Bindweeds - tight crusted soil, low in humus.
 - Foxtail barley - wet soil, possibly high in salts and low in calcium, compacted, possibly acid with unavailable potassium and trace elements.

- Burdock - acid high iron, low calcium, often with high gypsum and/or dolomitic lime.
- Chickweed - high organic matter at surface, low mineral content.
- Chicory - clay or heavy soil.
- Cocklebur - fairly good soil with high available potassium, and possible low zinc.
- Crabgrass - tight crusted soil, low calcium, poor decay of organic matter.
- Dandelion - low calcium, poor decay of organic matter.
- Dock - wet acid soils, low calcium.
- Fall panicum - anaerobic (poorly aerated), wet, compacted soil.
- Foxtail, giant foxtail - tight wet anaerobic soil, possibly high magnesium and/or high nitrogen use.
- Johnson grass - depleted soil (sick), low organic matter, low calcium, possibly high iron.
- Lambsquarters - rich, fertile soil, good decay of organic matter, high humus.
- Common milkweed - good soil, often grows in fence rows and fallow areas.
- Mustards (wild mustard, yellow rocket, wild radish, peppergrass, etc.) -crusted hardpan, poor soil structure, poor drainage, high crop residues on surface.
- Pigweed - usually good soil, possibly high in potassium and low in calcium.
- Quackgrass - wet, anaerobic, poor decay of organic matter, high aluminum (toxic).
- Ragweed - dry, poorly aerated soil, low available potassium.
- Red sorrel - acid soil, low calcium, poor decomposition of organic matter.
- Smartweed - wet, poorly drained soils.
- Thistles - fairly good soil, low manganese, possible high iron.
- Velvetleaf - anaerobic, poor decay of organic matter, low available phosphorus, possible high potassium and magnesium.

- Weeds often grow quickly due to excessive short term poor weather conditions. Some weeds are better able to grow in cold, hot, wet or drought conditions. They flourish where the desired crop or plant fails.
- Bad weather usually has bad effects on the soil such as crusting or water logging, conditions which favor weeds (i.e. poor or wrong soil conditions favor weeds over desired plants and are the basic cause of weedy fields or flowerbeds).
- "Don't shoot the messenger". Chemically intensive methods of gardening views weeds as a pure pest and tries to wipe out the weeds with herbicides which makes the problem worse (soil conditions more favorable to weed growth). Studies have shown that frequent use of herbicides increases the number of weeds found. Also weeds become resistant to the toxic herbicides.

Remember - weeds are only indicators or symptoms of soil problems....IF the problem is not corrected, weeds will return in greater numbers as nature tries to correct the problem.

- Many "modern" horticultural and agricultural practices such as high use of synthetic fertilizers and frequent tilling actually favor weeds and discourage crops.
- Over 200 weed species are now resistant to strong toxic herbicides. Using dangerous synthetic chemicals to control weeds is not working.
- Weeds such as prostrate spurge and chickweed, attract tiny predatory wasps that control caterpillars. Knotweed, wild carrot, and toothpick ammi also attract several species of very tiny predatory wasps. These predators help keep bad insects under control naturally.
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- Studies have shown that goldenrod, redroot, pigweed, ragweed, and mustard attract several species of beneficial insects upon flowering.



- Studies have shown that some pest prefers to dine on weeds rather than commercial food crops IF given a choice. For example the USDA has found that destructive leafminers prefer ragweed and redroot pigweed to bell peppers at the research lab in Weslaco, Texas.
- Studies have shown than the diamondback moth will lay its eggs on wild mustard (a weed) instead of cabbage or other brassica plants if given a choice.
- Many weeds produce special dissolving substances from their root tips that allow them to literally "eat" their way through tough compacted soils allowing for deep root growth. This feeding from deep subsoil layers returns minerals to the surface and loosens compacted soil.
- Many weed species produce deep roots that recover minerals in sub soil layers. For example leafy spurge (*euphorbia esula*) can reach 4-8' deep and Canadian thistle (*Cirsium arvense*) can reach 20 feet deep!
- Prospectors use weeds in the search for deposits of minerals like selenium or copper. Early settlers used weeds to indicate ground water quantity and quality before digging a well.
- Seldom is one weed species the result of only one soil or environmental condition. Since there are many variables involved it is better to use groups of weeds as indicators of soil problems. Note: The word "problem" is emphasized since weeds are not the problem; it is the poor condition of the soil that is the problem.
- Some weeds that are easily cultivated under can supply 20-30 pounds of nitrogen per acre.

WEED MANAGEMENT

- In weed management we do not mean eradication. Even in good soil we will not have 100% control. Weeds seeds can lie dormant in the soil up to 50 years waiting for the right conditions to sprout. New weed seeds can blow in or arrive with purchased plant seed.
- The best time for weed control is when they are first sprouting; this is when they are most vulnerable.
- Large plantings of one species tend to encourage weed germination (monocultures of one species tend to deplete the soil of certain minerals creating a soil imbalance). In farming crop rotation helps reduce weeds.
- Large amounts of synthetic fertilizers create soil mineral imbalances which in turn help weeds to germinate and increase the weed problem.
- Application of synthetic chemicals such as fungicides kills microorganisms in the soil creating a nutritional imbalance that encourages weeds to grow. Many fungal species living in healthy soil eat weed seeds.
- Some plants have the ability to naturally suppress weed growth, a property that is called allelopathic. These plants include rye, barley, oats, wheat, corn, tall fescue, sorghum Sudan grass, soybeans, alfalfa, red clover, peas, field beans, sunflowers and buckwheat to name a few.
- Improve soil conditions. Since the basic cause of most weed problems is the poor or wrong soil conditions, obviously correcting what is wrong with the soil will greatly reduce weed pressure. Adding organic matter to the soil is the best and fastest way to improve soil conditions and compost is the best form of organic matter to use.

- Maintaining a soil with high fertility and a balanced soil with plenty of calcium will eliminate a lot of troublesome weeds. They just do not want to grow in this type soil. Desired crops and plants do want to grow in a healthy balanced soil hence outgrow, out compete and shade the few weeds that do germinate.
- Encourage a large earthworm population.
 - the tunneling activity of earthworms prevents many of the conditions that weed seeds need to germinate.
 - earthworms often eat weed seeds and either destroy them or reduce their ability to germinate.
 - earthworms stimulate the growth of microorganisms in the soil and some weed seeds are destroyed by microorganisms.
 - some microorganisms (bacteria and fungus) live in a symbiotic relationship with plant roots and help plants grow better hence shading out weeds and out competing them for water and nutrients.
- Keep soil pH near the ideal range for most plants and crops of 6.0 to 6.8 is helpful in fighting weeds. This range maximizes the nutrients available to plants and crops helping them stay healthy and out grow and compete weeds (if a weed cannot get sunlight due to shading, it cannot make food, it will not grow well and will eventually die). This pH range also favors the growth of earthworms and microorganisms. Many weeds will grow well outside of this range whether alkaline or acidic.
- Keep soil covered either by a cover crop or by mulch. Many species of weed seeds need light to germinate hence covering prevents light from reaching the seeds. A cover crop or mulch also prevents weeds from reaching maturity and producing more seeds.

- Mechanical control can also be a tool in controlling weeds if used early in the season before weeds become established. These controls include hoeing, raking, burning, disking, mowing, etc.
- Certain herbivores like to eat weeds and can be an effective tool under the right conditions. Geese and chickens have been used for years for weed control in certain crops. Goats, sheep, and insects can also be used for certain crops and plants.
- A recent study has found that a naturally occurring rhizo-bacteria can reduce populations of Jointed Goatgrass (*Aegilops cylindrica*), a \$72 million problem per year for farmers, by 64% in winter wheat. USDA, AW91-5: Soil Bacteria to Control Jointed Goatgrass in Integrated Cropping Systems.
- Research is showing that the types and amounts of pesticides applied to vegetation (trees, shrubs, plants, etc.) on the edges of a field effect the type and concentration of weeds in a field. Pesticide Research Center, University of Michigan.
- A recent study has found that chisel plowing or ridge tillage reduces the amount of weed seeds germinating in corn. The study also found that if anhydrous fertilizer is replaced with manures there are lower survival rates of weeds. David A. Andow, University of Minnesota, LNC88-1: Integration of Conservation Tillage, Animal Manures, and Cultural Pest Control in Corn.
- Scientists have found that using Geese are a way to help control weeds and diversify income for farmers. USDA, AW91-1: Use of Domestic Geese to Control Weeds In Agriculture and Forestry Applications.
- Keeping the calcium and phosphate levels in equilibrium will roll back more weeds than all the chemicals in the Dow and Monsanto

armamentarium. "pH and Cation Exchange Capacity, A Conundrum", Acres, USA, September 1994.

- One researcher (Dr. Phillip Callahan) believes that the spines on weed species are "antenna" that are tuned to receive (absorb) specific frequencies (energy) from space. This energy is needed to help restore the vitality of the soil.
- Broadleaf weeds like a soil environment in which the available potash exceeds the available phosphate. Note: Most soil analysis give total nutrients in the soil, not the chemical form of the nutrient or it's availability to plants.
- Grassy weeds tend to like a tight soil. One way this can occur is if the soil contains an excess of magnesium to calcium. Calcium tends to separate soil particles and magnesium makes them stick together. In some soils the magnesium is held as trimagnesium ortho phosphate $Mg_3(PO_4)_2 \cdot 22H_2O$ which allows the soils to dry up and crack and not release the water to plants in dry conditions.
- Most microbes in the soil need oxygen to live (aerobic conditions) and break down plant residues and complete the decay cycle. Synthetic chemicals (fertilizers, fungicides, herbicides, etc.) kill off many microbe species directly and others by destroying soil structure creating soil compaction and anaerobic (without oxygen) conditions. Plant residues at this stage ferment (instead of aerobic decay) producing toxins like alcohol, formaldehyde, and methane gas. These chemicals sterilize the soil even further creating conditions where weeds like velvetleaf thrive. Further soil degeneration produces ethane gas which helps jimsonweed to prosper. Nature is just trying to correct the problems in the soil.
- Certain synthetic fertilizers create conditions that help preserve weed seeds. They will lay there waiting for the opportunity to germinate and grow.



- Decaying vegetation can produce chemicals that prevent the germination of weed seeds (allelopathy).
- Seeds, whether crop or weed produce chemicals (root exudates or auxins) that help prevent other seeds from germinating. In some soils these auxins last only 1 or 2 days. In biologically active soils these effects can last 6-8 weeks (free weed control).! Tilling the soil increases weed seed germination rates. Some weed seeds require only one-millionth of a second of light to start the germination process. Tilling the soil exposes many additional weed seeds to light.
- The two most common soil problems that encourage weeds are low humus and low available calcium. Note: Tillage also destroys soil humus faster.
- Many parasites will attack weeds if given the chance. These include insects, fungus, bacteria, etc. For example:
 - field bindweed is controlled by a Mediterranean mite that will attack it and nothing else.
 - hemp sesbania is controlled by a fungus found in pasta dough.
 - star thistle is controlled by a Greek weevil.
 - earthworms eat and digest many weed seeds.
- Research at Iowa State University has indicated that corn gluten (available at feed stores) when applied to lawn and garden areas (10 lbs x 1,000 sq. ft.) serves as a pre-emergent when applied before spring weed seed germination. It is more effective than most herbicides and contains 9-12% nitrogen that helps fertilize the good plants.

- It is reported that grass burs can be controlled with humates since grass bur seeds will not germinate if humic acid is present and active in the soil. Apply humate at 10-15 lbs per 1000 sq. ft. or 3,000 lbs/acre. Howard Garrett's Basic Organic Program Guide
- New research has found that mice (95%) and ants will eat (70%) of the weed seeds in agricultural fields depending on the crops grown hence they are the most effective natural weed killers. University of Guelph, Ontario, Canada.
- A Danish study has shown that herbicide resistant rape in two generations has passed on its resistance to its weedy brassica cousin. About 42% of the second generation brassica weed seedlings had inherited the resistant gene. New York Times, 7 March 1996.
- New studies have shown that nitrate from synthetic fertilizers stimulate the germination of weed seeds. In tests of 85 species of weeds it was found that nitrate could replace light requirements for germination, and increase germination under adverse temperatures. Other studies have shown that nitrate increases weed germination rates 11 times higher (3% to 34%). Another field study found that equivalent nitrogen supplied from crimson clover (green manures cover crop) had reduced emergence of some weeds by 27% while the use of ammonium nitrate increased rates by 75%. Acres USA February 1997, Harold Willis, Ph.D.
- Research at the University of Florida has shown that compost especially immature compost, applied to crop row middles reduces weed growth due to its high concentration of acetic, propionic and butyric acids. Avant Gardener, April 1998.
- Studies have found that many plants produce allelochemicals that suppress the growth of other plants, from the time the seeds germinate till quite some time after the plant dies. Small amounts of fresh residues of vegetables, grains, grasses and weeds have been found to reduce the growth of many plants (including desirable ones). This is why



unfinished or "green" compost should not be used very close to young crops or ornamentals. Avant Gardener, April 1998.

- Tests by the Henry Doubleday Research Association in England have found that sunflowers and cucumbers produce root secretions which suppress many common weeds by 50% or more. Avant Gardener, April 1998.
- Tests by the Henry Doubleday Research Association in England have found that a Mexican marigold, *Tagetes minuta*, is remarkably effective against some very tough weeds such as quackgrass, wild oats, field bindweed, ground ivy and plantain. Avant Gardener, April 1998.

Useful References:

WEEDS, Control Without Poisons, Charles Walters Jr., ACRES U.S.A., 1991

Weeds, Control Beyond Herbicides, Harold Willis, 1993

Weeds and Why They Grow, Jay L. McCaman, 1994

Weeds and What They Tell, Ehrenfried E. Pfeiffer