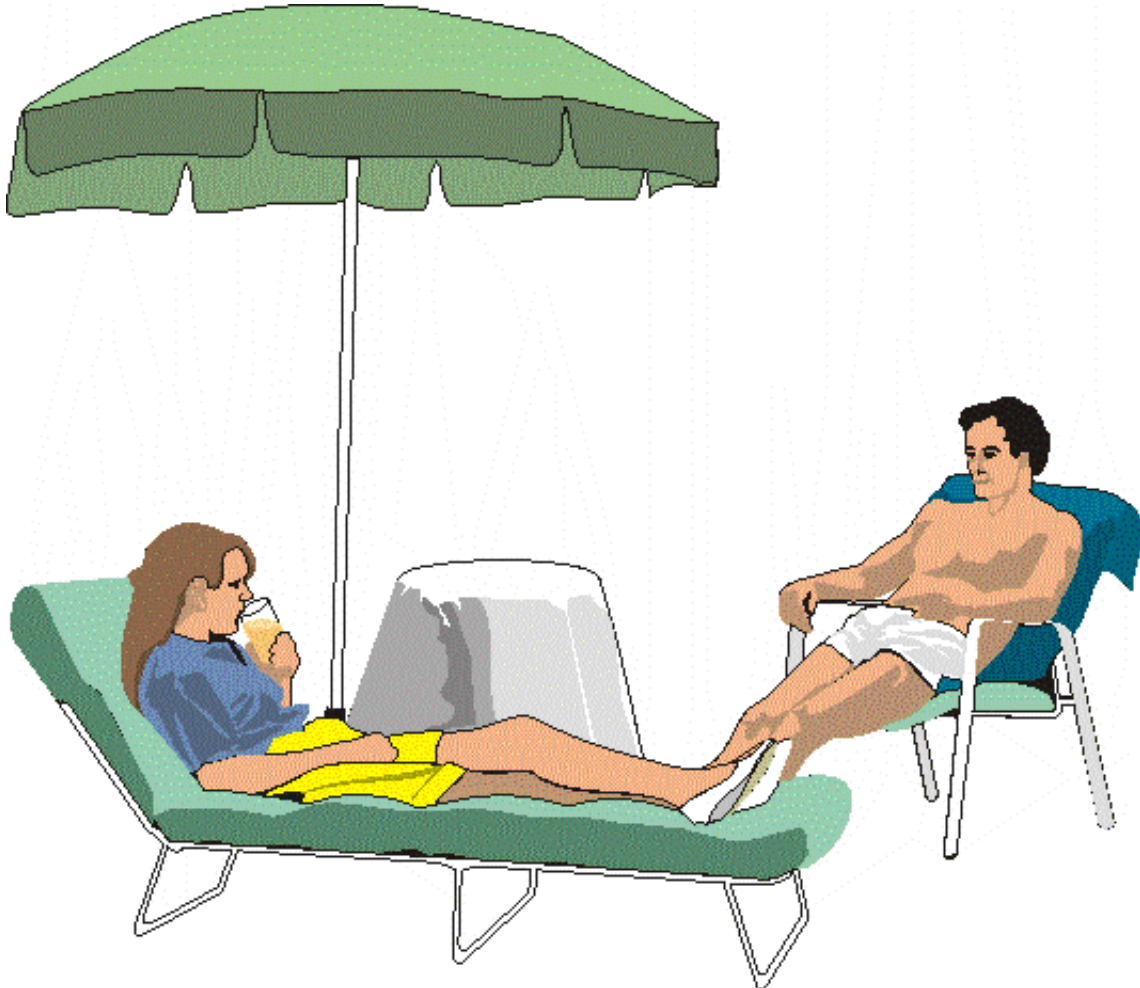


CHAPTER 37

THE BEST CONTROL FOR CAREFREE YARD AND LAWN MAINTENANCE



Of the 800,000 insects that live in a typical Florida lawn, less than 1% are pests of mankind and only about a tenth of 1% are pests to the lawn...the rest are beneficial insects! The U. S. EPA estimated in an August 1997 report that each U. S household spent about \$20 in 1995 to purchase pesticide poisons for use in their own homes and gardens - this is about double the amount of poison each house bought about 20 years earlier. The American Crop Protection Association noted U. S. sales increased 5.5% from 1996 to 1997 reaching \$8.79 billion and export sales of U. S. manufactured ag pesticides increased 10.7% the same year to \$2.81 billion. Well maintained plants are less susceptible to disease and insect damage. Plants under stress emit xylene gas which seems to tell the insect pests that the plant is weak and in trouble.

“The important thing is not to stop questioning.”
The Albert Einstein Archives, The Hebrew University of Jerusalem, Israel

CAREFREE YARD AND LAWN MAINTENANCE

True IPM or Intelligent Pest Management® is the only logical way to safely control pests either inside or outside your building. If I told you to build a building and only allowed you to use one tool, you would think my request was absurd. One needs many different tools, e.g., plans, blueprints, surveys, tape measures, drills, planers, sandpaper, saws, hammers, wrenches, clamps, screwdrivers, pliers, crowbars, vice grips, levels, a plumb, squares, shovels, floats, trowels and many other tools to properly build a building. Yet historically only one tool has been used to *control* pests - volatile, synthetic pesticide poisons; if one poison creates resistant pests (does not work), the poison *industry* simply uses another poison or greater amounts of dangerous poisons or more frequent applications of these same poisons; obviously, history clearly proves poisons have not and can never *control* pest problems, especially safely or permanently. Today, some well meaning environmentalists are trying to control pests with one *tool* too. They may suggest traps, insecticidal soaps, gluten, mulch, magic boxes, ultrasonic sound, radio frequencies, hoeing, ladybugs, wasps or boric acid or some other one-step approach. While laudable, **any one-step control** is doomed to failure. True IPM control may have to utilize all of the available *tools* at some point. The proper use of all of the Intelligent Pest Management® *tools* available, starting with prevention, proper selection, maintenance, exclusion, dehumidifiers and then the use of the safest, alternative controls and ending (if needed) with spot applications of least-toxic (non-volatile) pesticide poisons is true IPM. **To remove the cause rather than try to poison the “pest” is the only way to achieve long-term control.** You must discover the reason for the pest infestation or disease and then remove that cause or you are wasting time and money, endangering health and property and ensuring your pest problems will continue to become more resistant and to thrive.

“Modern” agriculture “treats” the problem and considers the soil as something only necessary to allow the plants to grow vertically while chemical enemas are rammed up their shafts. Our worst pest problem and/or pollution is our depleted (contaminated) soils devoid of organic material and beneficial microorganisms. Without these beneficial organisms and the contamination, our plants and those that eat them are sick and/or weak and/or dying. The American Indian farmed and inhabited this land for thousands of years before the white man came and used it for everything he needed to live and yet the land and the water were in pristine condition; that is no longer the case.

The February 1998 issue of the Metropolitan Detroit Landscape Association's The Landsculptor reported on two recent surveys regarding lawn and garden practices. In the survey 22% of those who **do not** currently use a professional service said they would consider one **if** the service offered environmentally sensitive programs. Over 30% of those who responded said they would pay up to 25% **more** for a service that offered a high degree of environmental protection! I would add, you need a service that treats the soil and not the pest.

In the 19th Century the typical American *lawn* consisted either of a forest, or of a lot filled with brush, weeds, dirt, rocks, old farm machinery, a woodpile and a few chickens and no *grass*. The first practical lawn mower was patented in 1830. Insect control up to the mid-1800's consisted of washing off or dusting or picking off the pests. Until recently, many building sites were scraped down to the bare subsoil and then compacted to a density of at least 90% to meet building codes and swept. Today a few people are again creating *grassless* areas and yards that require no effort, mowing, artificial watering, synthetic fertilizers or dangerous, volatile, synthetic pesticide poisons. Some athletic fields are using astro turf®. Some areas are now covered with woven geotextile fabric, then covered with gravel, shredded tires, stones, wood chips or bark or planted with trees, native grasses and species, bonsai, clover, ivy, creeping thyme or mint, chamomile, pachysandra, Irish or Scotch moss, myrtle, wildflowers and other ground covers that are easier on our earth and the homeowner's time, health and pocketbook. Kentucky bluegrass (*Poa pratensis*), which is the most popular lawn grass in America, requires 18 gallons of water per square foot during its growing season! If you still want a *lawn*, select a less thirsty grass, a native species that is both drought and insect resistant. But remember, the U. S. already has over 50,000 square miles of cultivated lawns (an area equal roughly to the State of Pennsylvania and larger than that occupied by any agricultural crop), which truly is a tremendous waste of time, energy, water, land, fertilizer, dangerous, volatile, “registered” pesticide poisons and many of our limited resources! Each year we spend over 30 billion dollars to maintain this useless monoculture, creating a terrible petrochemical addiction. In 1990 we poured about 70 million pounds of “registered,” volatile pesticide poison active ingredients just on our lawns plus fertilizers! Massive bird kills have been reported when pesticide poisons such as diazinon are used. In 1762, the author of the most read child rearing manual of that day, Jean-Jacques Rousseau stated a medical *truth*. “One-half of the children die before their eighth year. This is nature's law: why try to contradict

it? Today the poison *industry* would like you to believe another *truth* - that their poisons will “protect” you and yours. Benjamin Disraeli once noted: “There are three kinds of lies: lies, damn lies and statistics.” **The Author would add a fourth - the poison *industry*’s assurances of “safety”.**

Before “registered,” synthetic herbicide poisons were invented, about 200,000 geese were used each year to weed the cotton fields in California’s San Joaquin Valley. Geese have been used to weed other commercial crops, such as strawberries, mint, spruce seedlings and potatoes. There are two problems with weeder geese: the crop must be protected, and geese are selective grazers. Yellow nutsedge, *Cyperus esculentus*, and water hyacinth, *Eichhornia crassipes* are palatable and can be controlled by geese. Geese also prefer to eat quackgrass, *Agropyron repens*; shepherdspurse, *Capsella bursapastoris*; and chickweed, *Stellaria media*. Unpalatable weeds include pineappleweed, *Matricaria matircarioides* and prostrate knotweed, *Polygonum aviculare*. When geese were used to weed a crop of spruce seedlings, palatable weeds, especially quackgrass, were safely removed. After the second year, however, concentrations of unpalatable weeds had started to build. T. L. Wurtz concluded weeding geese could be useful in an IPM program that included hoeing, or reduced herbicide applications.

Just one example of the *use* of dangerous, volatile, “registered” pesticide poisons to *protect* lawns is a 1990s study by the “Citizens for a Better Environment” which found the average Chicago suburban used about 4 times as much volatile, synthetic pesticide poison per acre than an Illinois soybean farmer. So it is not surprising that the New York Times noted that as the champion ice skater, Christina Locek, was sunning herself in her Illinois back yard, a lawn “care” company routinely sprayed volatile, synthetic pesticide poisons onto a Neighbor’s yard. The toxic spray volatilized or drifted into Christina’s yard and over her, her cat and her dog. Within minutes her cat died. Christina’s dog died within a few hours. Ms. Locek collapsed within moments and is now legally blind, permanently disabled and no longer able to work. In October, 1996 CNN reported that the U. S. EPA conducted a test of volatile herbicide poisons and found the level of contamination inside homes after outdoor spraying was 10 - 100 times stronger than what was found outside! These toxic *residues* were brought inside on shoes and pets (and volatilization); the floor and carpet concentrations of poison were astronomical and readily picked up by children from direct dermal contact as they lay or crawled on the floors as well as orally as they put toys and objects in their mouths. The tragedy is that many of these toxic “weed” killers that cause leukemia, lymphoma; non-Hodgkins lymphoma and soft-tissue sarcomas have a latency period of 20+ years - who will recall the carcinogenic herbicide poisons you were exposed to way “back then” or associate the old exposure to your “new” disease? Twenty-five to fifty million pounds of volatile poisons are used in the U. S. every year to *treat* private lawns; this includes the routine use of diazinon which has been linked to massive bird kills - if it kills birds, how safe are you! The Journal of Occupational and Environmental medicine, 39:1055-1087 noted: “The use of pesticides (poisons) in French vineyards is being suspected as a contributing factor to the abnormal level of brain tumor deaths seen among producers and agricultural workers there. A report published in the Archives of Environmental Health found 258 French farmers or agricultural workers died of brain tumors in the 1984-1986 period, compared with the 201 brain tumor deaths statistically expected for a similar-sized sampling of the general population. It would be interesting to see how many died in the pre-world War II years of brain tumors. Toxic pesticides that are banned or otherwise forbidden in the U. S. were shipped from U. S. ports at a rate of more than 14 tons per day in 1995 and 1996 - a total of more than 21 million pounds - according to a new report by the Foundation for Advancements in Science and Education (FASE). United States corporations also exported more than 28 million pounds of pesticides designated as “extremely hazardous” by the World Health Organization, representing a 500% increase since 1992. With increased globalization of trade, the United States imports ever-increasing quantities of food grown abroad. **WE BUY THOSE DANGEROUS PESTICIDE POISONS BACK!** Obviously, homeowners that garden, farmers, landscapers and maintenance people who apply these toxins continue to absorb these herbicide and insecticide poisons from their clothing long after the actual spray application. One very good IPM book to read is Techniques for Reducing Pesticide Use: Economic and Environmental Benefits, 1997, David Pimentol, ed.; discusses the environmental and social costs of synthetic pesticide poisons examines the Swedish pesticide reduction program, which has cut use by 75%. 444 pages, US \$180, John Wiley & Sons, Inc., NY, NY. web site: <http://www.wiley.com>.

In mid-December, 1997 the USDA released a “new” proposal to implement the Organic Foods Production Act of 1990 and to redefine “standards” for organic production and labeling - if passed, this proposal would legalize practices that currently are unimaginable to organic farmers. Some of the most serious threats the USDA proposal poses to organic standards include:

Toxic chemicals. Under those proposed regulations, toxic chemicals (poisons) would be allowed in organic

food production, including some that are possible human carcinogens and/or cause other adverse health effects. Some of these toxic chemicals (poisons) would be allowed as “inert” ingredients in pesticide poisons approved for use in organic production, such as chloropicrin, toluene and xylene. Loose wording and bad definitions in other sections would also create significant loopholes, allowing routine use of seeds treated with chemical fungicide poisons and synthetic fertilizers and fumigation of foreign organic foods. Environmentally contaminated land must not be used for organic production. (Federal Register 65866-65867 and 65932).

Irradiation. The process of using ionizing radiation to kill food-borne pathogens, irradiation creates hazardous synthetic chemicals (poisons) in food. It destroys essential vitamins and damages beneficial fatty acids. It is also associated with dangerous radioactive isotopes, including Cobalt-60 and Cesium-137. The USDA is seeking comments on whether the regulations should allow ionizing radiation.

Bio-Solids. Another name for “sewage sludge” or “humanure”, Bio-Solids are a toxic soup of human, residential, industrial and hospital waste, and runoff from lawns, streets and farmlands. Sewage sludge contains residues of heavy metals, pesticide poisons and dioxins, yet the USDA would allow its use in “organic” production.

Genetically Engineered Organisms (GEOs). Due to the synthetic nature and to a wide range of health, ecological and social concerns, no respected organic certification in the world currently permits genetically engineered organisms in organic production. Some GEOs contain traits that could not have been obtained through natural evolution, and cross-breeding of plants and animals could spread unnatural traits to related species. The USDA’s proposed regulations would permit the use of certain GEOs, including genetically-engineered crops which produce their own pesticide poisons.

Other problems with the USDA proposal including allowing up to 20% of conventional feed in organic dairy operations, and loopholes allowing farmers to pack livestock into factory-style farm facilities.

In addition to undermining organic agriculture, the USDA’s proposal restricts eco-labeling and mandates states not be allowed to impose organic standards stricter than the USDA “standard”, taking away consumers’ right to know. No longer would the labels such as “produced without synthetic pesticides,” “ecologically produced,” “humanely raised,” “certified organic grower,” or “raised without hormones” be allowed. These regulations would prevent producers and manufacturers from identifying their safer products in terms of production practices. In other words, consumers would lose the ability to choose cleaner food and fiber and to select more environmentally-friendly products. **Eat live organic food to live; eat dead/poisoned food to sicken and die.**

In the beginning was the plan,
And then came the assumptions.
And the assumptions were without form.
And the plan was completely without substance.
And the darkness was upon the face of the employees.
And they spoke amongst themselves saying of the plan, “It is a crock of shit and it stinks.”
And the employees went unto their supervisors saying, “It is a pile of dung and no one may abide the odor thereof.”
And the supervisors went unto their managers saying, “It is a container of excrement and it is very strong such that none may abide it.”
And the managers went unto their directors saying, “It is a vessel of fertilizer and none may abide its strength.”
And the directors went unto their executive directors saying, “It contains that which aids plant growth and it is very strong.”
And the executive directors went unto the general manager saying, “It promotes growth and is very powerful.”
And the general manager went unto the board of directors saying, “This plan will actively promote the growth and efficiency of the soil and these plants in particular.”
And the board of directors looked upon the plan and saw that it was good. And the plan became policy.

This is how *shit* happens.

Why did the USDA propose new regulations for the organic farming industry to destroy all that we have worked so hard to create? Because it no longer is just “starting”. In 1997 the U. S. organic industry was worth US \$4 billion in annual sales and is growing at a rate of 20% per year! By the year 2000 Swiss air will be sure 90% of their meals are organic, including fair trade coffee. The poison *industry* is losing and does not like it and yet will

not adhere to the high food standards developed by the organic industry. Agribusiness conglomerates do not want to lose any more customers who no longer want to purchase their conventionally raised and synthetically poisoned food. This is the poison *industry* coming to take over a good profitable business by creating new “rules” that will make it “illegal” to say you have organic food produced without human waste, drugs, synthetic fertilizers or pesticide poisons! No one will benefit from the loss of stricter and safer organic food guidelines but the industrialized agriculture interests and poison “industry”. The GA Pest Management Newsletter Nov/Dec 1997 noted: “A recent study of pesticides detected in water found diazinon was found in every urban and suburban sample. A recent report by the California Department of Pesticide Regulation for the year 1995 noted that “registered” pesticide poison-related illnesses are up 20% overall - farm reported illnesses increased 46%. It, obviously, is very profitable to poison and kill people.

If you wish to avoid killing or injuring yourself and family, your pets, neighbors and our earth, you are going to have to get personally involved! You are going to have to become your own “EPA and FDA” and IPM applicator because, obviously, the poison producers, traditional poison applicators and *regulators* are not going to protect you, your family, your pets and/or our environment! If you, your family and/or pets, fellow workers, neighbors, etc. become *mysteriously* ill, forgetful, blind, start having headaches, miscarriages, seizures, flu-like symptoms or other health problems, ask, “Why?” Find out if the people, clothing, area, building, yard, food, school, restaurant, etc. are/were being currently *treated* with volatile, synthetic pesticide poisons or if the buildings were *treated* for wood destroying insects in the past. Avoid exposure to these poison *treatments* and other contaminated areas, eat organic food, drink filtered water and see if the *mysterious* health symptoms improve. Remember, however, chlorinated hydrocarbons and organophosphates can bioaccumulate and are stored in our bodies and many health *symptoms*, e.g., blindness, cancer and death will, obviously, never *improve*. **Always remember we are raising children and not grass.** It would be safer and cheaper to install Astroturf® on all of America’s lawns.

Diluted Safe Solutions, Inc. Enzyme Cleaners quickly digest thatch, fungus, mold, rot, insects and/or arachnids. Their MSDS considers them to be non-toxic or GRAS (Generally Recognized as Safe) to people and pets. What about to plants? The Venus fly trap has a bright color on the inside of the leaf that is caused by thousands of glands which both secrete enzymes and absorb nutrients; enzymes break down the insect tissues and in several days the plant digests its meal. The enzymes, obviously, do not harm the Venus fly trap... CAUTION...do not spray Safe Solutions, Inc. Enzyme Cleaners 2 weeks before or after a fertilizer application or without spot testing a small branch or patch first. The word enzyme comes from the Greek en (meaning in) and zyme (meaning leaven) or to ferment and thus cause change.

Lawns within a Good Landscape Design. Today, much of our suburban landscape is composed of lawn areas. Most of these large grassy areas came into being because developers looked for a fast and inexpensive way to cover the soil between buildings. Grass fit the bill. However, the burden of maintaining this unnatural feature in good order fell exclusively on the home owner.

Lawns look and function best when they are a part of the bigger picture: highlighting, adding contrast and/or helping your landscape to work in harmony with adjoining areas. In a complementary landscape plan, spaces less hospitable to grass can be used for native species of trees, shrubs and herbaceous plants that will flourish. Such combined plantings can contribute to the beauty of your property, instead of providing a constant source of headaches where the grass “would never and can never grow quite right.”

If you have a lawn that has problems now is the time to take a hard look at your overall landscape plan. The relationship of the lawn to surrounding areas may be crucial to the health as well as the attractiveness of your property. Landscape designs that include space for other plant materials, especially the rich native plant communities, are healthier and more resilient. Biodiverse landscapes also provide places for beneficial birds and insects. Erosion, flooding and drought are less likely to become a problem because there is a place for runoff water to go and be stored for a limited time. Such landscapes are likely to remain healthy, beautiful and more sustainable in the long run.

A Checklist: Basic Requirements for a Health Lawn. Most “scientifically developed” lawn grasses are fairly demanding plants. Some may be more tolerant of constraints than others. However, in general, **a lawn needs all of the following environmental components to remain healthy:**

- Deep, drought-resistant root system - green grass is about 90% water
- Two or more hours of direct sunlight
- Well-drained soil with humus and other organic matter and plenty of healthy bacteria, fungi and nematodes
- Adequate moisture during dry periods
- Limited traffic
- Good air circulation
- Limited slope of 12% or less
- Limited salt exposure and soil salt content
- Placement beyond the drip-line of trees

THE GRAND RAPIDS PRESS, SUNDAY, APRIL 5, 1998, A24

Michigan farmers fear federal regulators could ban key pesticides

The Associated Press

WASHINGTON — Joshua Wunsch is a third generation farmer, raising 360 acres of cherries and apples with his wife in the Traverse city area. But he is uncertain these days about whether they will continue farming if the Environmental Protection Agency decides to eliminate key insecticides for fruit. “The primary concern has to be consumer health,” Wunsch said. “But if (the EPA) is extravagantly conservative in establishing risk parameters (for “registered” pesticide poisons), then we endanger a whole new group — the farmer.” Wunsch and more than 100 other Michigan farmers descended on Washington last week to talk to congressional lawmakers about pesticide regulations and urge them to support the ethanol tax credit. The Michigan Farm Bureau holds a three-day conference annually near Capitol Hill that serves as a platform for the grassroots lobbying. Farmers said they were most upset about the potential changes in pesticide regulations prompted by the 1996 Food Quality Protection Act. “It’s the implementation of the act that’s controversial at the moment,” said Michigan Farm Bureau president Jack Laurie. “How do we implement the act without taking away all the crop protection products (poisons) we have today?” The new food quality law requires the EPA to review most organophosphate and carbamate insecticides by August 1999. For the first time, the EPA must assess the cumulative risk to humans — especially children — from (“registered”) pesticide residue (contamination) from crops as well as other sources of residue such as drinking water and home gardens. Farmers fear the EPA will cancel or restrict organophosphates since the agency said it is reviewing many of them first because they “appear to pose the greatest health risks.” EPA officials say that assumption is premature since they have not yet finished developing the criteria to reassess the pesticides. But the American Farm Bureau remains skeptical. The bureau’s Dennis Stolte said concern among farmers that organophosphates would “be canceled in one fell swoop” has “caused near hysteria across the country.” Farmers say there is no alternative to some pesticides and when alternatives are available they are generally less effective and often much more costly. Organophosphate and carbamate insecticides (poisons) are considered the main defense against insect infestations on fruits, vegetables and field crops and are used on some 80 million acres of crops each year. “Apples would be tremendously affected. It’s questionable whether I would be able to continue growing apples,” said Jim Miller, also a third-generation farmer, with 460 acres of apples, peaches and cherries in Berrien county. **(Note: We get better control with diluted enzyme cleaners.)**

One of the first people to define IPM, Senator Gaylord Nelson of Wisconsin on 9/3/71 introduced Senate Bill 1794 “To Authorize Pilot Field Research Programs for the Control of Agricultural and Forest Pests by Integrated Biological-Cultural Methods.” In 1972 President Nixon sent a message to the House of Representatives that referred to IPM as “The judicious use of selective chemical pesticides in combination with non-chemical agents and methods.” In September 1993 the Clinton Administration said implementing IPM practices on 75% of the Nation’s crops by the year 2000 was a national goal.

HOW TO BEGIN A TRUE IPM YARD/OUTDOOR CONTROL PROGRAM

Since 1984, the Eugene 4J School District has been developing an IPM-based landscape management program. The 4J District manages just over 600 acres of developed grounds. Prior to 1983, 180 acres (or 30%) were sprayed

with poisons annually, including herbicide poisons or soil sterilant (poison) applications to approximately 40 acres of tracks, softball diamonds and shrub beds. The District now uses no herbicide poisons at all on these tracks and fields. Weeds (and gophers) are kept in good control in high school fields using only safe techniques, e.g., irrigation, aeration, fertilization, top-dressing and over-seeding to keep the turf and the people healthy. Concrete mowing strips are being put in next to buildings and under backstops and fences to permanently control grass and weeds where mowing is difficult.



If yellowjackets are present outdoors, the 4J School District first attempts to physically remove the nest. Dumpsters and areas around them are kept clean, and outdoor eating is eliminated when possible. Children are educated not to swat at yellowjackets. If, despite these measures, the yellowjacket population exceeds a tolerable threshold and/or the stinging insects are coming from a nest that cannot be located for removal, then pesticide bait stations may be used.

Through safer IPM measures such as these the 4J School District has reduced its pesticide poison use dramatically. Pesticide poison applications are permitted only in response to concerns of imminent safety, site preservation, or only if initial use of a pesticide will allow a landscape to be changed so that it can, on a sustainable IPM basis, be safely managed by chemical-free means. Purely aesthetic concerns are not among the criteria for consideration of any pesticide poison use. In 1992-93, the District's limited landscape pesticide poison use included the following: some one-time spraying as part of a pavement cracks and seal program; poison oak control at one school; moss control on some school roofs, and fungicide treatment of two District trees.

At the start of the school year, parents are notified and given the opportunity to appeal any planned 4J School District use of pesticide poisons in its landscape maintenance program. A list is maintained of parents who want 14-day advance notification and opportunity to appeal any specific pesticide poison applications. A committee of community members and school staff meets to solve any pest problems and review any proposed pesticide poison use or parental appeals.

Safety and Liability. The first motivation for not spraying any volatile pesticide poisons, obviously, is safety and liability. One-fifth of the total volume of pesticide poisons applied to lawns and gardens are already considered potential human carcinogens by the U. S. EPA! If people, pets or wildlife become ill or die or there is any environmental contamination, all of the people involved in the poison application will be sued. At EPA's current rate of testing, it will take more than a decade before 32 of the 34 most commonly used lawn chemicals/poisons can be fully tested for their affects on human health. By then it may be too late. So when you compare *costs* of non-toxic or least-toxic IPM vs. *routine* "registered" pesticide poison *treatments...*, potential and actual health, insurance, decontamination and liability costs should **all** be considered as part of the true costs of using dangerous, volatile, synthetic pesticide poisons rather than common sense. **The second motivation is effectiveness** - Pesticide poisons really do not work as well as Intelligent Pest Management® techniques for many reasons including resistance and weather or irrigation. Many "registered" insecticide poisons need follow-up irrigation to perform. Most herbicide poisons cannot be watered until after the poison dries; some synthetic fertilizers need to be watered in and some granule synthetic fertilizer formulations recommend watering before their applications, so how are you going to stop the rain or the irrigation system or prevent the wind from blowing your "registered" poison application into a sensitive area?

Nations seek first global toxics ban

► **More than 100 countries target a "dirty dozen" chemicals.**

The Associated Press - 6/19/98

TORONTO — Taking aim at the world's most toxic chemical pollutants, delegates from more than 100 nations begin negotiations today on the first global treaty banning or reducing the use of the so-called "dirty dozen." They include pesticides (poisons) such as DDT, toxaphene and chlordane, as well as industrial products such as PCBs. The substances persist for long periods in the environment and accumulate in body tissues through food consumption. They can be carried across national borders by wind or water currents and end up in the food chain and water supplies. At week-long talks in Montreal, sponsored by the U. N. Environmental Program, delegates will start drafting a legally binding treaty to be in place by 2001 that would curb emissions of 12 of the most dangerous man-made substances. Though many nations have banned at least some of the "dirty dozen," others continue to be widely used. For example, DDT is still often employed in the tropics to combat malaria.

Numerous studies have linked the “persistent organic pollutants,” or POPs, with an array of health problems, ranging from cancer to low sperm counts. The toxins can be passed from mother to fetus or to an infant through breast milk. Dozens of non-governmental organizations are sending representatives to the talks, hoping to use the occasion to intensify pressure for tough action.

To begin a proper IPM yard care program, you must begin with proper plant/turf selection. Select a native species. When you plant “exotics” they usually struggle to survive and will quickly be attacked by insect pests and diseases. Once a plant, even a native species, is sick, infested, injured or diseased it is best to quickly cut it down or dig it up and burn it. Grasses fall basically into two temperature categories: cool season, e.g., Kentucky bluegrass (They grow best between 60° - 75° F.) and warm season, e.g., Bermuda grass (They grow best between 80° and 95° F.) Note: There are, obviously, also transition zones. Plant an improved “native” variety. In spring, spray the area with diluted Safe Solutions, Inc. Enzyme Cleaners and use organic fertilizers, e.g., Herbruck’s Nature’s Supreme 2-5-3, Nutri-Plus 10-3-4 and/or Pelleted Poultry Manure 4-3-2, 2 weeks later if necessary.

As a general rule of thumb, when choosing any lawn grass, you may wish to avoid the old *common* strains in favor of native grasses or the newest improved varieties. The newest named cultivars of lawn grasses often show superior disease or insect or drought resistance, cold hardiness or shade tolerance. Although many cultivars are available as seed or sod, some of the newest ones - especially of Bermudagrass and centipedegrass - are only available as sod, plugs or sprigs. Some warm-season grasses, such as zoysiagrass and Bermudagrass, are normally bothered by very few insect pests. But aphids, armyworms, pillbugs and cutworms can seriously damage succulent stems and stolons of many cool-season grasses. In the last decade, scientists have found that some lawn grass cultivars, including ‘Repell’ perennial ryegrass and ‘Rebel’ tall fescue, host a type of fungi that naturally protect them from many insect predators. Where local insect populations are high, introduction of these pest-resistant grass cultivars can greatly enhance the health of your lawn. **Remember, however, most birds and insects are beneficial to your lawn and Dow shalt not poison your neighbor.**

Irrigation Tips: To develop a deep, drought-resistant root system, spray in spring with Safe Solutions #2 Enzyme Cleaner; then water in frequently and deeply, preferably early in the morning to prevent evaporation and disease. To help you determine the irrigation requirements of your particular property there are some magic numbers:
one acre = 43,560 square feet
one acre inch of water = 27,154 gallons

Choose the right variety of grass for your area: In Florida and Texas, the southern chinch bug frequently injures lawns. The old St. Augustinegrass cultivar ‘Bitter Blue’ is extremely susceptible to the invasion of chinch bugs. Two newer St. Augustinegrass cultivar, ‘Floritam’ and ‘Floralawn’, show good resistance to this pest.

The following lawn grass cultivars are several examples of grass cultivars with better pest resistance, beauty and local adaptability:

1. Bermudagrass: ‘Tifway II’, ‘Tiflawn’, ‘Midiron’, ‘Vamont’, ‘Texturf 10’
2. Fine Fescue: ‘Pennlawn’, ‘Ruby’, ‘Dawson’, ‘Atlanta’, ‘Jamestown’
3. Hard Fescue: ‘Reliant’, ‘Spartan’, ‘Scaldis’
4. Kentucky Bluegrass: ‘America’, ‘Midnight’, ‘Baron’, ‘Glade’, ‘Challenger’
5. Perennial Ryegrass: ‘Manhattan II’, ‘Repell’, ‘Gator’, ‘Citation II’, ‘Palmer’, ‘Sunrise’, ‘Commander’
6. St. Augustinegrass: ‘Floritam’, ‘Floralawn’, ‘Floratine’

(The amazing thing to the Author is that all of our various lawn grass strains, selected and “scientifically developed” as a result of hundreds of millions of dollars in research, are all perpetually thirsty, hungry, full of insect pests and disease prone - seemingly all unable to combine carbon dioxide, water and sunlight to create a simple sugar and sustain themselves like native plants do in order to survive. (Ask yourself why? and who on earth benefits from destroying our native grasslands and substituting grasses you can not walk on and must continually maintain?) Remember, this country originally had prairie grasses covering it so deep that it fed herds of buffalo that took days to pass by. All of the time and money and *research* to produce a grass monoculture that we now must continually test, inspect and maintain and “doctor” with irrigation, aeration, toxic chemicals, fungicides, herbicides, insecticides, fertilizers and then must keep everyone off - took some real “junk science”.

Less than 1% of lawn and farm insecticide poisons reaches its intended target, the insect “pests”. The December, 1998 issue of Our Toxic Times noted: “A Monsanto official told the New York Times that the corporation should not have to take responsibility for the safety of its food products. ‘Monsanto should not have to vouch for the “safety” of biotech food,’ said Phil Angell, Monsanto’s director of corporate communications. ‘Our interest is in selling as much of it as possible. Assuring its “safety” is the FDA’s job,’ Angell said.”

Unreasonable Risk, the Politics of Pesticides noted: Monsanto, E. I. duPont deNemours and Company, Dow AgroSciences and 32 other manufacturers of pesticides for home and garden use have banded together for lobbying purposes in an organization that calls itself RISE (Responsible Industry for a Sound Environment). All tolled RISE and its member firms spent more than \$15 million in 1996 to employ 219 Washington lobbyists, including 24 former house staff members, 22 former senate staff members, 10 executive branch officials, 9 former White House aides, 4 former representatives and 3 former senators. Political Action Committees formed by agribusiness, pesticide companies and food industry have doled out \$9.3 million in campaign contributions to house members since 1992. From 1988 to 1995, more than 65 bills were introduced in Congress to tighten pesticide regulations. Not one of them passed.

Phytotoxicity Caution: Safe Solutions, Inc. Peppermint Soap or Enzyme Cleaner may cause injury to certain plants. It is a good practice to water/irrigate plants for several days before spraying. Spraying when there is a shortage of moisture may injure plants. Other conditions which may cause injury may vary considerably depending upon fertilization, temperature, humidity, direct sunlight, plant species and/or other environmental factors. **Always test a spray on a few plants or leaves at least for a few hours before spraying everything.**

“Do what you can, with what you have, with where you are.” — Theodore Roosevelt



“Conformity is the jailer of freedom and the enemy of growth.” — John F. Kennedy

“Do not be too timid and squeamish about your actions.
All life is an experiment.” — Ralph Waldo Emerson



Name	Description	Requirements
Cool Season Types		
Kentucky bluegrass (<i>Poa pratensis</i>), many varieties	Lush, green with fine texture. Good wear tolerance. Spreads by underground stems (rhizomes). Mows well but requires lots of water. 1 year from seed; 5 months from sprigs; 3 weeks from sod	Moderate drought tolerance. Plants become dormant during periods of drought; require regular irrigation to stay green in summer. Fertile soil with plenty of sun.
Fine fescue (<i>Festuca spp.</i>)	Dark green color and fine texture. Blends well with Kentucky bluegrass. Very good wear tolerance. 1 year from seed; 6 months from sprigs; 3 weeks from mixed-species sod.	Adapted to dry habitats, poor soils, especially in shady spots. Grows better in fertile, slightly acid soils. Requires less nitrogen.
Perennial ryegrass (<i>Lolium perenne</i>), many varieties	Very dark green grass. Somewhat clumpy unless blended with bluegrass or creeping fescue. Very good wear tolerance. 2 months from seed, but expect 2 years for mixed-species lawn to assume mature appearance.	Good drought tolerance. Plant in slightly acid soil in full sun. No other fine turf grass establishes itself so fast.
Transition Types		
Blue gramagrass (<i>Bouteloua gracilis</i>)	Medium-fine grass with bunching habit. Forms dense sod. Good wear tolerance. 2 years from sod.	Warm-season grass often planted in transition zone and Great Plains. Drought tolerant. Good for cool, dry regions. Alkaline soil. Turns brown in severe drought. Requires less nitrogen.

Warm Season Types

Improved Bermudagrass (Cynodon dactylon hybrids)

Medium to dark green grass with fine, stiff leaves. Excellent wear tolerance. Spreads by runners and rhizomes. 2 - 3 months from sprigs; 3 weeks from sod. Seeding not recommended.

Attractive and aggressive; excellent drought tolerance. Plant in fertile, well-drained soil with full sun. Requires lots of nitrogen.

Centipedegrass (Eremochloa ophiuroides)

Medium green grass with somewhat coarse leaves. Thick creeping stolons. Fair to poor wear tolerance. Low maintenance. 1 year from sprigs; 2 years from seed.

Excellent drought tolerance. Will grow in moderately fertile, acid soils. Plant in full sun. Needs less nitrogen.

St. Augustine-grass (Stenotaphrum secundatum)

Dark green grass with creeping stems and broad, flexible blades. Fair wear tolerance. Inexpensive, spreads by stolons. 3 months from sprigs or plugs. Not available as seed.

Average drought tolerance. Plant in fertile, well-drained, sandy, neutral to slightly acid soil. Can grow in shade. Remember to dethatch. Needs lots of nitrogen.

Zoysiagrass (Zoysia spp.)

Medium green, creeping grass with fine, stiff leaves. In the north, turns brown in winter. Very good wear tolerance if thatch is removed every few years. Difficult to mow. 2 years from sprigs; 2 months from sod.

Average drought tolerance. Plant in full sun with fertile, well-drained, slightly acid soil. Spreads by horizontal stems called stolons and fleshy underground rhizomes. Needs less nitrogen.

Obviously, if you are growing grass for a football field, a “Keep off the grass” area or leaving it grow in a “natural state”, you will require a different variety of grass. Take a sample of your current grass and soil to your local Cooperative Extension Service (CES) and ask which native/resistant variety will best fit your specific needs. If possible, use only high fescue blends. **The Soil Test.** A soil test is a chemical analysis that measures nutrients present and soil's pH (degree of acidity or alkalinity). When your soil is healthy with living organisms, your turf will be naturally strong and naturally control or repel moles, nematodes, insects, fungus and/or weeds. “Quickie” soil tests - Wet a soil sample add a pinch of baking soda if it fizzes - it may be too acidic. Add a few drops of cider vinegar to a soil sample; if it fizzes it is probably alkaline.

When to test:

- Test your soils yearly until nutrients and pH are balanced. Then test every other year.
- Test your soils in early spring before any fertilizers are applied.
- Note: Soil tests performed by different labs can give widely different results.
- Remember, many lawns do not require fertilizer; don't add anything until you need to add it.



How to take a soil sample for testing:

- Take a small trowel or soil sampler and remove a 4" deep core of soil. Remove the grass and roots and place the remaining soil into a one-pound coffee can or sandwich-size zip-lock bag. Collect soil specimens at six or more locations on your lawn so that the total sample fills the can half-way. Seal the can and deliver or mail it to your CES or the lab of your choice. **CES Caution:** With very few exceptions, the cooperative extension service might as well be a public relations branch office for the chemical (poison) industry.
- Grab a handful of healthy soil and you should have a few billion bacteria, up to 100 million fungi, 100 feet of grass roots, a few thousand grazing nematodes, several insects and an earthworm or two in your hand. Apply synthetic fertilizers and pesticides and you kill the life of the soil - the microorganisms.

There are four basic types of soil: clay, loam, sand and gravel. If you take a rough lump of damp soil and roll it between your palms, the thinner you can make the "worm" the higher the clay content. If it feels gritty or if it falls completely apart, it is mostly sand; anything in between is mostly loam or a combination; gravel will hurt your hand and will not grow "grass". The openings between soil particles are called pore spaces that allow air and water to pass through. Clay soils have tiny pore spaces that contain little air but retain water, resulting in poor drainage. Sandy soils and gravel have large pore spaces with large air pockets, but water drains away from the roots very quickly. Loamy soils have both large and small pore spaces and provide an excellent balance of soil, air and water. The County Extension service (CES) will test your soil, usually for about \$10, to check its pH (which should be between 6.0 and 7.5 (the ideal is 6.2 - 6.6) and to see if it lacks any of the basic nutrients, e.g., calcium, nitrogen, phosphorus and potassium. But a real good soil test will tell you not only what nutrients are or are not simply present or absent, but which nutrients are available for assimilation by your plant. You can be locked in a warehouse of canned food and water, but without a can opener you will soon die - soils need microorganisms to "open" (or chelate) their food for them.

If your soil requires any fertilizer/nutrients, we recommend you normally use only a 100% organic fertilizer to restore the proper level of necessary micro and macro nutrients. True organic fertilizers contain only animal or vegetable raw materials and contain no synthetic chemicals, chlorine or salts. Never use a fertilizer that contains any potassium chloride, high nitrogen levels or any other salts. Be sure the first number (nitrogen) of your organic fertilizer choice is 5 or lower. (Chilean nitrate is a good nitrogen source but should still be used with great discretion.) Grubs and fungi especially love synthetic nitrogen fertilizer *treatments* and increase dramatically after you have *fed* your lawn. Caution: Some synthetic fertilizers have carbon added so they can be labeled *organic* - so you must read your "organic" labels carefully. All grasses prefer to grow in fluffy, truly organic soil filled with living microorganisms, worms and other invertebrates. Composted materials, e.g., manure, mulch and seaweed not only suppress fungi but they add "fluffiness" to your soil. True organics usually contain decomposed biological materials and living microorganisms that aerate the soil and release their nutrients slowly and raise moisture retention capability. Synthetic or high salt fertilizers can destroy your soil's energy levels, e.g., they can kill beneficial micro and macro organisms, the absence of which helps compact the soil. Most synthetic fertilizers release all of their nutrients immediately and get leached away, which can contaminate lakes, ponds and streams, increasing weed growth and oxygen depletion in the water and/or they leach down and contaminate aquifers. Synthetics also usually acidify the soil and can burn the lawn and their form of nitrogen usually helps increase your insect pests, weeds and fungi problems. Synthetic fertilizers can and do kill earthworms and soil microbes that are the true essence of healthy soil and lawns and gardens. Eventually, a chemically-treated lawn becomes chemically addicted and your plants get little nutrition from such barren (dead) soil. Soil tests may say you have all the right ingredients, but they are no longer accessible or available to your plants. David Pimental, et al (April 1996) estimated that soil — the critical life-support system upon which we all depend — is eroding at a rate of 13 - 80 times faster than it is being formed.

Natural compost and processed manure are the best overall organic fertilizers. If you must use nitrogen, use Chilean nitrate, fish meal, blood meal or canola seed meal; to add phosphorus, use bone meal; to add potassium use kelp meal or liquid seaweed. Leave your (healthy) grass clippings in your lawn to help feed and aerate it, which restores the normal transpiration cycle. If you can restore your lawn's soil to a healthy condition - full of healthy macro and microorganisms, - they in turn will transform or chelate raw chemicals, minerals and nutrients into forms of nourishment acceptable to plants.

USDA Caution: A study produced by the Organic Farming Research foundation in 1997 found the USDA offers very little research for organic farming amidst a budget of hundreds of millions of dollars that currently support chemical- (poison) intensive approaches. The study was a thorough evaluation of the research projects and found only 1/2% to 1% had any content or relevance for organic practitioners of a \$4 billion market that has grown 20% a year since 1990.

Nitrogen Caution. The 12/7/96 issue of Science News had an article entitled, "Pollution helps weeds take over prairies," which noted that while nitrogen is needed for plants to grow, a new study finds that even small amounts of this fertilizing pollutant (found in acid rain and agricultural pollution) can dramatically impair native grasses' ability to compete against weeds. On 2/3/98 the Environmental Defense fund (EDF) announced: "The Clinton Administration has commissioned six teams of scientists to begin the first large-scale study of the Gulf of Mexico's 'Dead Zone,' about 7,000 square miles of oxygen-depleted waters off the Louisiana coast, caused by pollution from the Mississippi River."

Lawn Care Company Caution. Heavy applications of "registered" pesticide poisons are not necessary for a healthy and attractive lawn. Yet in pursuit of the "ideal" lawn, a potent assortment of volatile pesticide poisons is used by homeowners (who don't always read warnings or routinely follow dosage recommendations). These poisons are also routinely applied by lawn care companies who do not even bother to inspect for need before spraying. These poison applicators do \$1.5 billion of bu\$INess in the U. S. each year. Many of these "registered" poisons have been linked to human illnesses, pet deaths and bird kills.

Liming. A pH of 6.2 to 6.6. is ideal for grass. Use lime to raise the pH until it is within this range. Lime also provides essential calcium and will kill fungus. Liming the soil has several benefits:

- Increases yield by raising the pH to a level where plants can take up more nutrients.
- Reduces aluminum, iron and manganese toxicity.
- Creates a favorable environment for microorganisms to break down organic residue.
- Provides two nutrients — calcium and magnesium.
- Unless the soil has a magnesium deficiency, do not use dolomitic lime (which contains magnesium), because an excess of magnesium binds the soil and causes problems. Use high-calcium, low-magnesium lime.
- To raise pH, you can apply up to 40 lbs./1000 sq. ft. per year.

Other Minerals. If your soil tests indicates a nutrient imbalance, use ground-up rock minerals to correct the problem, but be sure you have enough microorganisms to restore proper chelation activity.

- Green Sand - Provides potassium as well as silica, iron oxide, magnesium, lime and phosphoric acid.
- Rock Phosphate - Provides phosphorus, some calcium and trace minerals.
- Gypsum - Provides calcium and sulfur when pH is at the desired level. It also loosens heavy clay soil and counteracts damage from the use of winter salt.

SOME INTELLIGENT PEST MANAGEMENT® BASIC WEED CONTROL THOUGHTS - "Weeds" are simply plants out of place or plants growing where you do not want or desire them to grow or be. A plant cultivated as an ornamental by one person may *escape* to a neighbor's yard and become a *weed*. There are, however, about 700 noxious plants in the U. S. that contain allergens or poisons. Weeds *normally* have many common or local names, confusing everyone, so if you need exact information, it is best to look up the scientific name, but this is usually only done if you plan on using synthetic herbicide poisons - which we do not recommend. Any attempt to control "weeds" without correcting the causes of the invasion and spread are useless because they only "treat" the symptoms rather than the cause. Herbicide poisons comprise 47% of the world agrochemical sales (Wooburn 1995). Successful long-term IPM weed control depends on an accurate identification of the weed species and an understanding of their life cycles and their biological control agents. Weeds can be classified into two types: annual and perennial. Annuals grow, produce seeds, and die in one year. Perennials live for several years, each year saving energy in their roots to survive the winter. Most annual weeds can be easily controlled by hoeing the emerging plants slightly below ground level. Perennial weeds are not easily controlled by this method, however, except through repeated hoeing (which eventually causes carbohydrate starvation). Obviously, knowledge of the weed species and life cycle and how to effectively reduce weed seed numbers is needed to select the correct control measures. Note: Some members of the same weed species growing in

different regions can germinate at different times of the year due to local climatic conditions, differing light and drainage zones and weather patterns. If you are unable to determine the correct species by comparing with color photographs and drawings, it may be necessary that weed specimens be sent or taken to an expert at your local Cooperative Extension Service (CES) Office for identification. Encourage desirable vegetation. Do not use synthetic chemical fertilizers, especially with high levels of nitrogen and/or chlorine or volatile herbicide poisons, especially on a routine or "scheduled" basis. Do not cut grass too short or with dull blades. Do not overwater. Use organic fertilizers only if and when you need them.

Soil solarization using plate glass or 2 -mil clear plastic is an effective means of ridding areas of annuals and some perennial weeds for 6 to 12 months. Mulches prevent sunlight from reaching the soil and provide an effective control of annual weeds. Hand-weeding is a very effective method of weed control. Perennial weeds are best controlled if attacked when their food resources are low, i.e., just after leafing out or just after flowering. For the most effective hoeing, cut grass weeds slightly below the surface and other weeds at the soil surface. Flamers emit a flame designed to kill weeds by burning their basal stems - the part of the stem near the soil surface. The flame should be touched only at the basal stem very briefly. The wilted weed should die after several days. Perennial weeds, grasses and older weeds may need to be retreated after one week. Spray weeds with undiluted white vinegar **concentrate** or urea or potash and/or calcium nitrate or *boiling* water or steam or flames to kill them quickly. **One of the best formulas is to use 4 gallons of liquid urea and 1 gallon of ammonia and 1 - 2 oz. of a spreader/sticker; this formula will kill all vegetation within hours.** Identifying problem weeds and tolerating more benign *weeds* is the first step in Intelligent Pest Management® weed control.

Guidelines for Sending Weeds for Weed Identification.

Sampling:

1. Select several weed plants that represent the species.
2. Include stems, leaves, flowers (if present) and roots.
3. Dig up (rather than pull up) the specimens to prevent damage to roots.
4. Shake the plants lightly after digging to remove excess soil.

Preparation:

1. Keep weed specimens in an ice chest in the field. If they cannot be shipped immediately, store them in a refrigerator.
2. Place weed specimens in plastic bags without moisture, or press them between sheets of absorbent paper and encase in heavy cardboard for shipping protection.

Labeling - Attach a label to the outside of each weed sample. Include the following information on labels:

1. Location where weed specimens were taken.
2. Description of specific characteristics of the site where the weeds were found growing.
3. Determine whether weed plants are annuals or perennials.
4. Your name, address and telephone number.
5. Date samples were taken.
6. Any other information that would help the expert in the identification of the weeds.

Shipping:

1. Phone the person who will receive your samples to determine the best method of shipping and to inform them that the weed samples will be arriving.
2. Pack your samples in a sturdy, well-insulated container to prevent crushing or heat damage.
3. Mark package clearly and request shipper to keep it in a cool location.
4. Ship packages early in the week so they will arrive before a weekend.

Note: A quicker alternative would be to simply bring them to your local CES office.

Weed	Location	Discussion	Control
Crabgrass	A familiar interloper in much of the U.S.; it is professionally attacked with a barrage of chemical herbicide poisons. A recent study showed that nonchemical controls are only safer, they work as well, though they may take longer.	Decide how much of it you are willing to tolerate. If you do not water you will create crabgrass.	Mow 1" higher to decrease the amount of light that gets to young crabgrass. Fertilize only in late fall and early spring. Cover an especially heavy patch with black plastic for 10 days. When you uncover the area, water and fertilize it. For small patches, pull by hand. If all else fails, try routine irrigation.

Dandelion



Dandelions bloom primarily in the spring. Lawn owners who have tried hacking off their heads know that a new plant can spout from the roots. Dandelions are "dandy, not deadly." They attract and help ladybug beetles.	Those cheery yellow blooms and, later, those fluffy white seedheads. If you have them, you'll know it. Use them for salads or to make wine. Help the kids make a necklace. When did these wonderful plants become your "enemy". Note: Japanese beetles stimulate microbial activity in the soil by burrowing into the earth to lay eggs and the larvae eat competitive grass roots and dandelion growth improves.	Dandelions prefer soil with a pH of 7.5 while grass prefers a pH of 6.7 - 7. If you dig up a dandelion while it is flowering, removing 5" of the taproot, there is an 80% chance that you have killed the plant. If you cut it at ground level, you may have to cut 3 or 4 times before it dies. Aerate the soil. Mow, check the calcium level (add lime). Try a propane flamer or urea, but apply it only to the dandelions themselves.
---	---	--

Weed Control. Dandelions are best eaten early in the spring - a little peppery, but not as bitter as they get after the flowers bloom. Wash the leaves in salt water to remove any "guests"; then add directly into your salads, or you can wilt the leaves like spinach! Weeds in a crack, under a fence or other areas near a building can be temporarily destroyed with fertilizers such as urea, potash, etc., or herbicidal soaps, flames, vinegar, hot (boiling) water, corn gluten meal, salt, steam, undiluted bleach; then the area can be filled with caulk, asphalt, cement and/or covered with geotextile fabric, plastic films or mats which were then covered with stones. Heavy clear or black plastic visquine will kill everything under it in a matter of days, especially sunny days. If you dig out weeds be sure you remove all of the roots; an old knife will do nicely. 1 - 2 tablespoons of rubbing alcohol or gin or vodka in 1 quart of cider vinegar will kill most weeds/plants. Use 5 tablespoons of alcohol per 1 quart of cider vinegar to control poison ivy. The alcohol/vinegar formula can be enhanced with 1 tablespoon of salt, 1 tablespoon of dish soap and/or 1 tablespoon of an essential oil, e.g., peppermint. Weeds can also be controlled with a strong soap and/or salt solution that will burn the leaves and roots. If you use a "post-emergent" herbicide you will have to manually remove dead weeds from your yard — why bother to kill them first? Just pull them up by hand in the first place.

Spot Repairs. Where weeds or lawn pests have caused patches in your yard, a partial lawn renovation will usually solve the problem. Clean out all of the weeds and dead grasses in the patch with a shovel and rake, till the soil and feed it with an organic fertilizer. The cultivated patch of soil will compact and settle over time, so rake it into a flat-topped mound slightly higher than the surrounding turf. Plan on planting seed, plugs or sod that will visually match the rest of your lawn, unless you have decided on an insect- or a shade- or drought-tolerant lawn grass for a particularly troublesome area. Seed, plug or cut pieces of sod to fit the shape you are made in the yard. After sowing or sodding, be sure to tap down the top soil to ensure good soil contact. Water only as necessary until the new grass shows strong new growth.

INTELLIGENT PEST MANAGEMENT® WEED CONTROL OVERVIEW - Weeds and other undesirable vegetation around buildings, structures and industrial areas can be controlled by using physical, biological, mechanical, cultural or chemical methods or combinations of any of these. For example, one effective technique that involves using a combination of several control methods is known as *Sprinkle/Sprout/Spade (SSS)*. Using this technique, water is sprinkled on an area that has been prepared to plant. Then cover with glass or clear plastic, creating an inexpensive “greenhouse”. The water germinates most of the weed seeds on the soil surface. After the weed seedlings emerge, they are then spaded or mechanically controlled through hoeing or by being covered for several sunny days with heavy black visquine. When the sprinkling process is repeated a second time, up to 96% of the potential weed problem is eliminated in the top 1/2” of soil. Care must be exercised not to disturb the top soil after this treatment, otherwise ungerminated seeds will be brought up to the surface from the lower levels and begin to sprout. Selecting the appropriate control method or combination of control methods depends on several factors. Of course, you must be certain that any of the methods used will be effective and will control the various weed types, their growth habits and their life stages. You can **carefully** burn them or wilt them with a propane torch or, better yet, a radiant heat (infrared) weeder or spray a mix of 1 cup urea and 1 Safe Solutions, Inc. Enzyme Cleaner and 2 cups water, or straight urea or straight calcium nitrate or diluted potash or 1 to 4 cups of salt in 1 gallon of boiling water, or 1 to 4 cups of borax in one gallon of boiling water, white vinegar or ammonia. Another fast way to control weeds in driveways, tracks, etc. is to sprinkle Dow Flake, snow and ice melter; be sure not to apply this in leather boots - it will eat them up. Soil with a pH of 3 will not grow anything! **The safety of the selected method to the person using it and to the public and environment is the most important consideration.** We are working on a probiotic microbe and oxidants that seem to kill plants quicking and, hopefully, safely.

Physical Control of “Weeds”. Physical controls may include the installation of mats, mulch, asphalt or concrete or other barrier on top of the soil to restrict weed penetration and growth. Other barriers might include wool, crushed rock or gravel, wood bark over visquine, plastic sheeting, or better still a geotextile fabric, or a combination of stones, rocks and/or appropriate mulches. The use of physical barriers is usually the most safe and effective method for controlling weeds around structures and the control is generally permanent. Physical weed barriers are expensive to install and can be difficult to remove. Sometimes weed seeds can still germinate in the cracks and seams of physical barriers such as asphalt or concrete, and growing weeds can contribute to their deterioration unless they are promptly controlled/removed.

Bioherbicides. Iowa State University researchers discovered that corn meal gluten is a natural fertilizer and weed killer. The product, a protein extracted from corn during processing, inhibits germination in crabgrass and other annual weeds. Its 10% nitrogen produces the fertilizer activity. For over 7 years corn gluten meal has inhibited annual weed grass germination and root development in their research plots. A-maizing®. Call 515-294-0036 Nick Christians in the Ag Department, mailto: nchris@iastate.edu. See: <http://www.hort.iastate.edu/gluten/pdf/iowahort.pdf>. The trash Tree-of-Heaven (*Ailanthus altissima*) is the most rapidly growing woody plant in our area. This tree/bush can be virtually seen thriving in sidewalk and alley cracks, vacant lots and sewer grates from Massachusetts to Oregon. Sprouts 12' long are not uncommon where one of these trash trees has been cut down. Immune to dust, exhaust and smoke, these trash trees thrive everywhere. The bark of the Tree-of-Heaven, *Ailanthus altissima*, contains a natural herbicide or chemical called ailanthone which will kill seedlings as efficiently as do the dangerous, “registered” herbicide poisons which persist far longer in the soil. Since 1959 we have known this tree produces a compound toxic to other plants and it has been called a “killer tree”. The toxin may also control insects and microorganisms; try spreading shredded bark from the Tree-of-Heaven where you do not want plant activity.

Mechanical Weed Control. Mechanical controls for weeds include mowing, cultivating, heat treatments, steam, flame, tilling, hoeing and/or any other mechanical processes that destroy the weed plants or disrupt their growth. These methods do not permanently destroy weeds and usually have no effect on weed seeds. Mechanical methods must be repeated periodically whenever weeds are sprouting or actively growing. Mechanical control methods generally work best for annual weeds and are most effective when weeds are small. Perennial weeds that sprout from rooting structures are not as well controlled by cultivation, because the rooting structures may be broken up into many pieces that could resprout. **It can truly be said, “No farmer ever plowed a field by turning it over in his mind” - get to work, lazy bones!**

Geo-textile Cloth. Works better than black plastic to allow air and water movement into and out of the soil. The barrier also reduces the amount of organic mulch on top needed to control weeds. However, fine organic

particles and airborne particles may in time restrict water/air movement. Soil and root conditions under these weed barriers should be carefully monitored a few years after installation. Roots may also grow up through the mulch in time to form a mat on the surface. Plants depending on these roots for water may stress or die under extremely dry conditions.

Seven Reasons to Mulch. Homeowners who mulch are doing their trees a favor in more ways than they might think. In fact, here are seven reasons to apply a layer of mulch around the around the base of your trees and shrubs:

1. **Moisture Retention.** Mulching your planting beds can reduce moisture evaporation anywhere from 10% - 50%.
2. **Weed Suppression.** Mulching your planting beds eliminates the need to weed, if the mulch itself is weed free and is deep enough to prevent existing weeds from germinating.
3. **Improves the Soil.** Mulch helps prevent soil compaction, acts as a soil conditioner and even encourages the presence of natural aerators, e.g., earthworms, and natural predators, e.g., earwigs, spiders, millipedes and ground beetles.
4. **Insulator.** Mulch keeps soil cooler during the hot summer days and warmer during the cooler spring nights.
5. **Adds Tilth and Nutrients.** Organic mulches contribute to the availability of potassium and can add nitrogen, phosphorus and trace elements to the soil. Bark mulch is an all organic fertilizer.
6. **Helps the Environment.** Mulch reduces the need for poisons and is an ideal way to make use of recycled yard waste. Protects tree trunks from weed whips and mower damage.
7. **Aesthetically Appealing.** Mulch can add color and texture to the landscape.

How much mulch? Multiply the width times the length in feet times the depth of the bed in inches. Then divide by 270. The result is the number of cubic yards you will need. **Mulch Caution: Mulch deprived of air and moisture can produce materials that can kill plants overnight. Most sensitive to mulch-made methane, ammonia and organic acids are annuals, then perennials, then shrubs and trees.**

Cultural Control of Weeds. Cultural methods are used to alter the conditions conducive to weed infestation and growth; these factors include water, nutrients and suitable soil, e.g., the growth of weeds around structures may be decreased if you deny them water, dehydration works best to control summer annuals, especially where there is little or no summer rainfall. Water may also be artificially applied to cause weed seeds to sprout, after which the weeds are left to dry out or are controlled by several different mechanical or chemical methods. Poison sumac, poison ivy and poison oak can be safely controlled by allowing goats to graze in the area; they actually like eating these toxic weeds. Cacti in south America and Australia are being controlled by introducing mealybugs into infested locations. You may also control weed growth by planting ground covers or other ornamental plants that actively compete with the weeds for space, light, water and/or nutrients. Native ground covers should be selected that are well adapted to your soil and local environmental conditions so they will flourish and require minimal maintenance. You can spray ammonia and/or urea or borax or salt or Coca Cola or strong vinegar with some salt and peppermint soap directly on a young plant to kill it. Bio-herbicides are in process of being developed.

Chemical Weed Control. Chemical control involves the application of volatile, synthetic herbicide poisons to prevent weeds from emerging or to cause emerged weeds to die. Some “registered” herbicide poisons destroy weeds by damaging leaf cells and causing plants to dry up. Others alter the uptake of nutrients or interfere with the plant’s ability to grow normally or convert sunlight into food. **We do not recommend the use of any volatile, synthetic herbicide poisons. It makes no sense to poison your family and pets to kill weeds.** We suggest you use borax, Dow Flakes, corn gluten meal, herbicidal soaps, boiling water, shredded tires, flame, ammonia, steam, urea with Safe Solutions, Inc. Enzyme Cleaner or ammonia, calcium nitrate, potash and/or salt, vinegar, 4 cups of borax in 1 gallon of boiling water, etc. as herbisafes! **Caution: All plants die; not just the “weeds”.**

“Weed” Pests. Weeds are merely plants that are not wanted (by you) in a particular place. **Weeds should only be removed when:**

1. They begin to cause damage to the building, roof, driveway, sidewalk, etc.
2. They grow in cracks of pavement and contribute the breakdown of paving materials.
3. They interfere with normal building use and maintenance and may attract stinging insect pests.
4. They restrict air circulation, light and are fire hazards and/or violate city codes.

5. They interfere with other types of pest control operations around structures.
6. They provide a harborage for other pests, e.g., insects, rats and mice.
7. Some weeds and ornamental plants are poisonous to people, pets and livestock.
8. Pollens from certain weeds and ornamental plants bother people with allergies.

Conditions Conducive. Remember the plant or *weed* that grows in your yard is the one your soil's conditions provide the best growth opportunities for it to grow in and survive, e.g., dandelions usually indicate hard, compacted soil and/or a lack of calcium, so aerate and/or add calcium to correct the causes. Most synthetic chemical fertilizers and herbicide poisons, especially with high levels of nitrogen and/or chlorine, actually create or promote weed growth - use organic fertilizers only if soil tests show you actually **need** them. You can help control or prevent fungus problems and lawn diseases on golf course fairways by dragging a hose over them in the early a.m. to disperse the dew that settled during the night. Mowing at 3" - 4" levels allows the long grass blades to shade out the weeds. Maintaining proper fertility and pH levels is vital for a healthy lawn. Thatch needs to be removed when the thatch layer exceeds 1/2". Correct watering is very important for maintaining a healthy lawn. Monitor routinely for troubles.

Seeding. Thick, healthy grass is your lawn's best defense against the invasion of weeds and other pests. Use an endophyte-enhanced blend of grass seed, containing tall fescues with some rye with both sun and shade types that resists insects, drought and disease. Avoid the use of bluegrass or bluegrass blends.

- Spring: Spot seed all bare spots to deter crabgrass and other weeds.
- Fall: The best time to overseed or establish a new lawn:
 - Overseed: 4 lbs./1000 sq. ft.
 - New Lawn: 8 lbs./1000 sq. ft.

Moratorium on Patenting Seeds

The Consultative Group on International Agricultural Research (CGIAR) has called for a moratorium on intellectual property claims on seeds held in trust in the collections of CGIAR agricultural research centers around the world. The CGIAR holds the world's largest international ex situ* collection of plant genetic resources — more than 500,000 accessions that are vital for crop improvement worldwide.

The seeds in question are plant genetic resources held "in trust for the benefit of the entire International community, in particular developing countries," and subject to conditions contained in agreements signed by the Centers and the UN Food and Agriculture Organization (FAO) in 1994. These agreements specify that neither the CGIAR Centers nor recipients of designated germplasm will seek any intellectual property rights (such as patents) over that germplasm or related information. Designated germplasm includes farmers' varieties and landraces, obsolete varieties, modern varieties, advanced lines, genetic stocks and wild species. In announcing the call for the moratorium, CGIAR Chairman Dr. Ismail Serageldin reiterated the CGIAR's "strong and unequivocal support" for the 1994 agreements, which seek to guarantee that access to these resources will not be restricted.

Recently, research by the Rural Advancement Foundation International (RAFI) revealed that a small number of organizations have sought intellectual property rights on materials obtained directly from CGIAR Centers. The biopiracy scandal first broke in early January 1997, when RAFI announced that two Western Australian research institutes were improperly claiming monopoly rights on two chickpea varieties obtained from ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) in Hyderabad, India. One of the two varieties challenged was part of ICRISAT's germplasm trust agreement with FAO. While this particular problem resolved itself quickly when ICRISAT demanded that the claims be dropped — and the Australians hastily complied — RAFI's researchers then reported another two dozen similar claims by Australian breeders on varieties held in trust by CGIAR centers in Colombia and Syria. As the Syrian center and the Australians scrambled to justify the claims, RAFI and the Australian Heritage Seed Curators Association revealed at the beginning of this month that at least 47 plant varieties under Plant Breeder's Rights claimed in Australia had been taken from other countries.

"RAFI warmly supports the moratorium idea," Pat Mooney, RAFI's Executive Director, states. "Not only will it bring an immediate halt to 'patent' rip-offs, but it also sends a very sharp message to national patent offices that there are fundamental problems with the way industrialized countries are managing their intellectual property." According to the Australian Heritage Seed Curators Association, the Australian Plant Breeder's Rights Office had

no authority to grant certificates for plant varieties that clearly had not been bred by the Australian applicants. In many cases, the varieties were bred by Third World farmers. In other cases, the varieties were just pulled from the ground in the Mediterranean region, and claimed in Australia.

CGIAR Chairman Dr. Serageldin called upon all recipients of designated material to honor the spirit of the agreements with FAO and to refrain from applying for intellectual property rights. "We are grateful to RAFI for bringing to our attention reports that some organizations are claiming rights to designated germplasm from CGIAR Centers," he said.

CGIAR is sponsored by the FAO, UN Development Programme, UN Environment Programme and World Bank. Members include developed and developing countries, private foundations and international and regional organizations.

RAFI is a non-profit international civil society organization headquartered in Canada. For more than twenty years, RAFI has worked on the social and economic impact of new technologies as they impact rural societies.

* Ex situ conservation refers to maintaining organisms outside their original habitats in facilities such as genebanks, field genebanks or botanical gardens.

Sources: RAFI News Release, February 9, 1998. CGIAR Press Release, February 11, 1998 . Contact: RAFI, 110 Osborne St., Suite 202, Winnipeg MB R3L 1Y5 Canada; phone (204) 453-5259; fax (204) 925-8034; e-mail rafi@rafi.org; old <http://www.rafi.ca>, now <http://www.etcgroup.org/en/>. GIAR Secretariat, 1818 H Street NW, Washington, DC 20433; phone (202) 473-8951; fax (202) 473-8110; e-mail CGIA,cgiar@cgiar.org, web site: <http://www.cgiar.org/>

Watering. Proper watering is the most important thing to do to have a healthy turf. Overwatering, especially in the spring, discourages the grass roots from growing deeply in search of moisture which will cause serious problems to your lawn in times of drought., so soak the soil (when needed) thoroughly, but let it dry out before soaking again. Frequent or daily, light watering can also cause shallow rooting, disease problems and drought intolerance. Follow these watering recommendations to help avoid problems.

- Water deeply at least 30 - 60 minutes early in the morning as needed - the hotter and drier the more frequently you will have to water.
- After fertilizers are applied, carefully apply a 1/2" of water to move the nutrients to the root zone.
- After seeding, water lightly every day to assist germination.
- During hot, dry periods, soak your *normal* lawn not more than once a week with 1" of water. This is especially important in the fall.
- *Showcase* lawns will probably need to be watered more than once a week during dry periods.
- If you have new sod, follow the watering instructions provided by your installer.
- Artificial watering with chlorinated city water will damage soil life and plants. Rain or untreated well water is preferable. Chlorine is a toxin.
- Change any of your improper watering practices gradually - over a season or two. Remember, any abrupt reduction in watering can cause burnout.

Runoff. Runoff from turf areas is almost equal to that of hard paved surfaces. This means in a good downpour most of the water runs off the site instead of being absorbed into the soil. This runoff significantly contributes to flooding, especially when so much land is used for turf/lawns.

Mowing. A properly mown lawn causes a type of reproduction called tillering, which causes the lawn to *thicken*, making it harder for weeds to invade your tight, thick lawn. If you mow too frequently or cut off more than 1/3 of the leaf height or too shortly, the grass plants can become diseased, smaller and thin out - allowing weed invasions. Badly cut ends allow more disease organisms to enter. Never cut more than a third of the blade at a time. During times of drought and/or summer heat, cut higher and less frequently to encourage the grass roots to grow deeper. Keep your mower blades sharp so they cut cleanly rather than tear the grass leaves, for a torn tissue is more susceptible to the entrance of disease organisms than a cleanly cut leaf. Allow shaded grass to grow 1" taller than grasses in the sun. If you use the following mowing guide, remember to also use some common sense, e.g., and mow only when the grass blades are dry. Reel type mowers are recommended for very dense, fine-bladed grasses like zoysia grass and hybrid Bermudagrass. **Remember, don't bag it - your**

lawn needs the clippings more than the local landfill.

Recommended Mowing Heights in Inches - Do not let your grass become overgrown.

Selected Grass	Cool Months	Warm Months	Final Mowing
Cool-season types			
Kentucky bluegrass	2-1/2	3	2
Fine fescue	1-1/2	2-1/2	1
Tall fescue	2-1/2	4	2
Perennial ryegrass	1-1/2	2-1/2	1
Transition types			
Buffalograss	2	2-1/2	2
Tall fescue	2-1/2	3	2-1/2
Warm-season types			
Bermudagrass	1/2	1	1/2
St. Augustinegrass	2	3 west, 2 south	1-1/2
Zoysiagrass	1/2	1	1/2

Cutting Summary. Proper mowing helps keep your lawn healthy and thick and prevents crabgrass and other weeds from germinating. The most important key to mowing is a sharp blade, especially during the hot summer.

- To encourage tillering, cut the grass blades to 2" for the first two cuts of the season. To avoid shock, never cut off more than 1/3 of the grass blade. Do not cut wet grass.
- For the last cut of the season, cut to 2" to reduce winter grass damage.
- Cut to approximately 3-1/2" during the rest of the season.
- Dull mower blades produce ragged, torn grass blades which are more susceptible to disease.
- Leave healthy clippings spread evenly on the lawn as a form of nitrogen. If thick clumps form, pick up clumps to prevent smothering the grass. Remove diseased clippings a.s.a.p.
- Simply raising the mowing height shades and cools the crowns of the grass plants and promotes the development of a deeper root system.

Grass Roots. Dig up a small section of your lawn and look at the grass roots - they should be 6" or longer. Roots 4" - 6" long or less usually indicate you have over-fertilized, overwatered or cut your grass too short. If you have more than 6" of top soil and the roots are less than 4" long, you need to aerate. Another way to see if you need aeration is to wait until your yard is dry and then try to push a screwdriver into it. If this is hard to do, you need to aerate with an aerator that *drills* holes in the ground. Aerators can be either powered electrically or manually. We recommend a core aerator be used rather than a spike type; it is suggested you spray Safe Solutions, Inc. Enzyme Cleaner at a rate of 5 gallons per acre which should increase root growth and crop yield as a result of increased aeration.

Compacted /Hard Soil. In addition to mechanical compaction caused by foot traffic, soils can be compacted or hardened by synthetic fertilizers and pesticide poisons. These synthetic products destroy soil life and the fluffy organic material and they leave behind soil-hardening chemical residues. To alleviate mechanical, chemical and biological soil compaction and hardening, follow the five steps below. If you do not have access to a core aerator, you can still have a real impact on your soil's hardness by just following the other four steps or by simply planting sweet clover or spraying diluted enzyme cleaners.

1. **Watering:** A day or two before your begin steps 2 - 5, soak your lawn with 1" of water. Try to water at a rate that does not cause puddling or run-off.
2. **Core Aeration:** Reduces mechanical compaction and ensures good penetration of chemical and biological agents.
3. **True Organic Fertilizer:** Encourages beneficial microorganisms and humus formation and provides fluffy organic matter.
4. **Gypsum and diluted enzyme cleaners**, e.g., Nitron A-35: Break down soil-hardening chemicals and open up (floculate) soil particle structures.
5. **Watering:** Immediately after completing step 4, soak your lawn again with 1" of water.

Clover, Earthworms and Microorganisms. An alternative to the previously-mentioned 5 *steps* is to simply plant sweet clover which by itself will greatly improve soil quality in a few years. Earthworms aerate soil, improve water filtration and drainage and greatly improve soil structure and fertility. Some volatile pesticide poisons, e.g., carbamates, are highly toxic to earthworms, even 2" - 3" from the poison application site. Other fertilizers and soil amendments can also kill earthworms by significantly changing the soil's pH. Cultivate earthworms, microorganisms and/or sweet clover; do not kill the *beneficials* that are trying to *help* your soil/lawn. I believe it is better to simply *ignore* NPK (nitrogen, phosphorus and potassium) levels and concentrate on healthy soil microbes and organic material in your soil.

Lawns stress trees. It is now well understood that turf grasses and trees are incompatible long-term growing companions. When turf is planted under trees, the trees become stunted and short lived, compared to those in their optimal woodland habitat. Trees need the regular decomposition of leaves that fall from previous seasons. This mulch helps to retain moisture, lower temperatures and maintain fertility in the soil. Chemical fertilizers, herbicides and other pesticides directly kill trees and/or destroy plants, animals and soils that help to support them. Although it may take a while after a lawn is planted beneath trees, they do suffer, decline and eventually die from their weakened condition. **Grasses do not do well in the shade.**

Thatch. Thatch is a mat of tangled *grass* and debris found just above the soil. In healthy lawns these materials decompose quickly and actually help soil quality. In unhealthy lawns, where you have been using chemical fertilizers and/or synthetic pesticide poisons, the thatch grows thick and looks like a layer of straw. Over ½" of thatch indicates your soil is compacted, overwatered, overfertilized or oversprayed, e.g., poison sprays kill the earthworms and other healthy soil microorganisms that normally pull thatch underground and eat it. Insect pests can breed in the resulting thick thatch and thick thatch also may aid weed growth. If you have thatch more than ½" thick. Physically aerate and/or irrigate with diluted enzyme cleaner and/or add natural fertilizers inoculated with soil microorganisms to your soil to hasten the return of the normal processes that will remove these unnatural, thick layers of grass.

If you have more than ¼" of thatch you can apply "living" Safe Solutions, Inc. Enzyme Cleaner and/or microorganisms to help decompose it, or you can rake the thatch up and remove it, but normally it is destructive to remove this vital part of a healthy lawn that helps to retain soil moisture, provides food for the microorganisms and eventually contributes to the all-important soil humus.. You can also use a dethatching blade on your rotary lawn mower or if the thatch is extremely thick, you can use a vericutter (a lawn mower with vertical blades). We normally recommend you leave the healthy grass clippings as they hold the water and in healthy lawns the decomposing clippings provide natural compost materials and nutrients. Thatch is not usually caused by lawn clippings. It is normally an accumulation of dead plant parts, especially bluegrass rhizomes (spreading stems that grow below the surface). Synthetic fertilizers and volatile, synthetic pesticide poisons cause thatch by killing beneficial worms and microorganisms that normally decompose thatch. Cutting grass too short and even light and frequent waterings will also promote thatch. Thatch is a serious problem because it increases the likelihood of insect, disease and drought problems for your lawn.

SEVERAL DETHATCHING TECHNIQUES TO ADMIT AIR AND NUTRIENTS

Bio-Dethatching:

- Natural organic fertilizers, combined with living microorganisms will re-establish beneficial microbial life that were killed by synthetic fertilizers and volatile, synthetic pesticide poisons.
- A healthy worm and microbial population provides the best long-term thatch control.

Mechanical Dethatching:

- Machines rip open the thatch layer and remove a small portion of thatch.
- This is a rough procedure for lawns, but necessary, especially when thatch problems are severe.
- This may be necessary as a regular procedure in bluegrass lawns.

Aeration:

- Enhances bio-dethatching, air/water penetration and microorganism growth. Try diluted enzyme cleaners.
- Spike aerators push tines into the soil. This is worse than useless because it further compacts the soil. Try Safe Solutions, Inc. Enzyme Cleaner sprayed lightly first thing in spring; then as needed.
- Core aerators *drill* and remove plugs of soil and deposit them on the surface. Core aeration is beneficial,

especially when combined with natural organic fertilizers and conditioners.

- Do not aerate mid-spring through the summer because it causes weed seeds to germinate.
- **The best natural aerator is the earthworm, the nematode and then the ant.**

Choice of Seed or Sod:

- Sod is usually commercially grown from bluegrass seed. Bluegrass is prone to thatch problems, disease and pest infestation. It does not tolerate drought or heat and needs heavy fertilizing and heavy irrigation. Do not use (bluegrass) sod if you can avoid it.
- Use an endophyte-enhanced seed blend containing turf-type, tall fescues with improved rye. It is hardy, disease-resistant, and does not normally cause thatch problems. **Ask your local County Extension Service (CES) Agent for the best local variety.**

GENERAL NUTRITION COMMENTS

Disease, Insects and Weeds: Any turf in a healthy state has the ability to overcome stress better than an unhealthy turf. Plant life demonstrates stress incrementally, i.e., first disease, then insect infestations, then weed incursion.

Disease: If the growing media (soil) is deficient in nutrient supply, then the target plant will also be deficient. If the turf grasses are deficient in nutrients, then they cannot develop healthy cells. Unhealthy cells are incomplete and create a state of stress generally known as disease (dis - ease) occurs.

Insects: Unhealthy, diseased turf grasses are weak and prone to insect infestations. Insects are nature's clean-up crew. Insects were created specifically to destroy the weak plants, allowing only the stronger plants (weeds) to survive and proliferate. The presence of insect damage indicates a weak plant that has needs that are not being addressed. To kill the insect "pests" and ignore their cause is insanity, costly and extremely dangerous.

Weeds: Diseased plants, especially under attack by herbicide poisons, fungus or insects, will die or grow sparsely, leaving openings for more unwanted plants (weeds) to grow. Weeds are opportunists that grow in an environment that is poorly populated with the turf grasses. Weeds are symptoms or indicators of a health condition, not the cause or the problem. If you do not correct the cause but only kill the weed, another weed will quickly grow back in the very same spot to replace the one you "controlled".

- An imbalanced environment will produce turf with weak cellular structures which allow infestation of disease, fungus, insects and weeds.
- A well balanced environment will produce healthy, turf grasses which have the ability to resist a disease, fungus, insects and weeds.
- Disease, fungus, insects and weeds are indicators telling us that the turf grasses have needs which are not being addressed.

Effects of Nutrients, Factors and Ratios

Carbon, the Limiting Factor of all Nutrient Supply: The soil's ability to receive, retain, chelate and exchange nutrients with the turf grass is directly determined by the amount of carbon present in the soil. Each unit of carbon will retain 4 units of water. Soluble nutrients are absorbed by this water (soil solution) which becomes available for use by the turf grass. Throughout the day as the turf loses moisture into the air, it will absorb more from the retained soil solution in the soil. This process is called "Transpiration". As the target plant transpires, the soil solution that is absorbed from the soil needs to be saturated with a balanced nutrient supply to renourish the turf.

- If the soil's composition is deficient or out of balance, the soil solution will be also.
- If the soil solution is deficient or out of balance, the plants' ability to produce healthy cells will also not be present. Therefore, disease occurs.

The effect of compacted soil on growing conditions: When soil is compacted, water, air and/or applied nutrients are not able to penetrate easily. Existing nutrients cannot move throughout the soil. Lack of air, water and nutrient movement throughout the soil prevents the turf from absorbing the nutrient supply that would otherwise be available for turf use. Lack of air movement throughout the soil will create anaerobic bacteria conditions

which are unable to decompose organic matter (grass clippings) which are a source of thatch. Compacted soil produces more thatch than non-compacted soil. Plant roots cannot freely penetrate compacted soil, creating another source of thatch. Soil should be “fluffy”; aerate and/or spray with Safe Solutions, Inc. Enzyme Cleaner.

ERGS / Sodium (2:1) and Calcium / Magnesium (8:1) ratios, effects on soil compaction. When the ERGS result is less than two times greater than the sodium result and the calcium result is less than eight times greater than the magnesium result, soil conditions are favorable for compaction.

Phosphorus and Calcium effects on disease: Turf grass that is deficient in calcium and phosphorus will also be prone to disease. Turf grasses need an adequate supply of calcium to build healthy cells. Turf grass lacking phosphorus does not have the ability to absorb and utilize trace minerals.

Phosphorus and Potassium effects on weed pressure: Whenever potassium results are equal or greater than phosphorus results, there will be conditions conducive to weed pressure. Your proper goal is to have 1.5 to 2.0 units of phosphorus for each unit of potash.

Calcium and Calcium effects on weed type: When phosphorus and potassium ratios are not balanced and:

1. Soluble Calcium is low and Insoluble Calcium is low, conditions are conducive to broadleaf-type weeds.
2. Soluble Calcium is low and Insoluble Calcium is high, conditions are conducive to grassy-type weeds.

Conditions Detrimental to Weeds: 1.5 to 2.0 units of Phosphate (P_2O_5) for each unit of Potassium (K). **PLUS** High soluble calcium and high insoluble calcium. When these conditions are met, most weed proliferation will be minimal.

To start a new lawn, rototill the entire area, water to a depth of 2”, cover with clear visquine, wait 7 - 10 days for the weed seeds to germinate, then top dress, hoe or shallow rototill to destroy the sprouted weeds. Repeat this process until the weed seeds have stopped germinating, then level the soil, seed with the proper *grass* choice, cover with organic mulch and water properly. An alternative to rototilling is to cover the closely mowed vegetation with heavy clear or black visquine for several weeks to kill all vegetation; this technique will also destroy weeds that sprout in rototilled soil. Planting clover will so improve most bare soils in a few years that you can simply rototill it under and plant a *proper lawn*.

Allow your yard to have a few weeds or unwanted plants, especially clovers which were highly prized until the 50's when a chemical company developed a synthetic herbicide poison that killed clover and then convinced the public that clovers were “noxious” plants. (The only negative things clover brings into your yard are bees.) Clover is soft, mows well, produces surplus organic nitrogen in the soil and encourages the presence of beneficial soil microorganisms. Sweet clover (*Melilotus spp.*) planted on bare compacted soil sends down deep roots breaking up the compacted soil and raising mineral nutrients, e.g., phosphorus, to the upper soils where they can be used. Research of 101 annual weeds showed the average plant produced 20,832 seeds per year and ants will eat most of them if you leave them live in your yard! By the way, when was the last time you saw any bees on your flowers?

Encourage beneficial organisms, ants, earthworms, microorganisms, lady bugs, spiders, dragonflies, toads, birds, etc. - both above and below the soil - these are the true keys to unlocking your soil's and /or yard's potential. By the way, all plants contain compounds that make them resistant to pests. Healthy plants resist pests better than sick/weak plants.

Weeds and Injuries. There is no record I have seen that *weeds* in playing fields cause increased (ankle) injuries, but that is what synthetic herbicide poison companies/applicators would have you believe. If you are really worried, line the team up with hand-weeders and have them walk the length of the field weeding as they go; the exercise will safely remove all of the weeds, give your players hand-to-eye coordination, toughen their hands, legs and bellies, etc. Bleach, borax, salt, urea, potash, calcium nitrate, herbicidal soaps, boiling water, flames, vinegar and gasoline are all herbicidal. We do not recommend the use of gasoline or petroleum oils. Cover the areas you want permanently “weed free” with porous plastic mats or geotextile fabric which are then covered with bark or stones, or use asphalt, astro turf or concrete. On the other hand, in California alone, glyphosate (the active ingredient in Round-Up and Rodeo) has been linked to more eye, skin and internal injuries as well

as rashes, nausea, swelling of the limbs and joints than any other of the 200 “registered” pesticide poisons used in that state. Weeds do not *injure*, but volatile pesticide poisons do! If your athletic team is tripping on weeds, they may be poisoned or they are very clumsy!

Traditional Pest Control Industry Caution: The Michigan mandate that schools and other public buildings must adopt an IPM program resulted in numerous school systems asking the pest control *industry* to set up alternative pest control programs for them that would bring them into compliance with Regulation 637. The mandate’s intended purpose was to avoid needless exposure to dangerous, “registered” pesticide poisons. In spite of the intended purpose, members of the poison *industry* have told “some” school systems that they will simply spray the volatile poisons at night so no one will ever know, or they can legally spray aerosols (while the kids are in school) that contain the same volatile, synthetic pesticide poisons! **Poison applicators apply volatile, “registered” poisons - that is what they do - do not expect “them” to use alternative (IPM) controls. Even if poison applicators are on some “environmental IPM” list, do not trust them.** The Healthy School Handbook notes in Chapter 21, “Legal Aspects of Pollution in Schools”, “Your school may be using toxic herbicides to rid a lawn or playing field of weeds. These chemicals (poisons) present a significant risk to maintenance personnel, other staff members and students. Most such chemicals (poisons) are cosmetics, not necessities. They pollute the ground water and may be harming migratory birds and interfering with your local ecosystem, regardless of what the producers and distributors who profit from selling or applying them may say. Further, the use of highly toxic, volatile herbicide poisons on school grounds poses so many needless risks (and so few real benefits as to be entirely unreasonable....they may even be lowering your performance test results and increasing your litigation and health problems. Chemicals, e.g., volatile, synthetic, pesticide poisons are indiscriminate killers (biocides) that destroy beneficial insects, earthworms, microorganisms and/or deter birds. **Just do not use these dangerous and useless “registered” poisons!**

If you were to closely examine one square yard of your garden/lawn you probably could find over 2,000 insects, everything from microscopic springtails to nematodes to scale to beetles to butterflies, etc. Most of the insects you find are extremely beneficial to you and your plants and necessary to the economy of nature and the food chain. There are over 4 million insects on each acre of earth. Insects make up the class Insecta or Hexapoda (meaning 6-legged) of the phylum Arthropoda (meaning joint legged). Any small backboneless animal (invertebrates) with 6 jointed legs is an insect. Mites and spiders have jointed legs but they have 8 not 6 legs - they belong to the class Arachnida. Centipedes belong to the class Chilopoda and millipedes to the class Diplopoda. All are in the phylum Arthropoda. The insect class is further divided into 26 orders and each order contains one or more families. Insect bodies are all encased in exoskeletons or rigid shells, as they feed, they grow and their coat becomes too tight, so they must stop eating, rest and molt. They molt by splitting open their old shell with a little enzyme “zipper” - the insect crawls out with a new shell and feeds again until it needs to molt again. Insects increase in size gradually by molting. The form of the insect between each molt is called an instar. Most insects pass through 3 to 6 instars. Diluted enzyme cleaners literally digest insects and/or “unzips” them and causes insects to prematurely molt before they can form new shells - so they all quickly die when sprayed with these natural “zippers”. Diluted enzyme cleaners do not attack most plants or inorganic materials, e.g., rubber, plastic, nylon, glass, ceramic materials, etc. Wood and high cellulose products generally undergo slow digestion. They are non-caustic and considered to be non-poisonous to pets, people and/or fish. Diluted enzyme cleaners are environmentally safe, containing biodegradable components that cause no problems with residual toxicity in the environment. Diluted enzyme cleaners are catalytic in action and do not accumulate in ground water aquifers. Concentrated acids or bases can destroy enzymes. Diluted enzyme cleaners help reactivate septic as well as aerobic sewage treatment systems and help stabilize the pH problems these systems might have in oxidizing certain organic acids. Diluted Safe Solutions, Inc. Enzyme Cleaners also digest most lawn diseases and fungi problems. Diluted enzyme cleaners are truly natural pestisafes® or beneficial organisms that quickly and safely control many pest problems.

The benefits of a chemical-free lawn include better health for your family, neighbors and pets; your lawn will actually learn (after a little time) how to take of itself, saving you time and money. Grass grows slower, needs less mowing and watering because it will have longer roots, and because microorganisms will again make it healthy and unlock the nutrients in your soil; your lawn will better be able to withstand environmental stress, pests, disease and the weather conditions. All plants contain natural compounds that make them resistant to pests. Healthy, strong plants resist pests, disease and stress better than sick, weak plants.

Natural Resistance. Thick, waxy coatings on leaves usually prevent fungal diseases as the pathogen is unable to penetrate the waxy layers; some plants have leaf hairs that make it impossible for water to accumulate on the leaf so diseases, e.g., blackspot, are not a common problem. Health plants resist pests and disease naturally.

Maple Trees and Dandelions - Silver or sugar maple leaves contain a natural herbicide that stops 70% - 80% of dandelions from germinating, even on deliberately abused turf - where the grass was cut too short, starved for water and organic fertilizers and actually sown with dandelion seeds. So this fall mulch maple leaves into your turf to reduce your dandelion crop next year.

Phytotoxicity Caution: Even pestisafes®, e.g., Safe Solutions Enzyme Cleaner with Peppermint, may cause injury to certain plants. It is a good practice to water/irrigate plants for several days before spraying. Spraying when there is a shortage of moisture may injure plants. Other conditions which may cause injury may vary considerably depending upon temperature, humidity, direct sunlight, plant species and/or other environmental factors.

All flesh is grass. Isaiah 40:6. Remember this when you think about applying herbicide poisons. — S.L.T.

If...

Rudyard Kipling

If you can keep your head when all about you
Are losing theirs and blaming it on you,
If you can trust yourself when all men doubt you,
But make allowance for their doubting too;
If you can wait and not be tired by waiting,
Or being lied about, don't deal in lies,
Or being hated, don't give way to hating,
And yet don't look too good, nor talk too wise:
If you can dream - and not make dreams your master;
If you can think - and not make thoughts your aim;
If you can meet with Triumph and Disaster
And treat those two impostors just the same;
If you can bear to hear the truth you've spoken
Twisted by knaves to make a trap for fools,
Or watch the things you gave your life to broken,
And stoop and build 'em up with wornout tools:
If you can make one heap of all your winnings
And risk it on one turn of pitch-and-toss,
And lose, and start again at your beginnings
And never breathe a word about your loss;
If you can force your heart and nerve and sinew
To serve your turn long after they are gone,
And so hold on when there is nothing in you
Except the Will which says to them: 'Hold on!'
If you can talk with crowds and keep your virtue,
Or walk with kings - nor lose the common touch,
If neither foes nor loving friends can hurt you,
If all men count with you, but none too much;
If you can fill the unforgiving minute
With sixty seconds' worth of distance run -
Yours is the Earth and everything that's in it,
And - which is more - you'll be a Man my son!

Disease	Symptoms	Conditions	Control	Resistant Grasses*
Brown patch, also called summer patch or Rhizoctonia blight. <i>(Rhizoctonia solani)</i>	A “frog’s eye” - large, irregular or circular, up to 2’ across, dark, wet-looking, initially light yellow-green becoming brown (as the grass dies) patches of various sizes surrounded by a discolored ring of grass. The border may turn purple. St. Augustinegrass is particularly vulnerable. Try using new biotechnology tools, e.g., mono- and polyclonal antibodies.	Common during hot, humid weather. Highly fertilized and overwatered lawns and golf greens are most susceptible.	Improve drainage by top-dressing lawn with organic matter to loosen soil. Make sure you’re not adding too much nitrogen or water to the soil. In high humidity, try removing dew by dragging a garden hose over the lawn in the morning. If the soil is chronically waterlogged, consider installing drainage tiles. Increase phosphorus and potassium levels. Mow the grass high and remove clippings. Use flowable sulfur fungicide or a sulfur-based fungicidal or diluted enzyme cleaner every 3 - 5 days until the symptoms beginning to disappear. Remove thatch. Consider reseeding with perennial ryegrasses and tall fescues that resist brown patch.	Perennial ryegrasses ‘Allstar’, ‘Barry’, ‘Citation’, ‘Delray’, ‘Manhattan II’, ‘Palmer Pennant’, ‘Prelude’, ‘Premier’ and Yorktown II. Tall fescues ‘Brookston’, ‘Jaguar’, ‘Mustang’ and ‘Olympic’. Check with your local CES.
Copper spot	The lawn is covered with penny-sized, copper-colored patches that eventually enlarge to cover huge areas.	Fungus disease most active in rainy weather when temperatures are between 50° - 75° F.	Properly fertilize your yard. See if the soil is too acidic, add lime. Use a fungicidal soap or diluted enzyme cleaner or baking soda.	Ask your local CES agent.

***All plants contain compounds that make them resistant to pests - Some “regulators” believe that under FIFRA anything that mitigates pests is a “pesticide”; based on this ‘logic’ all plants (especially all of the resistant ones) will have to become EPA “registered” pesticide poisons too!**



“It is common sense to take a method and try it; if it fails, admit it frankly and try another. But, above all, try something.” — Franklin D. Roosevelt

Note: Resistant grasses are cultivars that contain endophytes. Endophytes are fungi that live within grass plants and produce chemicals that kill or repel certain chewing insect pests. The endophytes are located in the above ground portions of the plant, and are effective against pests such as webworms, cutworms and chinch-bugs that feed on the foliage. Endophyte containing cultivars tend to withstand environmental stresses better than grass plants with no endophytes. Researchers are working on trying to add endophytes to Kentucky blue-grasses which would be a major advancement for IPM. Storage of endophyte-containing grass seeds at high temperatures and humidity can kill the endophytes. For best results, buy fresh seeds and use them soon after purchase. Caution: Endophyte fungi can be harmful when consumed by livestock, so this type of grass should not be used as forage (pasture).

Clipping Comment: Each year degrading clippings (if left on your yard) can provide 4 pounds of nitrogen, 1 pound of phosphorus and 2 pounds of potassium per 1,000 square feet! If you remove yours, you can expect to increase your fertilization costs 25% - 50%.

Intelligent Pest Management® Pest Problem Comment: The main reason there are pest problems on lawns and/or landscapes is very simple: Most people create very unnatural plant and animal communities around their homes. Nowhere in nature does only one plant grown in large areas, yet most lawns are basically a monoculture where only one type of plant/grass is grown in a large area. Consider allowing a few weeds to grow where the grass refuses to grow, or using tires, ground covers, shrubs or wild (native) flowers as an alternative to your boring grass area. Mow with sharp blades - more grass is killed by mowers and/or weed eaters than insects and fungi. Overwatering attracts insects and fungi to your lawn. Standing water will attract weeds. Water grass only when necessary to increase root growth which in turn helps your grass smother and/or choke weed sprouts out. Too much water actually stops roots from growing and endangers the plant.

Disease	Symptoms	Conditions	Control	Resistant Grasses
Dollar spot, also called scerotium rot. (<i>Lanzia</i> and <i>Moellero-discus spp.</i> formerly <i>Sclerotina</i>)	Small, round, brown to tan spots with a bleached center and brown margin. Individual blades are girdled by light tan lesions with reddish-brown borders; spots are about the size of a half-dollar that later blend together into irregular, straw colored patches of dead grass. Between the tan or bleached band and healthy tissue you should find a thin, brown border. Apply Chilean nitrate only if needed and/or mono- or poly-clonal antibodies in kit form or Safe Solutions, Inc. Enzyme Cleaner.	Appears usually during summer. Most active between 60° - 85° F. days and cool nights in humid weather. Usually seen on golf greens. Most active and damaging if there is too little or too much nitrogen in the soil.	Regular deep and infrequent watering in early part of day during early and late summer. Remove thatch and rake vigorously. Fertilize lightly, especially with a seaweed extract, which will add nitrogen. Don't use synthetic fertilizers, which tend to acidify the soil. Test pH and add lime if necessary. Mow infected tips at a higher height and throw away clippings. Apply flowable sulfur or a sulfur-based fungicidal or diluted enzyme cleaner (1 oz. per gallon) every 3 - 5 days until symptoms begin to disappear. Consider reseeding with a Kentucky bluegrass, perennial ryegrass, or fine fescue that resists dollar spot.	Fine fescues 'Agram', 'Barfalla', 'Biljart', 'Checker', 'Encota', 'Famosa', 'Koket', 'Reliant', 'Scaldis', 'Shawow', and 'Tournament'. Kentucky blue grasses 'Adelphi', 'America', 'Aguila', 'Arista', 'Bonnieblue', 'Bristol', 'Eclipse', 'Galazy', 'Majestic', 'Midnight', 'Newport', 'Palouse', 'Parade', 'Park', 'Pennstar', 'Prato', 'Primo', 'Sodco' and Windsor'. Perennial ryegrasses 'Barry', 'Capper', 'Caravelle', 'Citation', 'Dasher', 'Ensporta', 'Exponent', 'Linn', 'Manhattan II', 'NK 100 or 200', 'Regal', 'Rex', 'Sprinter' and 'Venlona'. Check with your local CES.

Disease	Symptoms	Conditions	Control	Resistant Grasses
Downy mildew or yellow tuft	Tufts of stunted, thick, yellow grass blades appear scattered over the lawn.	Fungus disease active in cool humid climates. The fungus spores spread in water.	Apply a fungicidal soap. Do not water. Mow only when dry. Spray diluted enzyme cleaner.	Check with your local CES.
Drechslera leaf spot (Melting out) (Drechslera sativus, formerly Helminthosporium sativum)	Gold patches with red-brown to black edges. Then stems and roots discolor, turning into mushy spots.	Appears during cool, moist weather of spring or fall. Too much nitrogen or water or mowing too low may encourage it.	Avoid nitrogen applications in hot weather. Water deeply and only occasionally. Mow high frequently and throw away clippings. Remove thatch. Spray diluted enzyme cleaner.	Kentucky blue grasses 'Challenger', 'Eclipse' and 'Midnight'. Perennial ryegrasses 'Belle', 'Blazer', 'Cowboy' and 'Ranger'. Tall fescues 'Adventure', 'Brookston', 'Jaguar' and 'Mustang'.

Note: Safe Solutions Enzyme Cleaner with Peppermint with borax and/or baking soda are natural organisms which "eat" or naturally destroy proteins, scale, rot, insects, fungus, plants, mold and garbage; try using them before using any volatile pesticide, insecticide or fungicide. The Author's Wife removed powdery mildew from her phlox using only diluted enzyme cleaner. He believes the application of enzymes at a rate of 1 gallon of concentrate per acre (make 2 applications or more if you have heavy, less permeable clay-type soils) as a **bio-catalytic soil conditioner** will significantly increase water retention/drainage/penetration, availability of nutrients to plants, root growth and aerobic soil microorganisms within 5 days, increase alfalfa and grass yields, and eventually decrease weed growth. Dilute heavily with water when spraying or apply enzymes. Do not apply diluted enzyme cleaner within 2 weeks after fertilizing and do not fertilize until at least 10 days after enzyme application as plants will assimilate too much of the fertilizer and may become damaged or die. **Non-selective "weed" control:** Apply enzyme cleaner with fertilizer, urea, calcium nitrate and/or potash and/or borax or salt water, spray to point of run-off and plants will die - or flame them or "boil" them and they will die. Fungal diseases can also be controlled with olive or canola or vegetable or mineral or neem or essential plant oils, insecticidal or peppermint or natural or lemon Joy® soaps, lime, baking soda, fatty acids, phosphate salts (e.g., potassium dihydrogen phosphate), silica and silicate salts, garlic, vinegar, waxes, botanical extracts and antitranspirants.

Fairy rings (<i>Marasmius oreades</i>)	In spring, circular, dark, lush green rings or "horseshoes" form a few inches to several feet in diameter. Mushrooms later appear around them. These rings may crowd out grass, but as ring spreads wider, inner grass may grow back. They appear mostly in lawns that have been synthetically fertilized with high nitrogen.	Common in areas where it rains frequently, or atop old, rotting tree roots. Soil dwelling fungi of the mushroom family feed on dead and decaying matter in soil, competing with grass for nutrients.	Aerate the soil as deeply as possible; start 2' outside and work towards the center - then deep soak every other day. Remove thatch, which encourages fungus to grow. If necessary, dig out turf and soil 2' down and about 1' beyond circle. Mow frequently and remove the clippings and mushrooms. Spray diluted enzyme cleaner.	None.
---	---	--	--	-------

Disease	Symptoms	Conditions	Control	Resistant Grasses
Fusarium patch (<i>Microdochium nivale</i> , formerly <i>Fusarium nivale</i>)	Circular water-soaked spots on leaves fade from purple to white as they grow. May have pink mold.	Usually appears in cool, moist weather during fall or spring.	Do not apply a lot of nitrogen or lime in fall. Remove thatch. Increase air circulation and drainage. Try spraying diluted enzyme cleaners or peppermint soap.	Perennial ryegrass 'Barenza', 'Diplomat', 'Eton', 'Game', 'Lamora', 'Manhattan', 'NK 200', 'Norlea', 'Omega', 'Pelo', 'Pennfine', 'Sprinter' and 'Wendy'. Fine fescues 'Barfalla', 'Bijart', 'Jade', 'Jamestown', 'Koket' and 'Scaldis'. Kentucky bluegrasses 'Adelphi', 'Admiral', 'Birka', 'Bonnie-blue', 'Fylking', 'Glade', 'Lovegreen', 'Nassau', 'Shasta' and 'Victa'.
Fusarium blight (<i>Fusarium culmorum</i> and <i>F. tricinctum</i>)	Tan marks beginning at tip of blade. Lawn has dull, reddish-brown circular patches turning to yellow or bleached tan.	Appears during hot, humid summer temperatures over 75° F., frequently on grass under stress. High nitrogen and low calcium encourage the disease.	Aerate by coring. Avoid fertilizing during later spring to early summer. Mow high and frequently and throw away clippings. Remove thatch. Water deeply if needed and keep pH above 6.2. Try diluted enzyme cleaners.	Kentucky bluegrasses: 'Abel I', 'Adelphi', 'America', 'Columbia', 'Glade', 'Majestic', 'Monopoly', 'Midnight', and 'Parade' or try 'A-34', 'Bonnie-blue', 'Sydsport' and/or 'Touchdown'.

Note: Recent research has shown the actual cause of this disease is a fungus called *Leptosphaeria* and not *Fusarium*; therefore, the correct name for this disease is Necrotic Ringspot.

Leaf spot, also called helminthosporium disease or foot rot or melting out. (<i>Drechslera</i> spp.) See <i>Drechslera</i> leaf spot.	Leaf spot, or melting out, is partial to bentgrasses, Kentucky bluegrass and fine fescues in the southeast, midwest, southwest and plains states. Diseased areas are yellow or dappled green.	Irregular patches of dead, reddish-brown, thin grass and oval or round, red-brown to purple-black spots on the leaf blades. This fungus occurs primarily when it is humid, temperatures are not too moderate and the lawn is overwatered or fertilized. Look in shaded areas first.	Avoid heavy application of nitrogen fertilizer, especially in hot weather. Water only if absolutely necessary and then only in the early a.m. Consider reseeding with a perennial ryegrass, tall fescue or the fescue that resists leafspot. Try flowable sulfur, lime sulfur (only after rain), a sulfur-based fungicidal or diluted enzyme cleaners or a copper fungicide or baking soda (only during warm, dry weather).	Fine fescue: 'Reliant'. Kentucky bluegrass: 'Bonnieblue', 'Challenger', 'Eclipse', 'Fylking', 'Georgetown'. 'Majestic', 'Midnight' and 'Nassau'. Perennial ryegrass: 'Belle', 'Blazer', 'Cowboy' and 'Ranger'. Tall fescue: 'Adventure', 'Brookston', 'Hounddog', 'Jaguar', 'Mustang' and 'Olympic' and the Tiflon Turf Bermuda hybrids. Check with your local CES.
--	---	---	---	---

Note: Safe Solutions Enzyme Cleaner with Peppermint with borax and/or baking soda are natural organisms which “eat” or naturally destroy proteins, scale, rot, insects, fungus, plants, mold and garbage; try using them before using any volatile pesticide, insecticide or fungicide. The Author’s Wife removed powdery mildew from her phlox using only diluted enzyme cleaner. He believes the application of enzymes at a rate of 1 gallon of concentrate per acre (make 2 applications or more if you have heavy, less permeable clay-type soils) as a **bio-catalytic soil conditioner** will significantly increase water retention/drainage/penetration, availability of nutrients to plants, root growth and aerobic soil microorganisms within 5 days, increase alfalfa and grass yields, and eventually decrease weed growth. Dilute heavily with water when spraying or apply enzymes. Do not apply diluted enzyme cleaner within 2 weeks after fertilizing and do not fertilize until at least 10 days after enzyme application as plants will assimilate too much of the fertilizer and may become damaged or die. **Non-selective “weed” control:** Apply enzyme cleaner with fertilizer, urea, calcium nitrate and/or potash and/or borax or salt water, spray to point of run-off and plants will die - or flame them or “boil” them and they will die. Fungal diseases can also be controlled with olive or canola or vegetable or mineral or neem or essential plant oils, insecticidal or peppermint or natural or lemon Joy® soaps, lime, baking soda, fatty acids, phosphate salts (e.g., potassium dihydrogen phosphate), silica and silicate salts, garlic, vinegar, waxes, botanical extracts and antitranspirants.

Note: The September 1994 issue of the Landsculptor noted that the annual expenditure just for maintaining turfgrass in the U.S.A., including labor but excluding capital expenses, was estimated to be \$45 billion for 1993! BIZ, a Dow Jones & Company, American City Business Journals publication, ranked the Landscape and Horticultural Services Industry as the No. 3 growth industry that had 269,200 employees in December, 1992 and 305,800 employees in December, 1993, or an increase of 13.6%. In just one hour a running gasoline-powered lawn mower emits pollutants equivalent to a car driven 350 miles! Lawns are the largest users of our resources like water, maintenance (time and/or money) and chemicals. The cost to the homeowners to maintain grassy areas is a lot more expensive than landscaping with native trees, shrubs, flowers and ground covers which attract and feed native wildlife and are basically maintenance free and a whole lot healthier.

Golfing Caution: In 1995, the Ladies Professional Golfers Association noted it recently had four of its members get breast cancer. In 1994, Heather Farr died of breast cancer at 28. She had played golf since childhood and had no other known cancer risk factors. Each golfing acre uses 6 times the amount of pesticide poison than farmers apply on their lands, including the likely cancer-causers 2, 4-D, chlorothalanil and dacthol; unlike migrant workers that have to stay out of *treated* fields for four days and nights golfers can *legally* walk through the spray!

Drift: There was a study done in the sixties in Erie, Pennsylvania; it was proven way back then that grapes 10 miles away were adversely affected by herbicide poisons applied in a 3 mph wind! In September, 1996 a cotton field spraying in Bakersfield, California area sent 24 more workers in an adjacent vineyard to local hospitals - and so *drift* continues...Do you really believe that you and your neighbors will not be harmed?

Patch Test: Always test spray a few infested leaves with your mix to see the pest is controlled and the leaves/plants are not harmed/burned.

How to Use Safe Solutions, Inc. Enzyme Cleaner: This chapter’s use of enzyme cleaner should be normally used at a rate of 1 oz. (or less) per gallon of water. Conduct a patch test first and adjust accordingly.

ALWAYS REMEMBER PEST PROBLEMS ARE THE RESULT OF (NOT THE CAUSE OF) POOR QUALITY TURF CARE, e.g., overfertilization, improper pruning and/or watering! Good soil and healthy plants are naturally pest-free and/or pest resistant!

Disease	Symptoms	Conditions	Control	Resistant Grasses
Necrotic ringspot (Leptosphaeria korrae)	Dead spots or yellow or red leaves on vigorous lawns.	Appears spring to early fall during warm temperatures. Most common established lawns from sod. May only affect roots first, symptoms appear when grass is stressed.	Reduce stress. Water lightly during heat. Mow high and frequently and throw away clippings. Remove thatch. Increase air circulation; fertilize with organic fertilizers 3 times a year.	Perennial ryegrass, fescue. Bluegrasses: 'Abel I', 'America', 'Majestic', 'Midnight' and 'Monopoly'. Ask your local CES agent.
Ophiobolus patch, also called take-all patch	The lawn becomes mottled with rings of dead brown grass. Eventually the rings enlarge and merge. Within the rings the blades first become bronze-red, then turn brown.	Fungus symptoms first appear in the spring, especially in bentgrass lawns, becoming most severe following periods of hot, dry weather in mid-summer, especially in alkaline soils.	Do not plant bentgrass. Lower the soil's pH with an acid fertilizer. Try diluted enzyme cleaners or baking soda.	Call your CES agent. Try less susceptible bluegrass and fescue varieties.
Powdery mildew (Erysiphe graminis)	White to gray fuzz or powder over yellow or brown leaves and/or withered grass. Lawn is a dusty white; white "bloom" rubs off easily. Stunts plants.	Appears during cool, damp nights and when days are hot and humid and in shady conditions. High nitrogen and poor air circulation encourage it. Spray water on the foliage to discourage this pathogen. Put infected plants in the sun or destroy them.	Reduce shading, improve air circulation. Mow frequently. Fertilize moderately. Water in morning. Mow high frequently and throw away clippings. Use diluted enzyme cleaners and baking soda. This fungus can also be controlled with a lime-sulphur spray at temperatures below 80° F. Try spraying with diluted Ivory dish or peppermint soap and vegetable oil.	Fine fescues 'Dawson', 'Fortress', 'Gracia', 'Reliant', 'Reptans' and 'Ruby'. Kentucky bluegrasses 'Aquila', 'Birka', 'Cello', 'Cougar', 'Glade', 'Kenblue', 'Mystic', 'Nugget', 'Palouse', 'Primo', 'Ram I', 'Sodco' and 'Welcome'.
Pythium blight (also called cottony blight or greasy spot) (Pythium spp.)	The lawn is spotted with brown patches of wilted grass blades which later join to form large, irregular, dark, wet-looking streaks. Cotton-like material may be apparent. Dead grass lies flat on ground.	Appears in summer during very hot, humid weather, 85° - 95°F. (night temps no lower than 68°F.) Usually attacks northern cool-season grasses. High nitrogen and low calcium may encourage fungus. Spread by flowing water and mowing.	Difficult to destroy. Add lime if calcium deficient. Avoid evening watering. Improve drainage and air circulation. Remove thatch. Do not overwater or overfertilize. Try a fungicidal soap or diluted enzyme cleaner or mono- and poly-clonal antibodies. Clean mower with 1 oz. per quart of enzyme cleaner after each	None.

Disease	Symptoms	Conditions	Control	Resistant Grasses
Red thread (<i>Laetisaria fuciforme</i>) and pink patch (<i>Limono-myces roseipellis</i>)	The lawn is spotted with circular or irregular reddish-brown patches 2" - 2' across. Red thread causes red or rusty threads at tips of blades. Pink patch shows up as pale pink gelatinous ooze on leaf blades. Overall, both appear as circular patterns of scorched leaf tips.	Related fungi occur during spring or fall, sometimes winter, in cool, wet conditions. Low nitrogen may encourage infestations. Most active at 30° - 60° F. in humid weather.	Add nitrogen. Mow infected tips and throw away clippings. Regular deep a.m. waterings. See if soil is too acidic; if so add lime. Use a fungicidal soap or diluted enzyme cleaner or baking soda or apple cider vinegar.	Fine fescues 'Argenta', 'Atlanta', 'Barfalla', 'Biljart', 'Boreal', 'Cascade', 'Centurion', 'Engina', 'Ensylva', 'Fortress', 'Gracia', 'Grello', 'Highlight', 'Jade', 'Pennlawn', 'Puma', 'Ranier', 'Ruby', 'Scaldis', 'Scarlet', 'Veni', 'Waldina', 'Waldorf' and 'Wintergreen'. Kentucky bluegrasses 'Adelphi', 'Admiral', 'Arista', 'Birka', 'Bonnieblue', 'Bristol', 'Campus', 'Cello', 'Challenger', 'Cougar', 'Delta', 'Dormie', 'Eclipse', 'Geary', 'Georgetown', 'Majestic', 'Monopoly', 'Nassau', 'Newport', 'Palouse', 'Primo', 'Sodco', 'Touchdown' and 'Trenton'. Perennial ryegrasses 'Acclaim', 'Barenza', 'Belle', 'Birdie', 'Blazer', 'Citation', 'Clipper', 'Dasher', 'Delray', 'Derby', 'Diplomat', 'Ensporta', 'Eton', 'Exponent', 'Fiesta', 'Goalie', 'Linn', 'Loretta', 'NI-100', 'NK-200', 'Norlea', 'Perma', 'Player', 'Ranger', 'Regal', 'Score', 'Sprinter', 'Venlona', 'Wendy' and 'Yorktown'.

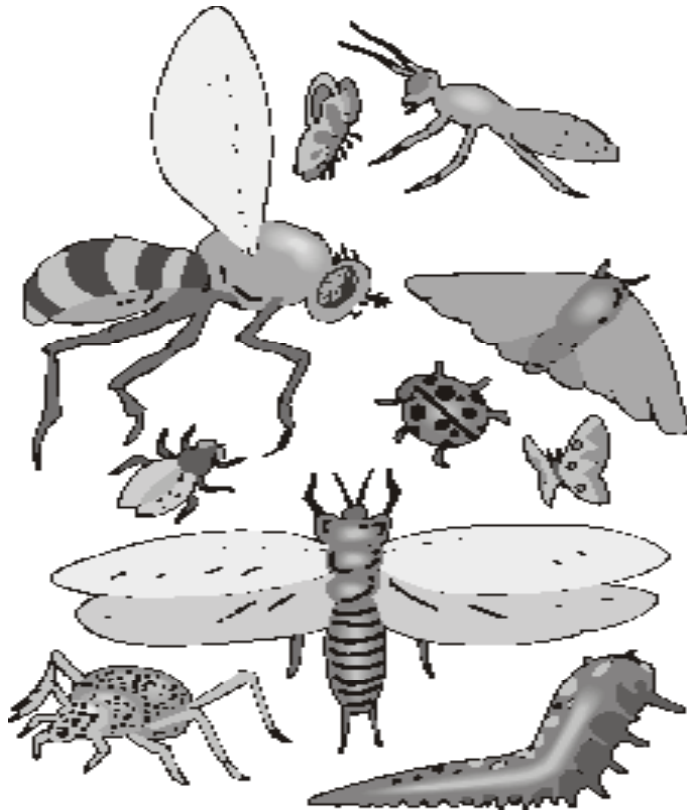
Sartling statistical results were revealed on February 6, 1994 at the Golf Course Superintendents' Association of America's (GCSAA) annual conference held in Dallas, Texas. Golf course superintendents have a higher rate of mortality from lung cancer than the general population, as well higher than average rates of mortality from brain cancer, non-Hodgkin's lymphoma, cancer of the large intestine and prostate cancer. The death certificates of 618 former GCSAA members who died between 1970 and 1992 were gathered for the study. Of the 618 deaths studied, 179 were related to cancer. Smoking-related deaths only account for 39% of these deaths. However, non-Hodgkin's lymphoma and brain cancer, both of which are normally uncommon cancers and have been associated with pesticide exposure, occurred at above average levels among the deceased superintendents as well. Approximately 18 pounds of volatile, synthetic pesticide poisons per golf course acre are applied annually.

Golf course putting greens receive more "registered" pesticide poison applications than any other turf grass site. Most repeated spraying of volatile poisons is done to the greens to control black cut worms! Simple mowing and removing the clippings will control this pest!

CAUTION: All of the resistant grass varieties can change yearly, so call your local CES Agent for current local varieties and advice. It usually is advisable to plant a blend or mix of several grass species, e.g., fine fescue or perennial rye grass and bluegrass seed. The fine fescue or perennial rye grass will dominate in the shady areas where bluegrass will die out. Other grass varieties are adapted to droughty conditions, e.g., smooth brome grass and tall fescue. All conditions including soil, temperature, rainfall, irrigation, shade, pests, etc. should be considered before choosing your proper mix or blend. **Note: We have found and many organic growers report that seaweed and fish emulsion sprays and/or diluted Safe Solutions, Inc. Enzyme Cleaners can prevent fungus and insect problems.** Mix 3 tablespoons of natural apple cider vinegar to a gallon of water and spray this mix during the cool part of the day to control fungal diseases, e.g., black spot on roses, or try using baking soda or hydrated lime or diluted enzyme cleaner as a fungisafe.

Bug Juice Spray. Bug Juice can be made with 1 cup of bugs to 4 cups of water - Put in a blender and liquefy bugs/water - strain "juice" through cheesecloth, put "concentrate" in sprayer and add 4 - 8 parts of water - spray both sides of foliage. The "spray" will last until a heavy rain. Leftover "concentrate" can be frozen until needed. Try preventing pests on plants with garlic spray.

Carbon Dioxide. CO₂ is one and a half times heavier than air and can be "poured" into tunnels, galleries, nests, etc. to quickly and safely kill the occupants. This "fumigant", however, will not poison the air or soil or water.



Disease	Symptoms	Conditions	Control	Resistant Grasses
Rust (<i>Puccinia</i> spp.)	Rusty bumps on leaves and stems which rub off easily. Blades are first mottled with powdery rust-colored or yellow-orange spots, then turn yellow or brown, then wither and die.*	Occurs during hot, dry weather of late spring or early fall when extended dry periods slow growth of grass. Humidity, overwatering, too much shade, inadequate drainage, heavy dew, stress or nitrogen deficiency may encourage infection. Severely rusted lawns are vulnerable to winterkill.	Avoid stressing turf. Fertilize organically regularly. Water deeply and occasionally during morning. Mow high frequently and destroy clippings. The orange powder consists of fungus spores, spread easily in the wind and/or are kicked up when you water or heavy rains hit. Spray diluted enzyme cleaner or peppermint soap and baking soda or apple cider vinegar.	Kentucky bluegrass 'Aquila', 'Arista', 'Bonnieblue', 'Columbia', 'Delta', 'Enoble', 'Geavy', 'Georgetown', 'Glade', 'Majestic', 'Merion', 'Palouse', 'Paradise', 'Park', 'Pennstar', 'Prato', 'Primo', 'Rugby', 'Sodco', 'Trenton' and 'Windsor'. Perennial ryegrass: 'Delray', 'Eika', 'Ensporta', 'Fiesta', 'Prelude' and 'Wendy'.

*Rust is usually host specific. To tell the difference between rust and another fungus, rub the spots with your finger. If yellow-orange spots appear on your finger, it's probably rust; if, however, the spores are dark, it probably is one of several hundred types of fungus. Fungus disease takes days or even weeks to show up, whereas bacterial or viral diseases strike very quickly, often in a day or two. Fungal infestations are usually more of an aesthetic problem than a life-threatening one. Spray with diluted Safe Solutions, Inc. Enzyme Cleaner. The worst time to water is in the evening. Leaves that stay moist all night are more vulnerable to fungus attack. Do not overfertilize; too much succulent growth will actually encourage and promote fungi. Prune back trees to allow more light penetration. Promote good air movement by making sure your plants are not overcrowded. If a plant dies, examine the roots and the soil surrounding them. A bad odor usually means the soil was kept too wet. Limited root development may indicate the same, or lack of water.

St. Augustine decline (SAD)	Patches of St. Augustine grass acquire a yellow cast. Inside the patch grass blades are mottled with yellow. Eventually the entire yard turns yellow and begins to thin out.	A virus disease transmitted to healthy grass by green bugs and other aphids and by diseased clippings carried about by mowers and the like.	Control green bugs and other aphids. Clean mowing tools thoroughly after each use. Burn or bury all clippings. Reseed. Spray diluted enzyme cleaner or peppermint soap.	Disease-resistant varieties of St. Augustine, e.g., 'Floratum'.
Septoria leaf spot (or tip blight)	Damage resembles that caused by a dull mower; grass blades are light yellow from tip downward with black dots, small lesions; 1/8" long with red or yellow margins.	A fungus disease active in cool, wet weather of spring and fall.	Control by maintaining a vigorous, healthy lawn. Spray diluted enzyme cleaner or baking soda or apple cider vinegar.	Check with your local CES agent.


Caution: Children with soft tissue sarcoma, a type of cancer that destroys connective tissue, were far more likely to have been exposed to volatile, synthetic, “yard-care” pesticide poisons than children without soft tissue sarcoma.

Note: A well fed, vigorous native/resistant plant has more natural defenses against disease, drought and insect damage than a weak plant that is ill-suited to its growing conditions or that has been *treated* with synthetic pesticide poisons and/or fertilizers, artificial chlorine watering and/or synthetic pesticide poisons! Avoid watering at night if at all possible - dark, moist conditions favor disease. If you don't believe me, ask any golf course superintendent how much fungicide poison he applies. Positively and properly identify the cause of the infestation or problem so you can remove the cause rather than *treat* the symptom/pest. Assist your plants in fighting off the pests. The greatest pest infestation in the world could have been easily/safely when it was small. Inoculum is any stage, structure or form of a pathogen that can cause disease. The majority of useful turf cultural controls, e.g., mowing, removing thatch, improving irrigation, air movement, etc. limit (potential) disease inoculum and pest habitat. **If you have some white fly problems, first try giving your plants some magnesium; this may be the only pestisafe® “control” you need.**

Colloidal Silver - Can be used as a spray or drench to control fungal problems and other pests. Be careful to dilute properly; always test a few leaves or plants before you spray or drench the entire yard, tree, vine, plant, etc. **May cause discolorations or permanent stains!**

Disease	Symptoms	Conditions	Control	Resistant Grasses
Smut, flag smut or stripe	Grass is pale green to yellow or brown; long, narrow black streaks or stripes on curled or stunted blades. Brown, thin patches on lawn 2" - 1½" in diameter.	Occurs during cool or moderate weather during spring or fall. Dry, thatched turf is most susceptible.	Mow high frequently and throw away clippings. Fertilize regularly. Water deeply and occasionally. Try diluted Safe Solutions Enzyme Cleaner with Peppermint or baking soda or apple cider vinegar.	Kentucky bluegrass: "A-34, 'Adelphi', 'Admiral', 'America', 'Apart', 'Aquila', 'Arista', 'Aspen', 'Banff', 'Barblue', 'Birka', 'Bonnieblue', 'Bristol', 'Brunswick', 'Campina', 'Campus', 'Challenger', 'Charlotte', 'Cheri', 'Columbia', 'Delft', 'Delta', 'Eclipse', 'Enmundi', 'E noble', 'Escort', 'Geary', 'Holiday', 'Kenblue', 'Lovegreen', 'Majestic', 'Mona', 'Monopoly', 'Nassau', 'Nugget', 'Parade', 'Park', 'Pennstar', 'Plush', 'Ram I', 'Rugby', 'Shasta', 'Sodco', 'Sydsport', 'Touchdown', 'Trenton', 'Vantage', 'Welcome'.
Snow melt/mold (<i>Fusarium nivale</i> and <i>Typhula spp.</i>)	As snow melts the lawn develops patches 2" - 2' across of yellow to tan, dry grass. The grass blades within the patches are matted, pink or grayish-white and may have a "cottony" growth.	There are two types: pink snow mold or fusarium patch and gray snow mold also called typhula blight. Both occur in winter and spring when the soil remains wet from melting snow. Most severe in low areas and north slopes.	Do not fertilize with nitrogen in fall. See fusarium patch and typhula blight. Try spraying a diluted enzyme cleaners or baking soda or apple cider vinegar.	Use winter hardy grasses, e.g., creeping red fescue or a resistant Kentucky bluegrass.
Summer patch (<i>Magna porthepoeae</i>)	Dead patches, then brown rings around healthy grass.	Occurs in hot, humid summers. Encouraged by high nitrogen, extreme pH and shortly cut grass.	Fertilize regularly. Improve drainage. Water lightly during heat. Mow higher. Lower nitrogen. Spray diluted enzyme cleaners.	Kentucky bluegrass 'Adelphi', 'Eclipse', 'Georgetown', and 'Monopoly'.
Typhula blight (<i>Typhula spp.</i>)	After snow melts, large patches of white or gray mold.	Occurs in late winter and early spring after cold temperatures and slow-melting snow.	In fall, mow short, throw away clippings and avoid fertilizing. Avoid winter compaction. Melt snow early by covering with ashes or other dark material. Use diluted enzyme cleaners.	Perennial ryegrass cultivar 'Regal'.

CONTROLLING INSECT PESTS - First try using pestisafes® , Safe Solutions Enzyme Cleaner with Peppermint in water. Remember, all insects are not pests - most are beneficial, so protect and do not kill them. True IPM does not mean “business as usual” (synthetic pesticide poisons), but is a strategy that focuses on long-term prevention or suppression of pest problems with minimum impact on human health, the environment and/or beneficial organisms.

Insect	Symptoms	Description	Cause	Control
<p>Aphids Note: Many aphids are named for a food preference. Commonly called plant lice.</p>  <p>(From U.S.D.A.)</p>	<p>Grass yellow-orange, leaves curl, wither or become distorted. Plants are stunted. A clear, shiny substance (honeydew) from the anus appears on leaves and stems. The substance makes leaves sticky and can support a black fungus called sooty mold that blocks light from leaves. Peach aphids carry more than 100 harmful viruses.</p>	<p>Aphids (green, red, black, purple, yellow or brown) 1/8" long, appear in clusters on leaves, stems and buds. Pear-like in shape with long antennae and a pair of tubelike appendages called cornicles project from the back end. A winged aphid holds its wings vertically when at rest.</p>	<p>Aphids suck sap from the plant, spread viral diseases, cause galls to form, leaf curl or drop, discoloration or distortion, withering and a general loss of vigor. At least 2 - 3 generations per season. The more nitrogen fertilizer you use, the more aphids you produce. Use Herbruck's Nature's Supreme 2-5-3, Nutri-Plus 10-3-4 and/or Pelleted Poultry Manure 4-3-2 fertilizer and spray with Safe Solutions, Inc. Enzyme Cleaners.</p>	<p>Routinely pressure wash the plants and dislodge the aphids. Spray with Bug Juice or pureed (in a blender) aphids. Rub leaves together between thumb and forefinger. Release lady bugs and other predators, e.g., green lacewings, hover flies and/or parasitic wasps. Sprinkle wood ashes. Aphids can be knocked off plants with a strong stream of water. Control with many different biologicals (or wasps in the broad sense), soapy water, diluted lemon juice or Safe Solutions, Inc. Enzyme Cleaner or Peppermint Soap, diluted and/or neem. Mow the lawn every 2 - 3 days. Blend some lamb's quarters or 8 tomato leaves in 2 cups of water to kill aphids.</p>

Note: The tiny, wingless aphids that hatch from eggs in spring are all female. A complete aphid life cycle takes only 10 - 14 days. They can spend their entire life on the same plant on which they were born. These (stem mothers) reach maturity within a few days and begin bearing daily as many as 7 live young parthenogenetically (without fertilization). All these babies are females also, and so it continues until fall. Near the end of the season, a few winged males (without mouths) are born, breed and the (winged) females lay eggs again for next season. Aphids are clearly the most destructive plant-eating insects and they are probably the easiest to control. If all the aphids born in in one year survived, they would cover the earth with a mass 100 miles high! Praying mantises, spiders, lady bugs, aphid lions (the larvae of green lacewings), hover flies, wasps, chickadees and house wrens love to eat aphids. Plant Queen Anne's lace to attract wasps and marigolds to attract hover flies. Other controls are diluted peppermint soap and water, diluted 500 to 1 enzyme cleaner, lightly dusting with food-grade DE, rotenone (as a last resort), horticultural oils, crushing aphids by hand, or strips of aluminum foil (shiny side out) placed around the base of plant will repel aphids. Their small size and soft bodies make aphids easier to kill. All aphids feed by sucking the sap of their host. Gum may ooze from feeding wounds. You may find winged and wingless forms feeding on the same plant. Viruses (that cause diseases) may be acquired and then inoculated or transmitted by aphid vectors even during very brief superficial probes lasting only a few seconds. Aphids are attracted to the color yellow, so put out soapy or diluted enzyme cleaner water in yellow bowls or pans or smear petroleum jelly or honey or Tanglefoot on yellow index cards or painted masonite to catch and kill them. There are two main categories of aphids: the polyphagous species which attack a whole range of hosts and the oligophagous species which are confined to a single host and two main wasp (Hymenoptera) families that are parasites of aphids - Aphidiidae and Aphelinidae.

Insect

Symptoms

Description

Cause

Control

Armyworm

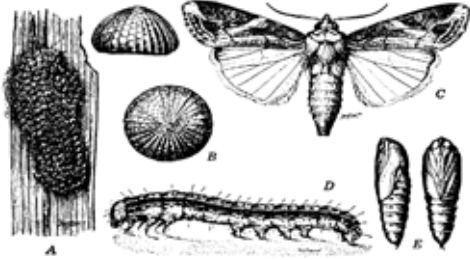
(*Pseudaletia unipuncta* [Hayworth]) and the Fall Armyworm (*Spodoptera frugiperda* [Smith])

May be seen on Bermudagrass. Large, circular or irregular bare patches develop in late summer or fall. Jagged holes appear in the grass blades.

Tan, brown, green or black caterpillar, 1" - 1½" long with yellow and dark stripes. Prominent Y- or V-shaped white mark on black head; usually visible on the grass. Adult is night-flying, 1 - 1½" moth with gray-white mottled wings.

At night armyworms chew the grass blades, often down to the ground. Can be found under brown or dead sod during the day. Spray with diluted or Safe Solutions Enzyme Cleaner with Peppermint

Spray with Bug Juice. Hand-pick and drop in soapy water. Trichogramma and ichneumon and braconid wasps parasitize the eggs and/or the larvae, several Bt (*Bacillus thuringiensis*) products and/or milky spore are effective controls; so are tachnid flies. Apply neem, diluted enzyme cleaner or sabadilla dust at night when all stages are active.



The fall armyworm, *Laphygma frugiperda*. A. egg mass, B. eggs, C. adult, D. larva, E. pupa. (From U.S.D.A.)

Beetles, including Asiatic, blister, chafer, flea, Oriental and Japanese beetles. They are 1/4" - 3/4" long with hard shells.

Attack lawns in a larval stage as white grubs. They eat the roots of bluegrass and fescues anywhere in the U. S. except the Gulf and Plains states, doing most of their damage in the spring and fall. Pull up tufts of grass where the lawn has died and you will see the roots have been cut just below the ground surface.

Irregular patches of slow-growing, yellowing grass and turf that is loose because its roots have been eaten. Cut a foot-square piece of sod 5" deep and turn it over. If you see 10 or more grubs, take action. Improve the soil quality. Minimize artificial irrigation.

Attract birds, natural enemies, with berry bushes, trees and feeders. Plant wildflowers to lure parasitic insects, and enemies. Apply milky spore disease, a biological control for grubs. Nematodes attack while "swimming", so pour them on damaged areas with a watering can. Don't use beetle traps, which can attract more than they kill. Use milky spore disease (*Bacillus popilliae*) or Bt and/or spray with Safe Solutions Enzyme Cleaner with Peppermint.

Raise the pH - beetle larvae dislike alkaline soil. Remove dropped fruit. Beetles flourish on poorly nourished grass, so properly feed and water it. Neem tree extract oil repels adult beetles and kills grubs. Diluted enzyme cleaner with peppermint, pyrethrum/ pyrethrins and insecticidal soaps kill adults but may kill their enemies too. So apply only when needed. Poisonous plants, e.g., Four-O' Clocks, Jimson-weed (*Datura stramonium*), dwarf, red buckeyes and delphiniums, will attract and poison Japanese beetles but they are toxic to people and pets as well. Plant garlic among roses, fruit trees and berry bushes to deter beetles. Cultivate soil deeply in winter and spring to kill or expose grubs to birds. Hand-pick adults. Invite robins, starlings and flickers to eat the grubs. Cardinals and catbirds will eat the adults. Use organic fertilizer.



(From Connecticut Agricultural Experiment Station)

Note: To make a natural, safer but still toxic, bug spray, boil 1/4 cup of quassia (*Quassia amara*) chips in 1 gallon of water for 2 hours. Note: The bark of the Tree-of-Heaven (*Ailanthus altissima*) also has very similar toxic chemicals to the quassia. Quassia is poisonous to aphids and caterpillars, but harmless to ladybugs and bees, or blend 1 clove of garlic, 1 tablespoon cayenne and 1 onion in 1 quart of water plus 1 tablespoon of liquid soap. Strain and spray on affected plants. Aphids love nasturtiums and will cover these plants allowing you to dispose of them easily. Nasturtiums are known to deter squash bugs and striped pumpkin beetles. Marigolds ward off Mexican bean beetles. Planting sage with rosemary among carrots and cabbage keeps flies and moths away. Mint planted around cabbage will also deter moths. Grow garlic around rose bushes and tansy around peach trees to keep them bug free. First try spraying any insect pests with dish soap and water and/or diluted Safe Solutions, Inc. enzyme sprays. The trash Tree-of-Heaven (*Ailanthus altissima*) is the most rapidly growing woody plant in many areas. This tree/bush can be virtually seen thriving in sidewalk and alley cracks, vacant lots and sewer grates from Massachusetts to Oregon. Sprouts 12' long are not uncommon where one of these trash trees has been cut down. Immune to dust, exhaust and smoke, these trash trees thrive everywhere. The bark of the *Ailanthus altissima* contains a natural herbicide or chemical called ailanthone which will kill seedlings as efficiently as to the dangerous herbicide poisons which persist far longer in the soil. Since 1959 we have known this tree produces a compound toxic to other plants and it has been called a "killer tree". The toxin may also control insects and microorganisms; try spreading shredded bark from the Tree-of-Heaven where you do not want plant or insect activity.

Insect	Symptoms	Description	Cause	Control
Billbugs , at least 8 species	Most lawns are attacked, especially Kentucky bluegrass, Bermudagrass and zoysiagrass. Grass is easy to pull up. Damaged areas are brown or yellow circular patches appear in June and July. "Circles" are a few inches across initially but can expand to several feet of turf. Peel back a piece of sod - if you see more than 10 larvae per square foot, take action.	Adult is brown or gray weevil with large "bill" or snout; 1/5" - 3/4" long. Larva is white, fat and wormlike, with bright brown-orange/yellow heads and a black blotch on their backs; 5/8" long. Larvae look like puffed wheat. Prefer dry grass. Adults emerge in the fall or May, feed briefly, then hibernate in areas between the lawn and adjacent pavement.	Larvae chew the stems and later feed on the roots, starting just below the thatch and moving downward. More common on dry, stressed grass. Wild hosts such as ragwood, thistle, cocklebur and joepyweed attract them, so destroy these weeds. Try spraying Safe Solutions, Inc. Enzyme Cleaner with Peppermint to repel and control them.	Aerate and water deeply in spring and add organic matter and/or organic fertilizers to reduce stress. Remove thatch. Reseed. Fungal diseases kill adults. Plant-resistant cultivars, e.g., perennial ryegrass or tall fescue. Enzymes and beneficial (predatory) nematodes kill both larvae and adults. Pour them on the lawn along with water. DE or diluted peppermint soap and/or enzyme cleaner controls adults. Milky sport disease (<i>Bacillus popilliae</i>) provides more long-lasting control. Use rotenone, neem or pyrethrins as a last resort.

NOTE: Bluegrass billbug larvae can be controlled by overseeding with endophyte-enhanced perennial rye grasses. These fungi destroy the larvae and remove the necessity of any further control once endophyte-infected plants exceed 40% of the lawn.

Black turfgrass (<i>Ataenius, spp.</i>)	Brown patches on various grasses.	Adult is shiny black beetle; 1/4" long. Grub is curled, white, fat and wormlike with brown head; 1/16" long.	Grubs chew roots. Use organic fertilizer to control all grubs naturally.	Use diatomaceous earth to control grubs. Rotenone kills adults. Pyrethrum, diluted enzyme cleaner or peppermint soap or neem control both.
---	-----------------------------------	--	--	--

Caterpillars (several species)

Jagged holes appear in leaves. May also be chewed or broken off.

Caterpillars are the larvae of moths and butterflies - emerge in spring and hide on the underside of leaves.

Larvae feed on plant growth, especially in the spring.

Hand pick and destroy large caterpillars. Spray *Bacillus thuringiensis* (Bt), a bacterium fatal to caterpillars but harmless to other organisms. One chickadee may eat as many as 500 caterpillars a day. The house wren, mockingbird, warbler, catbird and others also devour these larvae. Try dusting with a flour-salt mixture or spray with sour milk or garlic infusion. Various ground beetles, earwigs and trichogramma wasps eat the eggs. Dormant-oil sprays, insecticidal soaps, Safe Solutions Enzyme Cleaner with Peppermint will quickly control caterpillar pests. Band trunks with Vaseline® or STP® oil treatment or sticky materials like Tanglefoot®. Other predators include braconid wasps and tachnid flies.



**“Death is not the greatest loss in life. The greatest loss in life is what dies inside us while we live.”
— Norman Cousins**

“Love truth, but pardon error.” — Voltaire

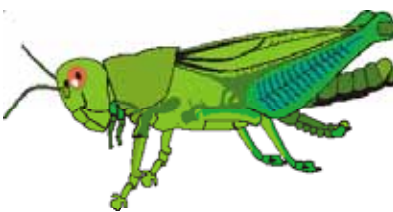

Insect	Symptoms	Description	Cause	Control
<p>Chinch bug, e.g., the Southern (<i>Blissus isivularis</i> - Barber), the Hairy (<i>Blissus leucoptems hirtus</i> -Montandon) and the Chinch bug (<i>Blissus leucopterus leucopterus</i> - Say)</p> <p>Order: Hemiptera Family: Lygaeidae</p>	<p>Look for off-color areas. Kentucky bluegrass, fine fescue, bentgrass, St. Augustinegrass and zoysiagrass often affected. Brown or yellow sunken circular or irregular patches appear, especially in hot, dry weather in areas that receive extensive sunlight. Offensive stinking odor when lawn is walked on. To sample, select a sunny spot along the yellowed area of the lawn, cut off both ends of a large coffee can, push into the soil about 2" and fill with soapy water. If more than 15 bugs float to the surface within 5 minutes, take action. Often become damaging after an insecticide application kills the Big-eyed bugs (<i>Geocoris</i> spp.) that prey on them. Chinch bugs in southern Florida have developed resistance to organophosphates and carbamates. They also encourage weeds in St. Augustinegrass.</p>	<p>Adult is reddish-brown to black with white or brown forewings and brown legs. Malodorous when crushed; 1/5" - 1/6" long. Nymph is bright red with a white stripe across back or black with white spots; 1/5" - 1/4" long. They "hibernate" during winter in dead leaves and grass and other litter. There can be 2 or more generations a year as the life cycle is only 7 - 8 weeks. They prefer hot, sunny lawns, e.g., athletic fields, where frequent application of water soluble inorganic nitrogen fertilizers have been made. During 5 instars, the color changes from red to orange to orange-brown to black. They have needle-like beaks with which they suck juices and inject a toxic saliva that causes the plant to</p>	<p>Adults and nymphs feed on juices of stems and leaves. They prefer hot, sunny areas and frequent weakened or stressed grass. Too much sun, too much thatch, too little irrigation and too much or too little nitrogen and they can destroy a lawn in a few days. Chinch bugs are repelled by soy bean plants. Adults emerge in spring, mate, lay eggs on the grass or soil surface. Discourage them by shading your lawn. Control them by seeding resistant varieties in soil made up of 1/3 builder's sand, 1/3 compost and 1/3 crushed rock. Aerate and fertilize with an organic fertilizer in spring and fall.</p>	<p>Remove thatch and clippings. Clean up your yard in fall. Well fed lawns discourage chinch bugs. Mix one capful of dishwashing soap or diluted enzyme cleaner per gallon of water and drench the problem area. Cover it with a large flannel sheet. The bugs will cling; wait 15 minutes, remove the sheet and scrape the bugs into the trash. Consider reseeding with resistant varieties or cultivars of perennial ryegrass or tall fescue. Shade lawn with trees or shrubs. Reduce stress by heavy watering. Remove thatch. Ladybugs, chickens, a tiny wasp (<i>Eumicrosoma beneficum</i>), a predaceous earwig (<i>Lapidura</i>) adult can eat as many as 50 chinch bugs in one night and black big-eyed bugs and anthocorids all prey on chinch bugs. Diluted peppermint soap or enzyme cleaners are effective. Use neem, sabadilla, several fungus diseases (e.g., <i>Beauveria bassiana</i> and <i>Beauveria globocelifera</i>) pyrethrum or pyrethrins as a last resort. The St. Augustinegrass cultivars "Floralawn" and 'Floritam' are resistant or switch to centipedegrass or 'Baron' or Newport varieties of Kentucky bluegrass or 'Score', 'Pennfine' and 'Manhattan' ryegrasses.</p>
	<p>(From Illinois Natural History Survey)</p>			
<p>Corn Rootworm. Anthony Wenning, 13821 Reed Road, Yorkshire, OH 45388 has found that corn root worm can be safely controlled by applying 10# of floured sulfur per acre. Anthony estimates the cost at \$22 per pound. You can get floured sulfur at a feed elevator.</p>				
<p>Bitter watermelon found to aid in anti-rootworm battle — While the juice from a bitter watermelon would gag most people, researchers have discovered it tastes like a hot fudge sundae to corn rootworms. Scientists have developed a process for extracting the active ingredient along with juice and combining it with a red dye that is deadly to rootworms, but safe for people and animals. In tests in the Summer of 1997, the watermelon/red dye combination was 80% effective in killing rootworms, compared to 70% with conventional pesticides.</p>				

Insect	Symptoms	Description	Cause	Control
Cutworm (several species) Note: Ants are great predators of cutworm eggs and larvae, e.g., <i>Formica schaufussi</i> , <i>Lasius neoniger</i> and <i>Solenopsis molesta</i> .	Usually not a serious problem. Small, closely cropped, elongated or irregular brown dead spots appear, 1" - 2" wide. Beginning in spring and continuing through summer within the affected areas, the grass blades have jagged holes along the edges or are severed at the soil surface. They are the earliest insects to begin feeding.	Adult is a nocturnal moth that usually have 1" - 2" striped or mottled, brown, black, gray or dirty white wings. Grayish to greenish to dirty white to brown, sometimes striped, fat caterpillars or grubs, usually curled; 1" - 2" long. Overwinters in tufts of grass or debris. Larvae are usually visible at the soil surface.	The "worms" or larvae chew young grass blades at base or edges during the night. Try mowing at a low height and disposing of all your clippings. Try spraying Safe Solutions Enzyme Cleaner with Peppermint.	Spray with Bug Juice or flood lawn until it puddles; then hand pick the cutworms and destroy. Clean up any lawn debris and mow closely in fall, throwing away clippings. Beneficial nematodes, chickens and braconid wasps all prey on cutworms. Barriers such as DE or Comet, talcum powder or lime also dehydrate and control populations. Sprinkle corn meal or bran meal on affected areas. Cutworms will eat the meal and die. Bt (<i>Bacillus thuringiensis</i>) controls some species. For severe infestations, treat lawn with pyrethrum or diluted enzyme cleaner at night when worms and moths are active.

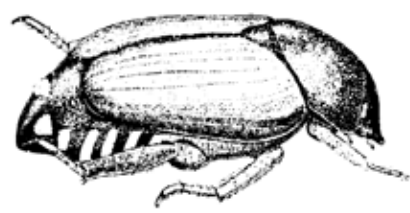
Note: The black cutworm, *Agrotis ipsilon* (Hufnagel) is a serious pest of turf grasses; close mowing several times a week and removing all the grass clippings removes virtually all of the eggs; eggs are seldom laid on the basal 75% of the grass leaf blades and/or sheaths. It was determined (by Williamson and Potter, 1997) that nearly all of the eggs deposited by *A. ipsilon* on creeping bentgrass putting greens are laid singly on the tips of the grass blades. a single mowing at conventional mowing heights removed 75% to 97% of the eggs from the putting service. Greens are mowed almost daily so cultural control by disposing of the clippings away from the courses should remove the need for any pesticide poison applications. As a last resort you could spray diluted enzyme cleaner, but there can be no fertilizer applications for 2 weeks prior and/or after an enzyme application. Use a resistant grass cultivar with endophytes.

Monitoring Techniques for Turfgrass Pest Management


1. **Coffee can.** Cut both ends out of a 2- or 3-pound coffee can. Drive one end a couple of inches into the turf; (if you can not drive through the St. Augustine runners, use a knife to cut the circle) then fill the can with soapy water. Wait up to 5 minutes for insects to float to the surface. Add more soapy water as necessary. Check at least 3 - 4 additional places if bugs are not found initially.
2. **Visual inspection.** Get down on your hands and knees, part the grass with your fingers. Look for movement, damage, frass (excrement), insects, parts, cases and/or for fruiting fungal bodies.
3. **White paper.** Remove a small piece of sod; slowly pull the specimen apart over a sheet of white paper and look for organisms.
4. **Soap and water.** Mix 2 tablespoons of liquid detergent in per gallon of water and apply mix to each square foot of turf you wish to inspect. Turf organisms will move quickly to the surface where they die and/or can be detected.
5. **Inspect the lawn every week** during the spring, summer and fall months. Look for off-color (yellowish) areas, especially in portions of the lawn that are not shaded by trees and along sidewalks and driveways.
Note: Pour a little molasses around the base of each plant when the cutworm emerges to feed; it gets stuck, hardens and dies; rain washes away the molasses, so repeat as needed and/or try sprinkling crushed egg shells around the base of the plant or protect each plant stem with newspaper or cardboard.

Insect	Symptoms	Description	Cause	Control
<p>Grasshopper (several species) (Orthoptera: Acrididae)</p> <p>“mene Hiiteen Heinasirkka” is Finnish for “Go away grasshoppers.”</p>	<p>Usually not a problem unless numerous. Fall rototilling exposes eggs to weather and predators. Major pests of crops in arid agroecosystems.</p>	<p>Adult has long body with enlarged hindlegs, large hearing organs on either side of the abdomen. Various colors. Can jump about 3'; if man could jump as well he/she could jump over a 12-story building!</p>	<p>Adults chew blades, sometimes down to ground. They are repelled by hot pepper sprays and diluted peppermint soap. They can be trapped in buried jars (or the 2-liter wasp trap) partially filled with molasses and water. Try using praying mantis or the entom- pathogenic fungus, <i>Beauveria bassiana</i> (Balsamo) to control them, or vacuum.</p>	<p>Spray with Bug Juice or diluted enzymes. A thick layer of compost or mulch prevents many grasshoppers from surfacing in the spring. Handpick in morning while they are less active. Use <i>Nosema locustae</i>, a protozoan parasite, mixed with bran to kill young in spring. Chickens and Guinea hens love to eat them. Cover seedlings with cheesecloth.</p>
				
<p>Greenbugs or aphids Note: See aphids (<i>Toxoptera graminum</i>)</p>	<p>Kentucky bluegrass a favorite. Rust spots or withered areas appear, (patches up to 15 feet across take on an orange cast - then die) especially in shaded areas. Bugs scatter as lawn is disturbed. Grass yellow-orange.</p>	<p>Tiny, yellow to light green, pear-shaped aphid.</p>	<p>Aphids pierce grass blades, then suck plant juices. Prefer shade and other cool, moist areas.</p>	<p>Usually not serious. Many insects such as ladybugs and green lacewings prey on aphids. Diluted peppermint soap and Bug Juice helps to control populations. Use diluted enzyme cleaner. Reduce fertilizer use, especially in shaded areas.</p>
<p>Grub (white), several species</p>	<p>Kentucky and annual bluegrasses, tall and fine fescues or bentgrass may be affected as grubs eat the roots Spongy, brown to yellow-brown irregular patches, especially in areas lighted at night in late summer to early fall. Patches pulled are easily removed and the turf or sod can be rolled back over the spots grubs have been at work. Japanese beetles like to be in the sun as they eat so shade tolerant plants are usually spared.</p>	<p>Larval stage of various beetles, e.g., Japanese, European chafer, Asiatic garden, Oriental and May/June beetles. Curved, fat, white, wormlike, ¼” - 1½” long with yellow or brown heads. Pick beetles by hand in the morning when they are cool and sluggish and drop in soapy water. Cover the ground with plastic or an old sheet and shake the tree and the collect the beetles.</p>	<p>Grubs chew roots. They have a 3-year cycle, so “outbreaks” are reported every third year. The period of adult (Japanese) beetle activity usually lasts 4 - 6 weeks. When they feed or nibble on larkspur they die. Try diluted Safe Solutions Enzyme Cleaner with Peppermint. Irrigate with at least 1 inch of water per week.</p>	<p>Turn up and rake loose turf and expose grubs to birds. If infested, water often and lightly to reduce stress on plants caused by damaged roots. Beneficial nematodes and parasitic wasps will prey on grubs. Milky spore disease (<i>Bacillus popillae</i> and <i>Bacillus lentimorbus</i>) may be an effective long-term control for Japanese beetle grubs. They eat the spores and die. They dislike soil with a high pH, so raise it. For serious infestations, use rotenone or neem oil. Adults can be caught in homemade or commercial traps. Use diluted enzyme cleaners.</p>
 <p>(From Connecticut Agricultural Experiment Station)</p>				
<p>European chafers do not survive well with frequent irrigation.</p>				

Note: The spores of a new sub-species of *Bacillus thuringiensis* (B.t.) strain “Buibui” holds great promise against several species of white grubs. The Author has also been told that Listerine® mouthwash sprayed out of a hose sprayer safely controlled grubs and made the lawn green. Try using diluted Safe Solutions, Inc. Enzyme Cleaner to flood the infected area. Proper organic fertilizer applications will also naturally control grubs.

Insect	Symptoms	Description	Cause	Control
<p>Japanese beetle - Asian native first reported at Riverton, New Jersey in 1916. Now in Michigan, etc.</p>	<p>Spots of dying lawn appear in July through September. They feed on over 300 different plants, especially roses, zinnias, linden trees and purple leaf plums. If you water regularly, you are likely to get infested.</p>	<p>Adult beetle is 1/2" - 3/8" long, shiny metallic green with copper-brown wings and 6 small patches of white hairs along the sides and back of the body. Grub is 1" long, grayish-white, fat and wormlike with a dark brown head and molts twice. Usually curled. First found in the U.S. in 1916 in New Jersey. Males slightly smaller than females. Roughly oval in outline. Females lay eggs in warm, moist soil where turf grass is exposed to full sunlight. Preferred host is the littleleaf linden.</p>	<p>Roots are cut by grubs. New housing developments are especially vulnerable. A high pH level discourages them. Larkspur attracts and is fatal to them. They avoid privet, honeysuckle and forsythia. Most likely to be found in turf areas which receive full sun, so provide some shade. Try diluted Safe Solutions Enzyme Cleaner with Peppermint. Use Herbruck's Nature's Supreme 2-5-3, Nutri-Plus 10-3-4 and/or Pelleted Poultry Manure 4-3-2 and irrigate only during dry spells.</p>	<p>Use Guinea hens or commercial traps for adults. Keep lawn relatively dry as preventative; adults lay eggs in moist areas. Hand pick beetles in morning; drop in bucket of soapy water. Try Oriental parasitic wasps, e.g., <i>Tiphia vernalis</i> or <i>T. pipilliavora</i>. For long-term grub control, use milky spore (<i>Basillus popilliae</i>) or beneficial parasitic nematodes (<i>Heterorhabditis spp.</i>) or the newly discovered and bio-engineered strains of Bt or the winsome fly from Japan <i>Istocheta aldrichi</i>. Use neem oil or Safe Solutions Enzyme Cleaner with Peppermint for severe infestations.</p>
	<p>(From Connecticut Agricultural Experiment Station)</p>			
<p>Lace bugs</p>	<p>Upper leaf surfaces lose color and are mottled with white or yellow. The undersides are covered with small, mollusc-like, black specks of excrement. Plants stop growing.</p>	<p>Lace bugs are tiny, flat bugs, 1/15" - 1/8" long with clear, lacy wings and hood-like coverings on their heads.</p>	<p>Adults suck the sap from the underside of leaves causing whitish or yellowish spots.</p>	<p>Use an insecticidal soap, nicotine, diluted enzyme cleaners, pyrethrum or neem.</p>

Note: If you wipe out a pest population, you also destroy all naturally occurring and introduced parasites, predators and diseases. A turf stand can not normally be both pest-free and still benefit from natural, biological control!

<p>Leaf hoppers, also called white fly (<i>Empoasca fabae</i>)</p>	<p>The lawn thins out and has a bleached, dried-out look. Grass blades turn yellow covered with tiny white spots.</p>	<p>Leaf hoppers are 1/8" - 1/4" long, wedge-shaped, yellow or light green insects that may be visible hopping from blade to blade.</p>	<p>Adults suck the juices from grass blades and can carry virus diseases. Spend winter in uncultivated areas.</p>	<p>Use diluted Safe Solutions. Enzyme Cleaner with Peppermint. Lacewings feed on leaf hopper nymphs. Eliminate winter weed hosts. They are repelled by neem, petunias and geraniums.</p>
				

Mealybugs - Kill them all with 1 gal. water, 2 T. corn or canola oil and 2 T. dish soap; then spray plants to the point of runoff, being careful to spray the insects as well. You can also spray diluted rubbing alcohol 50/50 with water to kill them. Always be careful to check any mix on a few leaves first.

Insect	Symptoms	Description	Cause	Control
Mole crickets, several species - At least four, including the Tawny, the Southern, the Northern and the Short-Winged mole crickets.	Bahia grass, St. Augustinegrass, Bermuda grass or Zoysiagrass may be affected. Dry soil. Brown streaks in lawn. Especially frequent near young seedlings. Pest of mainly southern areas.	Light brownish-gray or pinkish-buff crickets with large, shovel-like forelegs, paddle-like feet and a large head; 1-1/2" long.	Crickets' tunneling causes soil to dry out. They occasionally eat or cut off roots. They may chew off stems at the soil surface and pull plants into their tunnels. Nocturnal eaters and fliers. They are repelled by hot pepper.	Several fungal diseases and milky spore disease (<i>Bacillus popilliae</i>), Bt (<i>Bacillus thuringiensis</i>) or beneficial nematodes or boric acid baits or peppermint soap and water or diluted enzyme cleaners are effective against these pests.
Nematodes (as pests) A/K/A "threadworms, eel worms or round worms" (As many as 3 billion nematodes live in one acre of soil - most of which live in the top 3".)	The lawn thins out, turns light green or yellow, lacks vigor, may appear bunchy and stunted, fails to grow and/or wilts during heat or drought. The roots look swollen and/or "knotty". Grass blades dying back from tips may be found mixed in with apparently healthy blades.	Nematodes are microscopic, 1/125" long or so, soil-dwelling worms. Some species feed on roots, bulbs, stems, leaves, flowers, fruits and/or seeds. Only a soil test will confirm their presence. Parasitic nematodes, e.g., those in dog kidneys, may be a yard long and 1/2" thick!	Some species attack and feed on grass roots; other species are beneficial. There are unbelievable amounts and types of nematodes. St. Augustine, zoysia and Bermudagrass are favorite targets. When synthetic pesticide poisons and fertilizers are used, naturally occurring fungi are destroyed. Replace the fungi and it will catch the nematodes in a "web" and remove their nitrogen.	Fumigation or soil removal. The root-knot nematode is best combated by adding organic matter to your soil. Some fungi that inhabit rich soil are lethal to this pest. Restore them and control the nematodes naturally. Control with proper watering and fish emulsion fertilization. Many species are repelled by companion plantings of several varieties of marigolds (<i>Tagetes spp</i>) and/or 5 other plant genera: the rattlebox (<i>Crotalaria spp</i>), chrysanthemum (<i>Chrysanthemum spp</i>), castor beans (<i>Ricinus spp</i>), margosa (<i>Azadirachta indica</i>) and/or asparagus (<i>Asparagus officinalis var. altilis</i>). Use Nema or diluted enzyme cleaner or carbon dioxide.

Note: Nematodes can also be beneficial biological controls used against fleas, subterranean termites and/or white grubs. Termites tend to wall-off infested colony members that have been infested. When used against white grubs, temperature is critical and can explain why some landscapers have had poor results. Using one nematode species (*Heterorhabditis bacteriophora*) when the soil temperature was 70° - 80° F., the effectiveness of control was equivalent to chemical insecticide poisons. However, when soil temperatures were 53° - 61° F., less than 40% control was achieved with the nematode application. A thick thatch layer prevents nematodes from reaching Japanese beetle grubs. In comparison, the organophosphate insecticides isofenphos (Oftanol) only killed 60% of the grubs. When the turf was not irrigated prior to the nematode application, only 15% - 40% of the grubs were controlled. Heat the soil to 130° F. with (injected) hot water for 2 minutes to kill nematodes. Organic fertilizers can/or fungi will control (naturally) nematodes, grubs and moles. Ground-up coconuts can be used as artificial soil in greenhouses and to grow strawberries, tomatoes and other fruits and vegetables outside. Ground-up coconut soil has no destructive nematodes per David Mueller. Methyl bromide is a fumigant poison used to control nematodes and other pests by the poison industry; it is directly toxic to people and should be banned by January 2001 under the Federal Clean Air Act unless the government waives again. In September 1997 163 countries agreed to phase methyl bromide out under the Montreal Protocol Treaty because of its depletion of the ozone. From 1982 to 1993, 454 cases of methyl bromide poisoning were reported to California physicians and thousands were evacuated because of accidents with this registered pesticide poison.

Insect	Symptoms	Description	Cause	Control
Potato leafhopper (called the Bean Jassid in the South)	White spots on blades, especially on new lawns. Disturbing or mowing grass will cause them to hop away.	Adult is pale green, wedge-shaped; 1/8" - 1/4" long. Overwinters in garden and lawn debris. Nymphs are smaller and crawl sideways like crabs.	Adults suck plant juices. Very little feeding occurs at temperatures below 14° or above 30° C. Adults readily jump and fly.	Usually not serious, unless on new lawns. Clear away debris and weeds. Treatments with peppermint soap mixed with isopropyl alcohol (1 T. to 1 pt. soap) are effective as are sprays of extracts of wire grass and red strangletop. Use pyrethrum or neem or diluted enzyme cleaners for severe infestations. Try control with the mymarid wasp (<i>Anagrus atomus</i>).

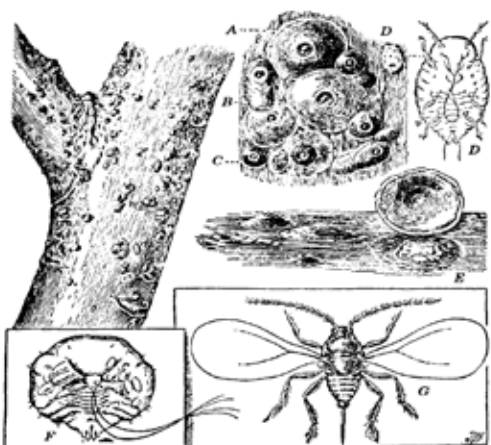
Scale, There are more than 6000 species of scales in 20 different families, e.g., hard or armored scales *Diaspididae*, that prefer orchard crops and soft scales (*Coccidea*) that prefer garden crops. At least 1000 species can be found in the USA, 253 of which are invasive. The most common scale insects have hard, scaly covers that protect them. Others are covered by mealy waxes that come in various colors.

Various nut and fruit trees, plants, forest vegetation, bushes and grasses may be affected, including Bermudagrass, St. Augustinegrass and centipedegrass. Withered or brown areas. Small "bumps" on blades.

Tiny round, legless insects with waxy shell. Various colors; 1/8" across, e.g., Euonymus scale has white male adults and the female develops a dark brown shell under which she lays eggs. Scale infestations often increase or develop after "registered" pesticides have been applied, which eliminates the natural enemies. They often go undetected until they have become established and have caused damage.

Scale insects are among our most destructive pests that suck plant juices from stems or roots. Try to use Safe Solutions Enzyme Cleaners or soap sprays with citrus oil, hot pepper wax, fish oil, vegetable or petroleum oils sprayed in a water emulsion to control scale.

Several insects such as trichogramma and chalcid wasps, green lacewings and ladybugs and parasitic aphids and several species of entomopathogenic fungi prey on scale. Cut down, prune and destroy infested plants. Repeated applications of diluted peppermint soap mix and/or dormant or summer or vegetable oil sprays will eventually control populations. Use diluted enzyme cleaner or neem for severe infestations. Note: Most outbreaks of scale, e.g., maple scale, often subside in 2 - 3 years because natural enemies, parasites and predators control scale problems naturally. You can use alcohol wipes or hand remove (scrape) female scale from the infested branches. Regularly water and fertilize infested trees.



A. scale of adult female, B. scale of male, C. first-instar young, D. same more enlarged, E. scale lifted to expose the female body beneath, F. body of the female, G. adult male (From U.S.D.A.)

See ScaleNet, an ARS-run internet database that allows users to gather information about scales at: <http://www.sel.barc.usda.gov/scalenet/scalenet.htm>

Note: Cottony cushion scales or mealybugs - The adult females show up on outside plants covered with "cotton" in late spring and summer, but the "cotton" can often be found present on plant leaves and/or leaflets or stems anytime of the year inside. The "cotton" covering the adult females is an egg sac containing up to 2500 eggs. The young insects that hatch are generally yellowish-brown to green in color. They feed by drawing sap from the plants like aphids, and like aphids some species are unable to digest all the sugar in the sap and they excrete it as a fluid called honeydew. A sooty mold fungus can develop in the honeydew making everything look dirty. The similar appearances of these insects make species identification difficult. The young often are found feeding on the underside of leaves.

Insect	Symptom	Description	Cause	Control
Snails and slugs (land-dwelling molluscs)	Large, jagged holes appear in leaves. Entire leaves and young seedlings may be eaten. Shiny, silver trails are seen on plants and other surfaces.	Snails have shells; slugs do not. Can grow up to 3" long.	They both feed on plants at night.	Spray with Bug Juice. Saucers and/or traps baited with beer or inverted grapefruit halves will trap snails and slugs or baits can be applied at dusk. Tobacco juice will kill them but it is a deadly poison. Use copper or salt or coffee.
Most of the sod webworms are moths in the genera <i>Crambus</i> , <i>Pediasia</i> , <i>Parapediasia</i> and <i>Fissicombus</i> . All species live in the thatch layer, especially in turf areas with a full day of sunlight. Note: Those tan moths you kick up while mowing are the adults of the sod webworm.	Kentucky bluegrass, tall and fine fescues, Bentgrass or zoysiagrass may be affected. Small, irregular, dead, brown patches appear, usually in July and August throughout the lawn. In the patch many grass blades have been cut off at the surface. Grass dies back from the shoot. Small, whitish tunnels appear at the soil surface. Larvae are readily seen when brown or dead sod is lifted. Never seen to damage lawns when the season is cool and moist.	During dry, hot seasons, scattered small brown pockmarks in late spring. Damage often starts around the pavement. If not checked webworms can multiply quickly until the pockmarks coalesce. If damage is visible, take action and irrigate. Larva of nocturnal buff-colored moth that flies in a jerky, zigzag pattern. Larvae are slender, dull, tannish-brown to gray with shiny, dark brown heads and spots with long, stiff hairs protruding from these spots; ½" - 1" long. Overwinters in thatch.	Larvae eat grass shoots and crowns at night. Caterpillars build a silk-lined tube in thatch and pull grass blades in, eating up to twice their weight each night. They proliferate in dry, hot weather. Chewing off the grass blades and pulling them into their tunnels of soil and webbing. Try to limit populations by mowing at a low height and disposing of clippings and properly irrigating. They can not survive.	Remove thatch. Install chickens and/or shade. Drench damaged areas with diluted enzyme cleaners with peppermint; caterpillars will crawl to the surface; rake them up; throw them away. Avoid insecticide poisons which can kill natural enemies. Plant resistant cultivars, e.g., Zoysia, Bermuda, ryegrass and/or tall fescue. Predatory ants, mites, big-eyed bugs, wasps and nematodes feed on eggs and/or larvae. Insecticidal soap, neem, milky spore disease or several varieties of Bt (<i>Bacillus thuringiensis</i>) or the fungus, <i>Beauveria bassiana</i> also control larvae. Spot treat infested areas with pyrethrum or diluted enzyme cleaner or neem or rotenone as a last resort. If there is ample rainfall, or if you are irrigating properly, most of the larvae will be killed by the microbes living in the thatch and soil.

Insect

Spider mites
(*Tetranychus spp*)
(When the young mite or acarid hatches from the egg, it has 6 legs and is call a larva. It then molts to a nymphal stage which has 8 legs.) Note: The largest outbreaks occur after spraying of insecticide poisons to *control* other pests! Often the use of volatile, synthetic pesticide poisons makes the mite problem worse! Try spraying with cinnamon or citrus oil, or garlic or hot pepper wax, or fish, petroleum or vegetable oils and see what happens.

Symptoms

Bermudagrass, Kentucky bluegrass, red fescue, fine fescue or bentgrass may be affected. Yellow or thinned turf, especially during hot dry weather. Leaves are mottled or speckled with white or yellowish, minute feeding marks and develop a dull, bronze sheen. Tiny specks can be seen on the underside of the leaves. Hold a sheet of white paper under a plant and then tap gently and look for little moving red or black dots. Many herbaceous plants look like they are drying up for lack of water. Eventually a fine, white webbing appears.

Description

Tiny, nearly microscopic, 8-legged relative of spiders; 1/150" - 1/50" long with piercing-sucking mouthparts like a stiletto it extracts chlorophyll from plants. White, green or rust-colored; several different species. They can produce new generations every few days.

Cause

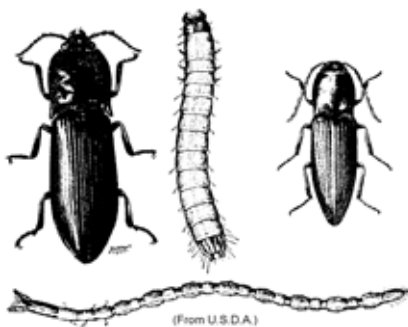
Spider mites suck plant juices. They may cause extensive damage. Mites can lower the chlorophyll content of leaves as much as 35%. They increase in almost direct proportion to the nitrogen-rich fertilizer you use. They thrive in dry, dusty conditions. They hate being sprayed with cold water. Clean up and dispose of litter under infested plants. Vacuum them up, especially on the undersides of leaves with a dusting brush attachment or dip the entire plant in mild soapy water or 1/2 oz. enzyme cleaner per 1 gal. water. A 2% emulsion of avocado or basil oil will repel them. Essential oils, e.g., anise, cumin, oregano or tansy will repel or kill them.

Control

Frequent light watering of the plant soil helps limit attacks during hot, dry, dusty weather. A forceful spray of water on the underside of leaves in the early morning, repeated for 3 days, will remove pests. Green lacewings, gall midges, predaceous mites (e.g., *Phytoseiulus persimilis* originally known as *P. riegeli* or *Amblyseius californicus*), several pirate bugs and ladybugs will control these pests. Spray diluted peppermint soap or enzyme cleaners, dormant oil or garlic/pepper tea and liquid seaweed or 1/2 c. buttermilk/ 3 1/2 c. wheat flour and 5 gals. water sprays or 1 oz. salt in 1 gal. water or diluted neem are effective controls. They seem to thrive on synthetic insecticide poisons.

Caution: Scientists have long known that acute exposure to or volatile, organophosphate pesticide poisons can be damaging or even fatal to people and/or pets. The effects of chronic exposure, however, are not well-studied, so be very careful. Mathematician Rene Descartes wrote, "Cogito, ergo sum." or "I think, therefore I am." almost 400 years ago...if you do not think before you use poisons - you will not be. S.L.T.

Wireworms (are larvae of click beetles or skipjackets)



Larva of click beetle. Light to dark brown, hard-shelled, thin and wormlike; 1/2" - 1 1/2" long. Light tan to dark brown or gray adult has dark, spotted head; 1/2" long. Click beetles flip into the air making a clicking sound when placed on their backs.

Usually not a serious threat. Remove any plant debris in fall. Hand-pick adults in spring. They are repelled by white mustard and buckwheat. Spray diluted Safe Solutions Enzyme Cleaner with Peppermint.

Wild Hosts. Plant pests can build up to high levels on wild weed hosts along road sides and field borders and then move in to attack crops, lawns and gardens. Keep wild weed hosts mowed or full of natural predators.

Synthetic, “Registered” Pesticide Poison Warning. We do not recommend the use of any volatile, “registered” pesticide poisons to control insect pests inside or outside. Just one incident involving the dangers of using any of the toxic synthetic pesticide poisons can be found at the Nashville International Airport where at least 92 workers at the U. S. Air reservation center have filled out paperwork for worker’s compensation. They were sickened after Terminix sprayed “registered” pesticide poisons in their work area. At the time of this writing, a class action lawsuit against Terminex was also being considered.

In Volume 18, 1994 of the Clinical and Infectious Diseases, a Scottish study of ten patients who experienced chronic fatigue syndrome (CFS) symptoms after organophosphate pesticide poison exposure noted many similar objective laboratory findings found in other CFS patients. These included lower cortisol levels, damaged mitochondria and persistent infection with enteroviruses. Both infections and toxic chemicals can cause chronic fatigue by damaging the cell’s main energy-producing organelle, the mitochondria. The Author was told in 1997 that there have been more than 25,000 poison control calls and there are over 2,600 separate litigations regarding just one volatile, “registered” organophosphate pesticide poison, Dursban®!

Scientists now know that men exposed to toxic chemicals can pass the poisons directly to their women and children through their semen. “Registered,” synthetic pesticide poisons decrease the numbers of sperm and those sperm that survive often have genetic defects. The resulting children may have heart defects, liver cancer, no spleens, have been born dead or have led short, unhappy lives.

The medfly poison spraying program in the 1990s cost California \$3.7 million in claims, including more than 14,000 claims just for damage to automobile paint.

Several studies have linked residential uses of synthetic, “registered” pesticide poisons to cancer. NCI researchers reported in 1993 that dogs of homeowners that use lawn poisons, and military dogs that served in Vietnam, have two to three times more cancer than dogs without such exposures. Another preliminary study found that children from homes with increased use of common household “registered,” synthetic pesticide poisons have between three and six times more brain cancer.

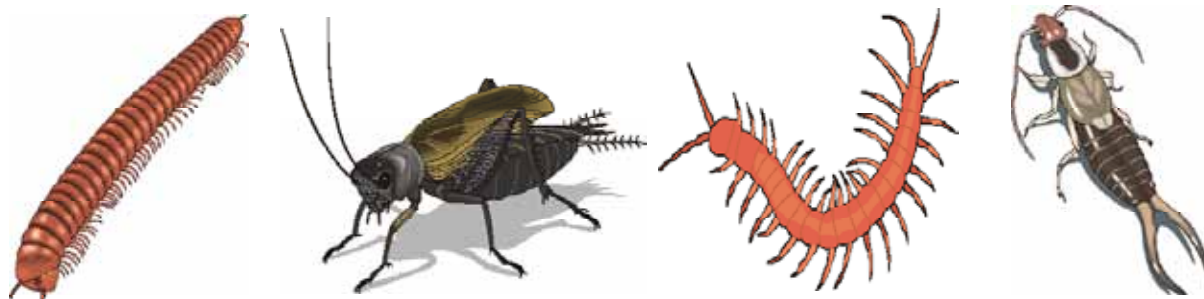
Household use of “registered,” volatile lawn poisons represents one of the largest and fastest growing markets for volatile pesticide poisons in this country. It is possible to buy some over-the-counter poisons for *unprotected* use in your household, on your lawn, dogs and children which require special breathing protection and other protective clothing if the same poisons are used by *professional* applicators!

A 1990s 34-page EPA report entitled: “Pesticide Industry Sales and Usage 1992 and 1993 Market Estimate Report” stated just the U. S. use of pesticide poisons is at about 1.1 billion pounds of just the **active** ingredients! If wood preservative and disinfectant active ingredients are included, the total U. S. use is about 2.2 billion pounds of just the **active** ingredients - or 8.8 pounds of just the poisonous **active** ingredients to *protect* every man, woman and child in our Country! What about the terrible unknown tonnage of “inert” ingredients that are often more toxic or dangerous than the active ingredient. In the non-agricultural section, the *top* poison used was 2,4-D, with chlorpyrifos second and diazinon third. There are about 1.3 million certified poison applicators in the U. S.! No wonder there are an estimated 45,000 annual human pesticide poisonings in the U. S., an estimated \$12 million in livestock losses, \$135 million lost in honey bee poisonings and reduced pollination, \$70 million in lost crop and trees, \$11 million in fish and wildlife losses, etc. The estimated \$839 million total annual losses directly attributed to the environmental and social costs of pesticide poison use pales in comparison to the unknown, indirect economic losses, needless pain, suffering, contamination, destruction and death caused by all the needless poison use! **We now use about 4.5 billion pounds of “registered” pesticide poisons annually...just in the U. S. A.! Stop using these dangerous, “registered,” synthetic poisons. Think for a moment - the dandelion is not dangerous or your enemy - poisons are!**

Before you decide to *protect* your children, pets, yard, garden, property or home with any volatile, synthetic pesticide poisons, carefully read Chapter 12, Chapter 13 and Chapter 14.

Intelligent Pest Management® Control Overview. Proper plant selection and mowing, crop rotation, biological and organic products, mulching, barriers, good soil maintenance and watering practices are your best defense against pests. Then try a pestisafe® like soap and water or diluted Safe Solutions Enzyme Cleaner with Peppermint **before** you reach for more volatile poison!

NOTE: Many other pests, e.g., ants, stinging caterpillars, stinging insects, centipedes, millipedes, moles, cats, deer, dogs, gophers, earwigs, scorpions, mosquitoes, flies, crickets, spiders, fleas, ticks and other occasional invaders are detailed in other chapters. Organic fertilizers actually create soil conditions that naturally *control* weeds, nematodes, grubs and moles naturally without using any herbicides or insecticides and greatly increase the microorganisms in the soil. **Do not use human sewage as your “organic fertilizer”.**



Chicken Control: Chickens love to search out and devour insects such as caterpillars, June bugs and other beetles, tomato worms, grubs, crickets, grasshoppers, leafhoppers, sod webworms, chinch bugs, armyworms and scorpions. “Rent” or borrow a few chickens for a few days, turn them loose in your yard and solve your insect pest problems and fertilize your yard naturally, but don’t tell the EPA or they may make you “register” your chickens as pest control devices.

Dust Note: Fine dusts, e.g., body bath powder, quickly suffocate most insects and arachnids, especially if you put an electrical charge on the particles. The Author has used baby powder, medicated powder, food-grade DE and many other dusts to control insect and arachnid pests. Remember to lightly dust and carefully monitor, especially if you use dusts outside.

Neem Note: Neem is a natural, broad spectrum, biological pesticide that comes either from the seeds or shade-dried leaves of the neem tree. It works as an anti-feedant that keeps most insects from feeding on your plants; if they do feed, it acts as a growth regulator that interferes with their molting process, killing the immature insects as they try to molt. It is commonly used in soap, medicine and toothpaste for man and his pets and livestock and is considered quite “safe” to mammals and man.

Organic Spray

- In a blender, combine 1 onion skin, 4 cloves fresh garlic and 2 cups water; cool in a sealed container overnight in the refrigerator. Strain the mixture the next day; add ½ gallon water and spray your “pesty” lawn and/or garden insects.

White Fly Control

- Household or garden plants can be vacuumed with a dusting brush attachment on your vacuum cleaner.
- Vacuum several times a week to remove flies from the plants and the air around the plants. Keep it up until control is achieved or spray with diluted Safe Solutions, Inc. Enzyme Cleaner.

It makes no sense to poison your family and pets to kill a few “bugs” or “weeds” for a few weeks or days.

Synthetic Fertilizer Warning. We believe that synthetic fertilizers that contain added nitrogen and phosphorus and especially people that over - apply nitrogen to their lawn and/or fields are creating a “dead zone” in a 7,000 square mile stretch of the Gulf of Mexico. The water quantity problem is called “hypoxia” a term meaning low oxygen. Water in the Gulf’s hypoxic (“dead”) zone contains dissolved oxygen levels of less than 2 parts per million, too low to sustain most sea life. This “dead” zone equals an area the size of Connecticut and Rhode Island - Suzi Wilkins, an executive director of the Mississippi River Alliance, stated “If you had dead animals on the ground you’d have all hell breaking loose. Under water it’s a hidden issue.” K. Elliot Nowels, Editor and Publisher of *Dealer Progress* (for fertilizer and chemical retailers) noted in his UP FRONT editorial for November, 1996 “**Of course, (I just can’t help myself, here ...)** if unwanted plant growth is the problem, perhaps you who offer vegetation management services could help out. A good aerial application (of herbicidal poisons)

could clear this algae problem right up. Perhaps you can send them a proposal.” Whether or not this is Mr. Nowels idea of a “joke” - it is not funny - adding poison to this “dead” zone will not bring it back to life - one of the easiest solutions would be to use only organic fertilizers like Herbruck’s Nature’s Supreme 2-5-3, Nutri-Plus 10-3-4 and/or Pelleted Poultry Manure 4-3-2 (bgeerlings@herbrucks.com) ... and/or to avoid the over use of nitrogen. The March 1998 issue of “The Global Pesticide Campaigner” noted: Marine fisheries all over the world are collapsing. All of the world’s fishing grounds are being fished at or beyond their limits. About 70% of the world’s conventional marine species are exploited, overexploited, depleted or in the process of recovering from overfishing. One fifth of all fresh water fish were already extinct or endangered in the 1990s.

WASHINGTON — Fish advisories sharply rise across nation: An environmental group warned the nation’s 52 million anglers Wednesday (4/18/98) that a growing number of the fish they take home for dinner may contain dangerous toxins. State fish advisories rose to 2,194 in 1996 from 1,290 in 1993, a 70 percent increase, according to the National Resources Defense Council. In Michigan, one of 11 states with advisories covering all rivers or lakes, the State’s fishing guide contains four pages of warning charts. Only Alaska, South Dakota and Wyoming did not have advisories.

The March 1998 edition of “Farm Chemicals” quoted University of Minnesota soil scientist, Gyles Randall, who cited a 4-year study that showed a continuous corn system lost 194 pounds of N per acre, while alfalfa only lost 6 pounds of N per acre. The 12/7/96 issue of Science News ran an article entitled “Pollution helps weeds take over prairies” which noted that while nitrogen is needed for plants to grow - even small amounts of this fertilizing pollutant (found in acid rain and agricultural pollution) can dramatically impair native grasses’ ability to compete against weeds. Heavy use of synthetic chemical fertilizers and/or synthetic pesticide poisons kills earthworms and other microorganisms which are vital for healthy soil. Many synthetic fertilizers contain chlorine...the American Public Health Association has called for the phasing out of all products containing chlorine “because of their probable link to breast cancer and other health-related problems. **Please refrain from using and especially over using synthetic fertilizers.**

The Author usually refers to the “mansters” in “professional” pest control as “swell old boys” or “silly old bears”, but he usually just uses the initials! S.O.B.

Seed Choice

- Endophyte-enhanced seed repels leaf feeders because they do not like the endophytic fungus that lives symbiotically with the grass.
- Tall fescues blended with rye do not normally cause thatch problems.
- Start your lawn with a native (resistant) blend of sun and shade seed.
- Avoid the use of sod and bluegrass seed.

Seaweed and Fish Emulsion Sprays

- Properly applied seaweed and fish emulsion sprays can naturally help prevent fungus and insect problems.
- These sprays have natural hormones and essential nutrients which encourage deep roots for healthier plants.

Fertilizer. You must first begin with the soil. The single most important phase of natural organic growing is healthy soil. Extended exposure to synthetic or high-salt or chlorine fertilizers, herbicide poisons and pesticide poisons has a negative, devastating effect on soil energy levels - that is - the ability of soil microorganisms to chelate and transform raw nutrients and minerals into forms acceptable to plants. **Soils with a low pH must be treated with lime before any fertilizer is applied.** Use “pasteurized”, organic fertilizer that has no bad bacteria.

To revitalize energy-depleted soil we do the following:

- Increase the soil organic matter content, which in turn raises the soil moisture retention capability. Less water used! Restore the proper pH.
- Detoxify the soil by leaching out harmful chemical residues.
- Soften hard soil for moisture and air circulation. Restore the transpiration cycle.

- Infuse the soil with fresh bacteria and fungi to restore proper chelation activity.
- Restore the proper level of necessary micro and macro nutrients.

Chinch Bugs

- Look for chinch bugs in full sun during July and August. They cause patches of lawn to die. Heavy watering can provide some immediate control. Remove thatch. Install chickens.
- Plant endophyte-enhanced seed for long-term control.
- Chinch bugs can be controlled with shade, sabadilla, insecticidal soap, diluted Safe Solutions Enzyme Cleaners, Peppermint Soap and/or big-eyed bugs, neem, dish soap, etc.

Fungus Problems

- Reduce thatch and properly aerate to provide good long-term control.
- Adjust your watering volume and schedule. Limit artificial watering to a bare minimum and water only early in the day (3 a.m. - 8 a.m.) Try spraying garlic juice or diluted enzyme cleaner with peppermint.
- Put 1 rounded teaspoon of baking soda and several drops of vegetable or horticultural oil in a quart of water; shake and spray daily or until all signs of fungus are gone and the weather becomes drier, or try hydrated lime or apple cider vinegar.

Bacterial Canker

- Remove cankered branches.
- Spray plants with fungisafes and/or fungicide alternatives in the summer and early fall.
- The bacteria, e.g., *Pseudomonas syringae* and *Pseudomonas mors-prunarus* cause bacterial canker. Try using colloidal silver sprays and/or drenches and/or various enzyme/surfactant sprays. Aspirin and/or a probiotic and/or an antibiotic and/or food-grade DE, and/or cider and/or garlic and/or hydrogen peroxide combinations also can be used as a dust, spray and/or drench, but always test spray/drench on a few branches or areas before treating the entire plant or grove or orchard.
- It is always best to use various pulse treatments rather than a consistent ongoing program.

Weeds

- Volatile, "registered" pesticide poisons and fertilizers leave chemical residues that kill beneficial organisms and actually encourage weed and pest growth.
- Crabgrass and other weeds will grow in any spot that is still bare near the end of spring.
- A good spring spot grass seeding will leave little room for weeds, especially if the cutting height is tall enough to shade weed seeds and prevent germination.
- Weeds can indicate nutrient imbalances. Ask your CES about soil testing and correcting any imbalances in your soil.
- If weeds are persistent, hand removal, undiluted ammonia, urea, calcium nitrate or potash in water and/or 1/4 cup salt in a quart of boiling water should be tried first.
- Peladow®, Dow Flake® calcium chloride, spread on sand and other playgrounds to control the dust actually keeps weeds from developing. Calcium chloride or any salt also kills termites and fleas in the soil.
- Rather than use herbicide poisons in tree plantations and other areas, plant legumes, e.g., peas, beans, alfalfa, hairy vetch and/or clover. Legumes contain bacteria in their roots which convert atmospheric nitrogen to a form that can be used by plants and they suppress weeds.
- Flame (wilt) them or spray them with boiling water or steam to get better, faster, safer, longer lasting control than you can with synthetic herbicides. A tea kettle full of boiling water still works pretty well. Just be aware that hot water is a non-selective killer. When it touches a plant, the waxy leaf surface is destroyed. Plants quickly dehydrate. The safest way to apply boiling water is as a spot treatment for weeds in turf, in gravel areas such as driveways or between pavement cracks.

Insecticidal and herbicidal soap. The Safer company, best known for insecticidal soap, has expanded its line of soap-based pesticides to include a weed killer. The Firm's new SuperFast herbicide is a "least-toxic" pesticide poison, so organic gardeners should feel somewhat comfortable with it. The tops of weeds wither quickly when sprayed with SuperFast, but the product is not transferred to the roots. Tough perennial weeds may require repeated applications throughout the growing season. Years ago, Safer's insecticidal soap killed the Author's

Russian olive tree when he sprayed it; Safer refused to replace the tree, **so be careful!**

Mowing. Can provide effective weed control of annuals, biennials and perennials, if done at the proper stage of growth and done often enough; perennials may take several years to completely control by mowing.

Gluten kills. More than a decade ago, horticulturists at Iowa State University stumbled upon the weed-killing properties of corn gluten meal quite by accident. They were using it to study fungi when they noticed that grass seed germinated poorly in plots treated with the meal. Gluten is the protein component of corn meal. The fine yellow powder, a by-product of the milling process, is normally added to livestock and poultry feed as a nutritional supplement. Further testing revealed a dual personality: corn gluten meal not only stopped seeds from sprouting, it acted as a slow-release fertilizer (it is 60% nitrogen). Corn gluten meal was finally approved in 1994 by the EPA as a pre-emergency herbicide. **The Author prefers to call it a herbisafe.**



Gardens Alive! (5100 Schenley Place, Lawrenceburg, IN 47025; web site: <http://www.gardensalive.com>, free catalog), a mail-order company specializing in products for organic gardeners, is licensed to distribute gluten under the trade name WOW!® Plus (previously A-Maizing Lawn). Corn gluten meal is more of a weed preventer than a weed killer. Applied to turf, "A-Maizing Lawn" keeps seeds of annual weeds such as plantain, crabgrass, purslane, dandelion and clover from sprouting. Use corn gluten meal only on established turf and flower beds. If it is applied at the same time as new grass seed, it will keep the grass from sprouting too. Experts suggest putting the product down a week or two before primary weeds are likely to germinate, but not much more than that. The gluten begins to break down into nitrogen fairly rapidly. Water it in, then allow a few days for the soil to dry out. Expect to kill between 60% and 90% of annual weed seeds with one well-timed application. Over several seasons, control approaches 100%.



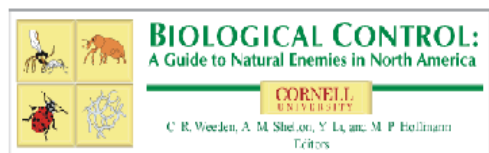
Rhizobitoxine, a compound produced by some strains of the bacterium (*Rhizobium japonicum*) is an effective herbicide in amounts as low as 3 oz. per acre. Agrostemmin, one of the allopathic agents produced by the corn cockle, decreased numbers of weeds and increased yields of desirable grasses when applied in the amount of 1.2 grams per hectare to selected Yugoslavian pastures - Symposium in Sarajevo, 1973.

Weed Mobiles. Can be constructed with large wheels that straddle vegetable beds and are kick-powered or pedal-powered with a roof that allows you to be in the shade and to lay face down and pull weeds by hand.

Biological Control. Don't forget to investigate the use of biological controls. One of the best bugs to have *infesting* your garden or lawn is the ladybug. Each day it feeds on many bad bugs or harmful insects, such as aphids, Colorado potato beetles, grape rootworms, alfalfa weevils, plus others. The black-spotted red ladybird, better known as the ladybug, is a voracious, predatory beetle described as one of the most beneficial insects on earth. The multi-colored Asian beetle (*Harmonia axyridis* - Pallas) has been found feeding on ripening fruit, e.g., grapes peaches, apples, raspberries, etc. and is also biting people. They will enter homes in fall in huge numbers. Turn on a light (let this be the only light) and the adults will fly to it; so use a trap or lure so you can vacuum them up.



Millions of ladybugs have been safely released on croplands, their hearty appetites helping to reduce scale and aphid populations - with biological pest control. They help keep things in natural balance.



Cornell University scientists note the advantages of using natural, biological controls: There is no environmental damage; the pests do not develop resistance to their predators as they do to chemicals, and a small initial investment results in a safe, permanent control method. (<http://www.nysaes.cornell.edu/ent/biocontrol>).

National Geographic magazine reported there are 4,300 known species of ladybugs, of which North America has 475. The old children's chant, "Ladybug, ladybug, fly away home, your house is on fire, your children will burn." This was a plea by English farmers concerned for the safety of their ladybugs during the annual burning of hop fields. Only 3 of the 475 ladybug species in North America are not considered beneficial.

Given a chance, an adult egg-laying ladybug (1/32" - 3/8" long) may consume up to 200 aphids a day. One ladybug larva may eat between 200 and 300 aphids during its development.



National Geographic noted that ladybugs were first put to work by man in the late 1800's. Today they are sold by the package, pint, quart and gallon; Gurney's Seed & Nursery Co.; web site: http://gurneys.com/product.asp_Q_pn_E_5065 offers a package (Sta-Home™ Lady Beetles) for \$13.95 said to cover 1,000 sq. ft.

A major concern is in getting the tiny migratory insects not to "fly away home". California studies indicate that 90% take wing and leave your property soon after release. Since they do not fly at night, a late afternoon or early evening release will encourage at least their overnight stay on your property. These beetles are very mobile. When there are only a few aphids around, a Cornell researcher reported, they migrate, searching for other areas of food, scouting apple crops, oats, winter wheat, sugar beets and beans. The researchers imported the predacious European seven-spotted lady beetle to protect potato and alfalfa fields. There is no correlation between the number of spots and the ladybug beetle's age. The number of spots on a beetle's back is characteristic of its species, not its age. Ladybugs (Family Coccinellidae) often squeeze into tree stumps and cracks in wood, where they remain dormant for several months. They seek winter refuge on mountain tops and/or can be found gathered together under stones.

Ladybugs are but one example of millions of harmless insects used for biological control. Fewer than 2% of all insects are considered to be *harmful* pests and those are most often naturally controlled by their natural biological enemies. Please be certain that *your* insects are actually pests doing damage before you spray anything. Other biological controls include praying mantis, parasitic wasps, chickens, nematodes, big eyed bugs, and lacewings. The parasitic wasp, *Encarsia formosa*, is a predator of whitefly. The trichogramma wasp, a generalist egg parasite, is used against scale and various pest worm species. Green lacewings and ladybugs, both generalist predators, are released to control aphids, mealy bugs and various other soft-bodied insects. Several small releases are generally more effective than one large release.

Don't forget to think even when you conduct biological controls - During the 1980 sterile med fly release in California, there was an accidental release of 100,000 fertile (not sterile) med flies. (Marshall).

Sterilizing Soil Safely. Researchers from as early as 1986 began reporting alternative methods for reducing weed infestation and soil-born pathogens in commercial agriculture. They found certain short-lived cover crops suppressed weed development during the critical germination stages of desired crops. They also found that when these cover crops were tilled into the ground as "green manure," they reduced specific pathogens that were detrimental to high yield production. The selected cover crops came from a genera of plants called brassicas.

Some brassicas are better known as "cole crops." They include kale, broccoli, cauliflower, broccoflower, cabbage, Brussels sprouts, canola, grapeseed, field mustard, turnip, rutabaga, Chinese cabbage and more. Their known benefits range from helping livestock digestion to stimulating human appetite to induction of Phase II enzymes that protect against cancer.

The researchers concluded that fresh brassica residues produced sulfides that stopped fungal growth and thiocyanates that killed pathogens. At the same time, the volatiles produced during decomposition changed the soil microflora thereby killing the detrimental microorganisms while increasing beneficial bacteria.

We have known for a while that some mustard oil chemicals, called isothiocyanates, possess pesticidal qualities, killing fungal root rot pathogens and root-knot nematodes. Mustards are also known to repel or kill some pest insects while attracting beneficial ones.

To summarize the research and reporting, the use of brassicas as a soil amendment, coupled with a process called "soil solarization," killed 99.4% of the targeted pathogens, spurred development of beneficial microflora

and microorganisms, and prevented weed development “for several months.” And although this research was aimed at large farming concerns, it has application on a smaller scale for the suburban landscape and garden.

The process of soil solarization involves using clear polyethylene plastic or plate glass as a solar cover atop freshly tilled soil. The plastic or glass retains the solar energy and the resulting heat destroys soil pathogens, pest nematodes, weed seeds and rhizomes. They also stimulate heat-tolerant bio-control organisms and stimulate microbes that live on dead or decaying organic matter. The resulting change in microbial population produces disease-resistant and disease-suppressive soils. Soil solarization is best accomplished in the summer months when temperatures are warm and the sun is at its highest angles relative to Earth.

With this definition in hand, test data concludes that the use of soil solarization and the incorporation of dried and finely chopped brassica leaves (such as those from cabbage) will significantly reduce pest organism and weed infestation in as little as 13 days; and is more effective when both procedures are used than if either procedure is used alone. Dried brassica leaves can be obtained by dehydrating spent cabbage or broccoli plants in the microwave, oven or dehydrator; then passing them through a fine-meshed sieve. Incorporation into the soil is best done with a tiller at a rate of 2% leaf residue into the top 6” of soil. (Or coat the top of the soil to a depth of about 1/8” before rototilling.)

Tests also conclude that the interested practitioner who chooses to try this method of weed and soil pathogen suppression should use caution when planting just after this treatment. Tomato transplants, for example, withered and died within a day after planting in solarized/brassica-treated soils.

Herbicide poisons may *kill* weeds, but they do not solve weed problems. In order to solve weed problems it is necessary to change the conditions that are allowing weeds to grow/thrive. Making these changes prevents weed problems and safely provides long-term control. In lawns, careful mowing, proper seed selecting, aeration, overseeding, organic fertilization and proper irrigation will keep weeds under control. Weeds grow only where soil conditions permit. **The best weed/pest control is a healthy lawn.**

Organic fertilizers (Try Herbruck’s Nature’s Supreme 2-5-3, Nutri-Plus 10-3-4 and/or Pelleted Poultry Manure 4-3-2™: bgeerlings@herbrucks.com): Agriculturists have long recognized the value of “humus” or organic material in their fertilizer programs. This has been demonstrated by the purchase annually of thousands of tons of manure. Growers also have recognized the possible harmful effects from overuses of phosphorus and potassium, which cannot be leached out,, and an increase in salinity, according to the University of California, Riverside research scientists.

One of the important benefits realized from using manure is that manures are parent material for the synthesis of humic acid derivatives (HAD). Humic acid derivatives are mixtures of humic acid, ulmic acid, and fulvic acid, and are products of organic matter transformations by the soil microorganisms. There are several ways to build up humic acid derivatives in soil - the application of manures, the growing of a soil-building crop such as a grass sod in rotation, the growing to maturity of green manure crops, or by applying concentrated Humic Acid material in the fertilizer mix.

Some organic deposits found in various parts of the world contain various percentages of humic, fulvic, and ulmic acids. Humic acid derivatives have several known benefits to agriculture. University of California research scientists, scientists from other U. S. universities and European scientists have agreed on these benefits from the soil humus formation:

1. Improves soil physical properties.
2. Holds exchangeable plant nutrients.
3. Improves moisture conditions.
4. Affects the release of plant nutrients through slow decomposition by organisms, especially nitrogen release.
5. Improves trace element nutrition through chelation.
6. Has a growth promoting effect.
7. Has a high base exchange capacity - an important basis for soil fertility concepts.
8. Some of this research has shown that fruits and vegetables from plants grown with Humic Acid added to the regular fertilizer program had a longer shelf life, as compared to produce grown without the material. Evidence also shows an increased sugar content in strawberries and Thompson Seedless grapes for raisins.

Note: Zoo manure (flesh-eater) can be used to repel some mammal pests and/or to (plant-eater) fertilize your plants. The Associated Press on 5/3/98 noted:

Zoo dung popular fertilizer — BALTIMORE — The secret to Joe Mills' prodigious pumpkin patch is in the fertilizer. It's exotic, all natural - and there's a ton of it. That's how much elephant manure the museum photographer ordered this year from the National Zoo in Washington for use on his 1,300-square-foot garden in Virginia. Zoos from Washington state to Washington, D.C., are fulfilling gardeners' dreams - and making money - by selling elephant, hippo and giraffe manure as fertilizer, turning a stinky problem into sweet-smelling success. Gardeners praise the nutrient-rich manure for producing bumper crops. The Seattle zoo is already sold out for the season. And one company, ZooDoo of Memphis, Tenn., sold almost \$500,000 worth of animal-shaped manure products such as "Dung Bunnies" and "CrocADoos," thanks to a continuing supply from the nearby Memphis Zoo. "The year I used it, I got a 408-pound pumpkin," said Mills, of Falls Church, VA, a Washington suburb. "It drains well; it adds nutrients. It's great stuff. It even smells good." Well, not at first, as anyone who has been to an elephant house in July will attest. A full-grown elephant produces about 300 pounds of manure per day, said Rick Reichley, self-proclaimed "ZooDoo" expert at the National Zoo, which has four elephants. Turning the waste into fertilizer is great, Reichley said, but not all zoos can do it because of the space needed for the compost pile and the manpower needed to keep it going. "These animals are producing about 1,500 to 2,000 pounds of poop a day and they don't take any days off," said Reichley. "We're almost to the point where we're going to give it away." Other zoos either burn the manure, pay to send it to landfills or use it on zoo flowerbeds. "Ours is hauled to a mushroom farmer in Pennsylvania, who composts it. I think a blueberry farmer also gets a share," said Steve Linda, chief horticulturist for the Baltimore Zoo, which has a small composting plot it uses for zoo grounds. "We use it around everything." The ZooDoo program at the Woodland Park Zoo in Seattle, http://www.zoo.org/zoo_info/zoodoo.html is so popular that the recycling coordinator uses a lottery to determine who gets to put a load in their pickup truck. Although the zoo is sold out for the season, there are 200 people on the waiting list, just in case. "Sometimes people show up with plates of cookies and cannolis, but we have a stringent code of ethics," said Tom Gannon, who has a master's degree in environmental management. He said the zoo makes about \$18,000 from its annual fertilizer sale. Woodlawn started the program about a decade ago, when the zoo was trying to save money on sky-rocketing landfill fees. Now Gannon composts almost 100 percent of the manure from the zoo's plant-eating animals and sells it for around \$1 for 25 pounds. For current prices, please call the Poop Hotline, (206) 625-POOP (7667).



Natural Lawn Maintenance Conclusion. The grass should be cut frequently enough so that no more than 1/3 of the blade is removed at one time. This allows the grass to retain enough of its food production capability and prevents the plants from going into shock. High cutting also encourages deeper roots and produces a healthier, drought-resistant plant. Grass should be cut to about 3-1/2" in summer to prevent scorching, avoid die-back and prevent weed seeds from germinating. When possible, cut the lawn only when it is dry, using sharp, clean blades. Remove 1 cubic foot of soil from your yard. Place soil in a wheelbarrow and count the earthworms. If you have 0-5 add compost and organic fertilizer; 5-10 is good but you should still add some compost; 10-15 is great, add only organic fertilizer as needed. Once the life in your soil is restored, it is beneficial to leave the grass clippings on the lawn, providing they are not diseased or too long. Active bacteria and microbes will decompose the clippings quickly and provide an ideal 4-1-3 lawn fertilizer. The clippings will not cause a thatch problem because they biodegrade in healthy lawns and become a part of the soil. Wet or long clippings that form clumps which smother can the grass should be removed and composted. **Diseased clippings or clippings with insect eggs should not be left on the yard or composted.** Grass nurtured by natural organic fertilizers begins to grow later in the spring and at a slower rate than synthetically fed grass. This later beginning and the slower growth means your yard will require fewer mowings during the growing season. Try spraying the entire yard with diluted Safe Solutions, Inc. Enzyme Cleaners using a hose-type sprayer each spring and/or as needed. Improper watering practices can be disastrous. Flooding the soil can drown microbial life and causes harmful fungi to flourish. Light and shallow watering kills off deep root growth and stunts the grass. At the beginning of each growing season, calibrate your sprinkler to find out how long it will takes to give your lawn 1" of water. To do so, place several coffee cans within the spread of the sprinkler and check the evenness of watering as well as the time it takes to fill the can 1" deep. This initial calibration will help you to water correctly during the season. During times of no rain, 1" of water given by a sprinkler system will percolate 6" into the soil. **Remember, however, chlorine is also a toxin.**

Compost Piles. With a compost pile you can recycle the leaves, long grass clippings from your lawn, along with other garden or kitchen vegetable waste. The resulting compost will save you money, provide organic plant nourishment and save valuable landfill space. When composting is done properly, there is no offensive odor. Maintenance of a compost pile is minimal; it simply needs aeration by turning it over once a month and to be checked weekly to see that it is still moist but not wet. When chemicals and pesticide poisons are not used, compost is a high quality soil amendment for your shrubs, flowerbeds and lawn. A compost bin adequate for an average-sized property is 4' by 4' and easy to build or can be purchased ready-to-use with proper instructions. **Diluted Safe Solutions Enzyme Cleaner with Peppermint or Not Nice to Odors will also quickly control or remove most odor problems.**

Watering Instructions. Water is the very life-blood of the landscape. It is the limiting factor that can override every other management practice done in and to the landscape.

- A turf grass plant is 75% - 85% water by weight.
- After a summer of extreme heat and lack of rain, all the dead lawns that were observed had severe thatch conditions, which led to either burnout or insect infestations.
- Excessive watering can cause thatch problems even when natural fertilizers are used.
- Routine use of sprinkler systems usually leads to overwatering; even in the rain I see sprinklers on.
- The healthiest lawns were those that were not artificially watered at all, or watered only infrequently.
- **Utilize plants that can adapt only to the local rainfall.**

So you should refrain from watering, except in the following situations:

1. When fertilizers are applied, 1/2" of water will help move nutrients into the root zone.
2. When seeding is done, water lightly every day or two to assist germination.
3. During very hot, dry periods, soak your lawn (not more than once a week) with 1" of water. If your lawn is predominantly bluegrass, you will probably have to water more than once a week during hot, dry periods. Think about reseeding with resistant cultivars to save water and prevent other problems.
4. If you have new sod, follow the instructions provided by the installer. (This may include daily watering and midday soaks during extremely hot weather.)

***To avoid burnout, change your improper watering practices *slowly* over the course of a year or two. Improper irrigation has killed more plants in the landscape than man or pest ever could.**

Weeding and Bed Maintenance. If foundation plantings are mulched, you can easily control any weeds by and hand pulling them once a month. Wool and/or aged, hammer-milled hardwood mulch gives your landscape a neat appearance, reduces the need for additional watering, provides your shrubs with organic food, and protects the root systems in the winter. Weeding is effective only when beds are mulched. If you use ground-up tires as mulch you will find this material will last virtually forever. You can also lay down scrap carpeting with the "good side" down and the bottom side up and cover with stones or mulch. This allows the water to pass through, but not the weeds!

If you do not mulch your shrubs, weeds will quickly become a problem. The only IPM option then is to try to rip the weeds out with a cultivator during spring clean-up and to weed-whack them once a month. Both *cures* will shortly make matters worse. Cultivating can destroy your shrubs' surface roots and always exposes new weed seeds to the sun. Weed-whacking stimulates the growth and germination process, allowing the weeds to better compete with the shrubs for available food and water, so mulch all foundation plantings. **Proper soil preparation and maintenance and proper plant selection will prevent most pest problems.**

Compost Management. If you catch your grass clippings and add them to your compost pile, check to make sure it is not too wet or dry. Once a month turn it over and aerate your compost. You may add leaves and other plant waste and kitchen vegetable waste to your compost pile.

Liming. Limestone is used mainly to raise the pH of acid soils but is also useful as a source of calcium when this nutrient is low in the soil (most likely in sandy soils). The most common liming materials available are dolomitic limestone and calcitic limestone. Dolomitic limestone contains 5% to 13% magnesium and 30% to 40% calcium. Hydrated lime, another liming material, neutralizes soil acidity more quickly than either dolomitic or calcitic limestone, but overliming is more likely with this material.

Pounds of ground limestone needed per 100 feet² to raise pH to 6.5

Current soil pH	Sandy Loam	Loam	Clay Loam
5	8	10	15
5.5	5	8	10
6	3	4	6

Organic Materials for Improving Soil Tilth.

Organic Material	Material per 100 feet²
Corncobs (ground)	50 lbs. (2 bushels)
Sawdust	50 lbs. (2 bushels)
Wood chips	50 lbs. (2 bushels)
Leaves	75 lbs. (3 to 4 bushels)
Straw	60 lbs. (1 bale)
Hay	60 lbs. (1 bale)
Peat moss	5 to 10 cu. ft.
Compost	10 to 20 cu. ft.
Lawn clippings	4 bushels

Fall Clean-up. When you mow, remove any fallen leaves from the lawn area. After the mowing season ends, the leaf-removal process begins. Remove leaves from your lawn and planting beds and put the debris in the street. If your town does not pick up leaves and you have no place to burn them or to dump them on site, compost them. If you allow leaves to remain on your lawn too long you may burn out or smother young grass.

Some pestisafes®:

Sulphur and calcium sulphate can replace all of the fungicides that are on the market and work on most of the gray and black powdery mildews encountered in the garden. You can start with baking soda mixed in water for mild infestations.

Horticultural oils are very fine mineral oils used to spray on dormant insects to smother them during the early spring before they emerge. They are mainly used on fruit tree insects.

Herbicidal soap and acetic acid (vinegar, lemon juice) and 3% solutions of essential oils are the new herbisafes® to kill lawn weeds. You can also use saltwater and mild solutions of ammonia to kill plant life. But beware as all these products kill both the weeds and the cultivated plants, e.g., grass. You have to apply these products very carefully to only hit the weeds, and then remove the dead weeds and replant the resulting hole with grass seed in fresh soil.

Thrips — If you have roses, you probably have thrips. These are tiny, tan insects that can and will bite humans just for the fun of it. Spray lightly with 1 oz. Safe Solutions Enzyme Cleaner with Peppermint per 1 gal. water. If you want to attract thrips, wear lighter colors which remind them of flowers.

Interesting Facts — The average peanut butter and jelly sandwich contains more than 350 insect fragments. Tomato juice can have up to 9 fly eggs per 100 grams. Insects make up about 59% of all life on earth.

Roles of selected nutrients and signs of deficiencies.

Nutrient	Role*	Signs of Deficiency
Boron	Regulates carbohydrate metabolism; essential for protein synthesis.	Dieback of shoots or growing points; thickened, wilted or curled leaves; distorted fruit; hollow root vegetables.
Calcium	Part of cell wall structure; membrane integrity; stem strength.	Deformation or failure of terminal buds and root tips to develop; blossom end rot on tomato and pepper fruit.
Copper	Electron transport in photosynthesis; protein and carbohydrate metabolism; catalyst for enzymes; synthesis and stability of chlorophyll and other pigments.	Bluish-green appearance; plants appear wilted; young leaves die, tip first - may resemble frost injury; summer dieback of terminal shoots of fruit trees; affects flowering and fruit formation.
Iron	Synthesis of chlorophyll; electron transport.	Upper leaves develop interveinal chlorosis leading to total bleaching. New leaves may be yellowish-white.
Magnesium	Part of chlorophyll; essential for photosynthesis; helps activate many plant enzymes.	Interveinal chlorosis and/or mottling of older leaves.
Manganese	Catalyst involved in chlorophyll formation.	Interveinal chlorosis; may be followed by necrotic spots; frequently occurs on middle leaves first.
Molybdenum	Nitrogen fixation.	Yellowish or pale green leaves; deformed leaves. Some leaves have a mottled and/or cupped appearance
Nitrogen	Formation of chlorophyll; amino acids; proteins.	Pale green or yellowish lower leaves; slow growth.
Phosphorus	Flower and fruit formation and maturity; cell division; root growth; energy transfer; membrane integrity.	Stunted, very dark green leaves; purplish to reddish coloration of veins, leaves or stems; late flowering and maturing fruits.
Potassium	Water transfer; stomatal opening; winter hardiness; disease resistance.	Older leaf edges are yellow or brown; leaves may be chlorotic and curl, and may have necrotic spots.
Sulfur	Constituent of several amino acids.	Light green color of whole plant; chlorotic younger leaves.
Zinc	Controls synthesis of indoleacetic acid, which regulates plant growth; active in enzyme reactions; chlorophyll synthesis and carbohydrate formation.	Short internodes; leaves appear rosetted; small leaves with interveinal chlorosis; mis-shapen leaf blades and abnormal root growth.

*Each element may have other roles than the primary ones listed.

Note: Without beneficial microorganisms in the soil, chelation is not possible and one is forced by the dead soil to apply chelated nutrients. Help heal our soil; farm and fertilize organically.

INTELLIGENT PEST MANAGEMENT® TREE AND SHRUB CARE

Mulching. We strongly urge you to maintain a 3" layer of organic mulch on top of the soil around your foundation shrub plantings. Aged, hammer-milled hardwood mulch is excellent plant protection. Another *new* mulch is Ewe Mulch® (from Peaceful Pastures), a coarse *blanket* of naturally pigmented brown wools and other natural fibers, placed around the bases of young trees, shrubs, bushes and in plant beds. It suppresses weeds, insulates and protects the soil and conserves moisture. It can last up to 2 - 3 years and eventually composts into the soil, releasing plant nutrients. Available at:



https://ssl24.chi.us.securedata.net/peacefulpastures.com/merchantmanager/product_info.php?cPath=0_25&products_id=191&mmsid=1fab1942e721e283a64756cd154a0ba5

Not only does a mulch give a neat and groomed appearance to the shrub border, it reduces the need to water by lowering the soil temperature, adds to the food supply as it decomposes, protects the shrub roots in the winter, and drastically cuts down on the need to weed. If your plantings are mulched, they should be top-dressed yearly with an additional inch or so of mulch. We caution you against using wood chips. Wood chips have to be aged a couple of years or they will rob your shrubs of nitrogen and cause a yellowing of leaves. Wood chips decompose very slowly. Because they do not knit together like mulch, they can escape to the lawn and driveways creating yet another maintenance problem. (Some organic mulches may increase pest problems, so you may want to use stones, ground-up tires or other materials that do not decompose.)

Mulch note: Organic mulches provide better weed control than synthetics and hold moisture better, but they also provide excellent habitat for many pest arthropods. Some feed on the mulch; some feed on the fungi and bacteria that grow on mulch, and others use it as a hunting ground. The deeper the mulch the greater the weed control but also the infestation rate. Mulch greater than 2" deep can house termites, slugs, snails, pillbugs, sowbugs, earwigs, fungi, ants, centipedes, millipedes, spiders, etc. Rake and/or turn the mulch on a regular basis or dust with food-grade DE to help control these pests. Synthetic mulches could be ground up tires or polyethylene sheets or woven and/or nonwoven fabrics. Clear plastic can be used for solarization, but weeds will grow under it. Black plastic warms the soil and stops weeds, but does not allow the moisture to pass through to the soil as polypropylene and polyester fabrics do.

Feeding. A soil rich in organic matter and a good layer of organic mulch provide all the necessary nutrients shrubs need. If your soil has been badly depleted, or if you have sick, damaged or new shrubs, we recommend you augment your mulching program with a little bio-organic fertilizer, e.g., composted chicken manure.

Dormant Pruning. Heavy pruning and renovation of hedges, dwarf conifers and broad-leaved evergreens, such as rhododendrons, is done in February and March when plants are dormant.

Touch-up Pruning. Touch-up pruning is done during the growing season at the appropriate time. When needed, prune in conformance with the natural form of the plant.

Spraying. Spraying (fruit) trees with diluted Safe Solutions, Inc. Enzyme Cleaner with Peppermint results in wonderful/safe insect, fungus and (sooty) mold control and cleaner fruit.

Dusting. Lightly dusting (fruit) trees with food-grade DE results in wonderful pest control.

Removal. Quickly cut down and remove dead or dying plants.

NATURAL ORGANIC TREE FEEDING

Trees growing in a healthy, natural environment seldom require artificial feeding, as they play their part in the careful balance of nature. The chloroplasts in their leaves, using the process called photosynthesis, convert water and carbon dioxide into sugar. Their roots reach for all the other necessary nutrients and moisture and find them in normal soils. Evidence of decline in old trees and stress in young trees indicates that their nutritional needs are not being met. Old trees often die back at the crown or lose large limbs. Younger trees may grow poorly and be subject to various infestations and diseases. When trees stop growing vigorously, they lose their ability to heal themselves and to fight off pests and disease.

The current chemical *industry* approach to tree care usually involves deep root feeding with synthetic nitrogen fertilizers and the automatic application of volatile, synthetic pesticide poisons. Synthetic nitrogen can seriously hurt a tree. It damages fragile root hairs, stimulates excessive green shoot growth at the expense of root development, and feeds fungus infections. Salts form in the soil. These salts can bind up nutrients, destroy soil structure and kill soil life. The trees begin to lose their natural balance of root and foliage growth that defends them against drought and ensures their structural integrity.

Especially when there are no indications of a dangerous infestation, automatic application of synthetic pesticide poisons seriously threatens the health of you, your tree and the environment. A tree's leaves and bark provide harborage for millions of beneficial insects, fungi and bacteria. This symbiotic relationship provides the tree with its first line of defense against damaging pest infestations. Volatile, "registered" pesticide poisons cannot differentiate between good and bad organisms or people and pets. Consequently, a tree's natural defenses are weakened with each dangerous volatile, synthetic pesticide poison application. If a tree has a life-threatening infestation, the benefits of a *natural* pesticide or pestisafe® might offset the damage that will be inflicted upon its natural defenses. If there is no evidence of serious infestation, spraying volatile poisons will weaken the tree unnecessarily. Not only is the tree weaker, but pesticide (poison) runoff will damage the soil life and aquifer below and stress nearby plants. Most importantly, volatile, synthetic pesticide poisons expose people and pets to unnecessary risks, so only none-volatile, natural pesticides or pestisafes® should be used, and then only when a serious infestation threatens the life of a needed or historical tree.

If any bush, tree or plant has no *historical* significance and becomes seriously infested, the Author believes it should be quickly cut down and burned, or you can try spraying it with diluted enzyme cleaner.

Tree Injury Note. If a large tree or plant has been injured, cut the bark in a cat's eye fashion for bark heals from left to right not from top to bottom.



Pruning. You can do your own minor pruning of low limbs of ornamental and fruit trees, but for tree removal, severe pruning or climbing jobs, we recommend you call a trained, insured arborist.

The Best Control®: Beneficial Insects or Biological Controls or Pestisafes®. Insects are a vast group of truly amazing creatures: there are more known species of beetles than there are of all other animals put together. Although over 750,000 species of insects are known, thousands are yet to be described and no one knows how many there really are, or how they help us control pest insects and/or maintain a healthy environment. What we do know is that most species are not pests, but beneficial insects. The status of *pest* is reserved for the few dozen species that really bother us by eating our food crops, infesting our homes, biting us or our pets or visually irritating us. Safe Solutions, Inc. Enzyme Cleaners are also natural or biological controls or Pestisafes®.

What are all the other beneficial insects doing in "our" yard? Some species are pollinators, others decompose waste material or serve as food for birds and fish, while still others are predators that feed on pests. These beneficial insects (and mites) are a vastly underestimated resource, wonderful allies, important to backyard gardeners as well as farmers. These natural enemies of pests are a fascinating and valuable group of allies that you do not have to pay or motivate.

Insects have been best controlled by other insects and other organisms for millions of years and your lawn is no exception. "Registered" synthetic insecticide poisons often kill more beneficial insects than problem ones. Once the natural balance is destroyed, continued reliance on dangerous and ineffective synthetic insecticide poisons will occur. This is also true of weed killers. When a crabgrass stand is killed with an herbicide, there will still be thousands of seeds ready to start anew. In the long run, synthetic pesticide poisons actually help the very pests they target by also killing their predators, and their use becomes self-perpetuating, putting you on a chemical treadmill. Until a natural balance is restored, more and more will have to be spent each year on toxic chemicals, and resistant pests will also continue to increase and invade. Using alternative strategies will bring better results and be kinder to the environment. Intelligent pest management® gives simple, long-lasting solutions which require no toxic chemicals, much less money, and much less time and effort. The lawn pesticide industry is a very recent creation the poison *industry* to expand the market for aging (but still dangerous) farm chemicals. These products are not necessary for use on our lawns and pose serious ecological and human

health risks that outweigh any *benefits* they offer. Integrated pest management strategies offer alternatives that work better and have less harmful effects. Proper legislation to protect the public regarding truly safe pesticide poison use is still seriously insufficient and an oxymoron. Therefore, the responsibility rests on you to be the ultimate judge of what the acceptable levels of risk you will allow for your families' and our environment. Will it be Intelligent Pest Management® or volatile, "registered" pesticide poisons?

Predators versus Parasites. Insects that attack other insects fit into two main groups: predators or parasites. The predators are like lions and tigers of the insect world. They need to eat many other insects to complete their life cycle. A ladybird beetle, for example, may eat over 2,400 aphids during her life span. The parasites (also called parasitoids) develop from an egg laid in, or on, another insect. In contrast to predators, parasites complete their development to adulthood by killing only one host. Sometimes many parasites develop simultaneously from a single pest egg or caterpillar.

Within these two broad groups there are many different life cycle variations. In some insect species, both adults and immature states (called larvae) are predators on insects. In others, only the larvae feed on insects while the adults live on pollen and nectar. Some natural enemies have tastes restricted to one particular host species, while others eat any insect they can catch. Natural enemies occupy a great variety of habitats, from burrows in the soil to the tops of the highest trees. Here are a **few** examples of the tremendous variety of common natural insect enemies:

Ants. Not only remove weed seeds but many pest insects including ticks and fleas.

Bats. One bat can remove a thousand mosquitoes in a single night.

Beetles. Most people know a ladybird beetle is a super aphid predator, but did you know that there are hundreds of related species preying on aphids, spider mites and other small pests? Some ladybird beetles have gray or yellow wing covers marked with black spots or blotches, while others, such as the spider mite destroyer, are entirely black and very small. Both adults and larvae of ladybird beetles are predators. Tickle them with a blade of grass and they give off a foul odor. You can occasionally get them to bite you if you irritate them enough. The larvae resemble tiny alligators, covered with rows of short spines. Ground beetles are another large family of beetles, with over 2,500 species in North America. These are large (2 - 3 cm long), iridescent black beetles we see scurrying quickly out of the light when we turn over a rock. They are a gardener's best friend because they eat slug eggs, grubs and insect pupae in the soil; some even run up trees after tent caterpillars. The slender, swift rove beetles are another value ground of soil-dwelling beetles. With their short wing covers they look like earwigs without pincers. They prey on root maggots, insect eggs and grubs in the soil and may kill as many as 90% of the cabbage root maggots in a field. Some species climb low-growing plants at night after aphids.

Birds. One chickadee may eat as many as 500 caterpillars in a single day. Purple martins will help control mosquitoes and other flying insect pests. Guinea fowl can give you amazing organic control.

Dragonflies Not really flies, these are large, familiar insects with spectacular flying and hunting skills. Dragonflies, and their smaller relatives the damselflies, capture huge numbers of mosquitoes, midges and gnats on the wing. Dragonfly nymphs live in water, where they prey on mosquito larvae and other aquatic insects. Although some people are afraid dragonflies sting, they are entirely harmless to people and pets.

Earthworms, Ants and Other Microorganisms: True Lawn Care Professionals. A thriving earthworm and microorganism population is important for a healthy lawn. Earthworms burrow in the soil, breaking down organic material into rich fertilizer, mixing it deeper into the root zone and aerating the soil. They are important decomposers of the thatch layer and save the homeowner a lot of work by aerating and removing thatch. Earthworm castings are readily visible in tall grass. However, if large accumulations make bumps in the lawn, they should be periodically raked or scattered over the grass. Ants will remove over 90% of all weed seeds. Earwigs and other hunters remove pests; still other microorganisms chelate soil so plants can use the nutrients.

Flies. Although buzzing house flies spring to mind when we think of flies, there are actually many different families of beneficial flies. They range from the delicate, long-legged aphid midges whose tiny, bright orange larvae are common aphid predators, to large bristly, gray tachinid flies (tack-eye'-nid) that are important parasites of tent caterpillars and other pests. Syrphid flies (sir'-fid) (also called hover flies for their ability to hover like

hummingbirds over flowers) are robust, yellow-and-black or white-and-black striped flies. The adults feed on nectar, but their greenish gray larvae are voracious aphid predators.

Lacewings. These delicate insects have large, finely veined wings. Both adults and larvae are predators, but it is the larvae that earn the name of “aphid lions” because they eat so many aphids. They also prey on spider mites, thrips, leafhoppers, small caterpillars and insect eggs. Over two dozen species of green lacewings occur in Canada alone. Their eggs, which are laid singly on long stalks, are often seen standing up along the leaf veins of garden plants. The larvae are tapering, alligator-shaped, with prominent curved jaws that they use to capture their prey. The similar brown lacewings are a bit smaller and more prolific.

Spiders. These are not insects, but because they are similar, they are often discussed with insects. Unfortunately, spiders inspire fear and loathing, whereas they should garner respect for being extremely effective predators. Poisonous species are exceedingly rare and very timid. There are many species of spiders and the more you see in your home or garden, the better pest control you will have. Mites are related to spiders, but are minute in comparison (many under 0.5 mm long). Spider mites and rust mites are pests, but they have natural enemies too - native predatory mites abound in trees and shrubs and in the litter on the soil surface.

True Bugs. There really is a group of insects, the Hemiptera, called “true bugs” to distinguish them from “bugs: in general. They have needle-like beaks for sucking fluids, a characteristic triangular-shaped section behind the head and leathery wings crossed flat over their backs. Some are plants pests, but others are vicious predators, such as the assassin bugs and ambush bugs that lurk among the leaves to catch unwary prey. Minute pirate bugs can probe deep inside flowers to catch thrips and damsel bugs and big-eyed bugs are notable predators of tarnished plant bugs, chinch bugs and other pests. Predatory bugs are valuable natural enemies of aphids, leafhopper nymphs, beetle larvae, thrips, spider mites and moth eggs.

Wasps. Unfortunately, most people think of yellowjackets when they hear of wasps. Yellowjackets are excellent predators of house flies and caterpillars and have been seen bringing over 250 flies per hour to a single nest to feed their young. It is arguable whether the benefits from yellowjackets outweigh their disadvantages, but there is no argument about the benefits from three other important groups of native parasitic wasps - and these don't sting! (1) The ichneumonid wasps (ick-new-mon'id) are slim, “wasp-waisted” with long antennae and an obvious thread-like ovipositor extending over the tip of their abdomens (it looks like a stinger but isn't). The wasps use their ovipositors to inject eggs into spruce budworms, tent caterpillars and other larvae. Ichneumonids vary in size from just 5 mm long to large, 3 cm long, blue-black wasps that can drill into wood to parasitize sawflies. (2) Braconid wasps (brack-on'id) are a group of smaller, more compact parasitic wasps. They lay eggs in flies, beetles, other wasps, caterpillars and aphids. Braconids that parasitize aphids are widespread; as the young wasp develops inside, it turns the aphid into a rigid, tan or bronze colored mummy that is easy to see on the leaf. (3) Last, but not least, are the chalcid wasps (cal'sid), a large group of extremely small parasites (many under 1 mm long) that parasitize aphids, flies, beetles and many caterpillars that attack forest trees and agricultural crops.

How to Attract and Conserve the Natural Enemies in Your Yard.

*First of all, stop using volatile, synthetic, “registered” pesticide poisons, especially broad-spectrum residual chemicals. Most poisons meant to kill pests also kill beneficial insects. Foil pest attacks with physical barriers, such as cutworm collars or floating row covers. Spray with diluted Safe Solutions, Inc. Peppermint Soap and/or Enzyme Cleaners at low rates. Use sprays of the biological control *Bacillus thuringiensis* (also known as BT) against caterpillars and high-pressure sprays of water to control aphids only when they are present and damaging plants.

*Plant pollen and nectar plants to attract beneficial insects into your yard. The adult beneficial flies, midges and parasitic wasps must have nectar to give them the energy to lay eggs, while ladybird beetles, lacewings and pirate bugs supplement their diets with pollen when prey is scarce. Once adults are attracted to your garden, they are likely to stay and lay their eggs there. The small flowers of dill, parsley, caraway, catnip, lemon balm, thyme and other herbs provide food for tiny parasites that can drown in the nectar of larger flowers; daisies, coneflowers and yarrow are good pollen sources. Annuals, such as alyssum, candytuft, marigolds, phacelia, schizanthus and salvias are also attractive. Consider leaving a few weeds in the borders: dandelions, goldenrod, wild carrot, lamb's quarters, nettles and wild mustard are excellent plants for beneficial insects.

*In areas with dry summers, provide a safe drinking water source where they won't drown. Fill a container of water with rocks so that the rocks become islands, or make a floating island from a disc of plywood cut to a size slightly smaller than the diameter of the water container. An example of the importance of this is shown by the study that found that aphid midges lay twice as many eggs when they have a water supply.

*Get a good insect guide and learn to recognize the variety of insects you see in your yard - it could easily become more fascinating than bird watching!

Pheromones and other scents tell insects exactly where to come to, to leave, to fight, to breed, to protect, to aggregate, to avoid, etc. - they are the major means of insect and animal communication. John A. Pickett and Lester J. Wadhams have begun a study of insect chemical ecology, particularly the development of synthetic semiochemicals such as pheromones (i.e., signal chemicals working by nontoxic mechanisms) for management of insect pests, which is widely seen as having greater potential for providing pest control methods safer and better than conventional volatile pesticide poisons. <http://www.novartisfound.org.uk/catalog/223abs.htm#Pickett>

First scientists will have to learn how to maximize use of systems that directly couple electrophysiological recordings from insect sensory cells with high resolution chromatography. This will allow identification of a wide range of semiochemicals involved in insect chemical ecology, since pheromones when used alone are often ineffective in controlling pest behavior under field conditions. So, you must not only identify pheromones of agriculturally important pests, including normally intractable insects such as aphids and midges, you must also characterize semiochemicals employed in interactions with plants, for example in colonization of rice plants by leaf hoppers.

The second part of this control strategy will be in the development of pest control approaches based on push-pull or stimulo-deterrent diversionary strategies (SDDS). These approaches will have to utilize a number of semiochemical types, e.g., those that prevent insect colonisation by interfering with host plant location (to reduce pest buildup on the harvestable crop) and attractant pheromones and host plant components (to cause aggregation on trap crops). Biological agents (or enzymes) can then be deployed in the trapping region to destroy pest populations, again by a method that is intrinsically safe, since the organisms are selected to act by pathogenicity rather than antibiosis. The chosen pathogen is more effective in such as integrated regime because the trapping area can be regulated to provide ideal infection conditions. Inside control can use SDDS to draw pests directly into traps or to the poisoned bait.

For the third aspect, new studies investigating the biochemistry and plant molecular biology necessary for genetic modification of crop and trap plants to produce appropriate semiochemicals for control strategies based on insect chemical ecology. Programs are now underway at Rothamsted on genetic regulation of enzymes in the glucosinolate biosynthetic pathway to provide oilseed rape cultivars for use in SDDS, and genes from plants are being cloned for enzymes on the route to aphid pheromone components. Already, use of higher plants, particularly semiochemicals or precursors is being developed.

Conclusions. If you practice natural or organic turf control and maintenance, children and pets can actually play on your lawn and be safe!

1. True IPM or Intelligent Pest Management® techniques provide a safe, natural and environmentally sound approach to lawn care.
2. A 100% organic fertilizer uses only natural animal or bird or vegetation sources. This builds soil and encourages slow, healthy growth. **Other products that claim to be organic or natural/organic may still contain synthetic nitrogen sources such as urea.** You should only perform major lawn renovations in the fall, when you have to compete with weeds and crabgrass. If you need something planted immediately, sow an inexpensive temporary cover crop of annual rye and/or sweet clover. **Do not use humanure!**
3. True IPM or Intelligent Pest Management® techniques using Pestisafes® and/or least-toxic alternatives, e.g., Safe Solutions Not Nice to Bugs®, and/or Enzyme Cleaners, proper nutrition, endophyte-enhanced seed, neem, milky spore powder, food-grade DE, etc., provide insect control that is vastly superior to and safer than volatile, synthetic pesticide poisons. Many people think that if you chemically kill all the insects

or weeds and then go natural, you will achieve better results. This strategy is counterproductive; volatile, synthetic pesticide poisons destroy soil life and weaken plants, thereby again inviting the attack of insects and weeds. Diluted enzyme cleaners will control virtually and instantly all insect pests, fungi and mildew problems and should be tried before any volatile, “registered” pesticide poisons are tried. Use flame or straight ammonia and/or urea to control virtually all weed pests before using any synthetic herbicide poison.

4. The proper use of natural organic fertilizers, combined with aeration and proper watering, encourages soil life that will eventually control grubs, thatch and weeds “free of charge”.
5. If your lawn began as sod, it is probably bluegrass, because bluegrass tends to thatch-up, making it very suitable for cutting as sod, but bluegrass is very sensitive to heat and drought and, of course, thatching. It also is prone to insect and fungus infections.
6. Planting native species normally removes the need to spray or fertilizer or water.
7. Organic soil-building fertilizers, mineral amendments, proper watering and correct cutting practices work together to produce grass that is highly resistant to insects, drought and disease. This virtually eliminates the need for fungicides and synthetic pesticide poisons.
8. Nutrients, minerals and soil pH should be routinely monitored and adjusted to encourage grass and discourage broadleaf weeds. Correct cutting and spot seeding discourage crabgrass and annual weeds.
9. There is no such thing as an all-natural weed-free lawn. True IPM or Intelligent Pest Management® programs are designed to develop lawns that are green, lush and predominantly grass. Weed-free lawns require **continual** doses of highly toxic herbicide poisons. Weeds can be killed with straight (undiluted) ammonia, liquid urea or potash or boiling water or flames, but be careful not to burn or scald yourself.
10. True IPM or Intelligent Pest Management® results in a lush, green lawn that family and pets can enjoy without being exposed to poisonous chemicals. IPM programs are designed to ensure long-term health. Some lawns may look better ‘immediately; some may require a season or more. Summer dormancy is the natural defense mechanism by which grass protects itself from excessive heat. If you try to prevent dormancy by excessive watering, **you** will cause serious problems.
11. Safe Solutions, Inc. #2 Enzyme Cleaner applied at 1 gallon per acre have increased water retention, penetration, aeration, microorganism and root growth, plant vigor and will control virtually all diseases, fungus and insect infestations.
12. Initially, Intelligent Pest Management® (IPM) programs may cost about the same as volatile, synthetic poison programs (that “treat” only the symptom). As your lawn improves, however, IPM programs cost far less and are safer!
13. Total eradication of pests is far more expensive than bringing the pest population down to “acceptable” levels. Eliminating the last few surviving “pests” may take as much time, materials, energy and money as required for the first 90% - 99%.

Note: The Danish EPA found that synthetic herbicide poisons actually create better conditions for some plant diseases and pests. The investigation, which looked at the weed killer isoproturon and the growth regulator ethephon, concluded that isoproturon seemed particularly popular with mildew in winter wheats; the greater the dosage of the herbicide poison, the worse the plant disease became, with even the minimal dosage contributing visibly to the severity of the mildew. Both poison compounds proved to have a profound (disastrous) effect on the reproductive capacity of the greenfly, particularly in barley fields. A story on the report, “The Unintentional Effects of Pesticides on Mildew and Greenfly” was published in Danish Environment, Danish Environmental Protection Agency, Strandgade 29, 1401 Copenhagen K, Denmark.



Chemtrec, the Chemical Manufacturers' Association's emergency response center, had a record year in 1997, handling more than 65,000 emergency calls and responding to more than 89,000 non-emergency calls. This represents an increase of more than 13% from 1996 responses. - Pesticide and Toxic Chemical News, Feb. 4, 1998.

Azomite, is a trade name for a pink, powdery clay from the Utah desert that contains 67 minerals and trace elements. <http://www.azomite.com/> When added to Herbruck's Nature's Supreme 2-5-3, Nutri-Plus 10-3-4 and/or Pelleted Poultry Manure 4-3-2 bgeerlings@herbrucks.com it produces startling growth results when sprinkled around plants.

Note: In 1994 President Clinton signed an executive order encouraging federal agencies to incorporate native plants, reduce fertilizer and pesticide use and conserve water in landscapes on federal land.

NUISANCE WILDLIFE CONTROL

In the last two decades lot sizes have shrunk 6% while home sizes have increased 16%. The median-size home in 1950 was just over 1000 sq. ft.; in 2001 the median-size new single-family home was 2000 sq. ft.

If you find your yard invaded by animal/wildlife pests, read the chapter on "The Best Control for Vertebrates". If you require additional trapping information, write or call one of the following (partial) list of small animal trap manufacturers/suppliers:

1. Minnesota Trapline Products, 6699 - 156th Ave., N.W., Pennock, MN 56279, 320-599-4176, web site: <http://www.minntrapprod.com>.
2. Kness Manufacturing Co. (Ketch-All Traps), Hwy. 5 South, P. O. Box 70, Albia, IA 52531, 800-247-5063, web site: <http://www.kness.com>.
3. Manufacturing Systems, Inc. (Tru-Catch Traps), 300 Industrial Street, P. O. Box 816, Belle Fourche, SD 57717, 605-892-2717 or 800-247-6132, web site: <http://www.trucatchtraps.com/>.
4. Tomahawk Live Trap Co., P. O. Box 323, Tomahawk, WI 54487, 715-453-3550 or 800-27-A-TRAP, web site: <http://www.livetraps.com/>.
5. Williams Trapping Supply, 4647 E. Station Rd., Roanoke, IN 46783, 219-672-3721.
6. Woodstream (Havahart Traps), 69 N. Locust St., Lititz, PA 17543, 717-626-2125, web site: <http://www.havahart.com>.
7. Or look for others online at: Wildlife Control Technology Magazine, <http://www.wctech.com>.

Weeds - Typical First Strikes by Grounds People

1. Remember, "nature abhors a vacuum" and bare soil invites weeds to move in and fill the area. Avoid leaving any bare spots. Aerate the soil to loosen the dirt. Use lime to balance the soil acidity. Overseed. Shade is the best way to control weeds and fallen leaves are free, natural mulch and true "herbisafes." Adjust mower to 3" to remove all dandelion heads and collect all clippings that are diseased or infected. Use organic chicken manure that has been composted, e.g., Herbruck's Nature's Supreme 2-5-3, Nutri-Plus 10-3-4 and/or Pelleted Poultry Manure 4-3-2, bgeerlings@herbrucks.com
2. Spray weeds in cracks and along fences with a steamer and vinegar plus a dash of soap, or use a regular sprayer and ½ c. borax per 1 gal. water and 1 dash liquid soap, or 5% citric acid, 1% peppermint oil, 1% vegetable oil, 1% salt and 1% soap in water; or mix 80% table vinegar and 20% rubbing alcohol and a dash of soap or diluted borax or salt water, or flame them with propane or use steam or boiling water. Vinegar has been registered by Sweden as a herbicide. The acetic acid in vinegar kills plants by dissolving cell membranes, which causes desiccation of the plant's tissues. The stronger the acetic acid the better and quicker the control, but the stronger the more dangerous vinegar becomes to people and pets. Concentrations of vinegar or acetic acid over 5% can burn and should only be applied with protective equipment. **Remember, all controls work better on hot, sunny days! Be careful!**
3. Cover weeds with overlapping cardboard or newspaper (5 - 6 pages thick) or landscape fabric or black plastic (at least 4 mills thick) or tar paper, or tar paper shingles, or wood for several sunny days. Thickly mulch (at least 3") around newly planted trees and plants.
4. Start a good organic soil program. Remember, many weeds thrive in disturbed areas, so if you can minimize disturbance, you can minimize many weed problems.

5. Put down a fabric (weed control) ground cloth or black plastic with drainage holes in it and mulch or stone over it. Remember, simply pulling a few “weeds” is not a major chore.
6. If you still have weed problems, read the entire chapter.
7. If you need a good organic lawn care program or want to purchase Fasst or Safe Solutions exempted weed killer products, call Get Set, Inc. @ 1-616-677-1261 or Safe Solutions, Inc. @ 1-888-443-8738

Plants - Typical First Strikes by Housekeeping & Maintenance

Garden Insects

1. Get a 2-liter plastic bottle, string, 1 banana peel, 1 c. sugar, and 1 c. strong vinegar. Slice banana peel into strips and insert them into the plastic bottle. In a separate container, combine sugar and vinegar. Pour this mixture into the bottle, then fill it to within 2 inches of the neck with water. Tie the string around the neck of the bottle, then tie the other end around the lower branches of a tree. Fruit and black flies, yellow jackets, and other insects find the fermenting banana, sugar, and vinegar more attractive than the fruit on the tree. Once they fly in, they get caught in the sticky mixture and drown. This reportedly works so well that it can make spraying fruit trees with diluted Safe Solutions Enzyme Cleaner with Peppermint unnecessary.
2. Mix 1 c. dish washing detergent and 1 c. vegetable oil. Add 1 - 2 tsp. of this mixture with 1 c. water and spray it on plants.
3. Spray with diluted (1 - 2 oz. per gal. water) Safe Solutions Enzyme Cleaner with Peppermint as needed.
4. Take an empty spray bottle and fill about ¾ of the way with water, then add a few drops Ivory® liquid soap, some hot peppers or hot pepper sauce and some garlic. This works well, but needs to be reapplied after every storm and/or every couple of weeks.
5. Grind together three hot peppers, three large onions, and at least one whole clove of garlic. Cover mash with water and place in a covered container. Let container stand overnight. Strain mixture through cheesecloth or a fine strainer and add enough water to make a gallon of spray.
6. Mix one tablespoon of a mild dish washing detergent plus one teaspoon of a vegetable cooking oil with one quart of water. This can be sprayed on all plants. Remember to spray both the top and the underside of the leaves. You can also add 1 tsp. (rounded) of baking soda if you have fungus problems or use diluted apple cider vinegar or a little lime. You could also lightly dust with Safe Solutions, Inc. food-grade DE.
7. White cabbage butterflies stamp on plant leaves with their feet in order to taste them. If they smell like mustard oil, females lay their eggs, so make some sticky traps with mustard oil.

House Plant Pests

7. Spray with dishwater or 1 T. soap, 1 tsp. vegetable (canola) oil and 1 qt. water.
8. Make a spray of garlic, onion, cayenne pepper and dish soap.
9. Spray with 1 rounded tsp. baking soda and/or (1 oz. per 1 qt. water) Safe Solutions Enzyme Cleaner and/or 2 - 4 T. potato flour/starch if fungus develops. These mixes also kill insects.

Safe Nematode Control

- Plant marigolds (*Tagetes spp*); (plant them first and disc into the soil and then plant susceptible plants) or mix in dried bean plant material or pressed milkweed seed cake to reduce or suppress nematodes.
- Solarization - Heat the soil under visquine.
- Flood with diluted Safe Solutions Enzyme Cleaner with Peppermint.

Pine wilt is a disease of pine (*Pinus spp.*) caused by the pinewood nematode, *Bursaphelenchus xylophilus*.

The pinewood nematode is native to North America and is not considered a primary pathogen of native pines, but is the cause of pine wilt in some non-native pines. In countries where the pinewood nematode has been introduced, such as Korea, Japan and China, pine wilt is an important non-native disease. The pinewood nematode is transmitted (vectored) to conifers by pine sawyer beetles (*Monochamus spp.*) either when the sawyer beetles feed on the bark and phloem of twigs of susceptible live trees (primary transmission) or when the female beetles lay eggs (oviposition) in freshly cut timber or dying trees (secondary transmission). Nematodes introduced during primary transmission can reproduce rapidly in the sapwood and a susceptible host can wilt and die within weeks of being infested if conditions are favorable to disease development. Pinewood nematodes introduced to fresh logs

or dying trees during egg laying of sawyer beetles feed on fungi introduced by the sawyer and other bark beetles. The common presence of the pinewood nematode from such secondary transmission can confound the diagnosis of pine wilt disease. For example, if a dead or dying pine tree with pinewood nematode also has oviposition pits from sawyer beetles at the time of sampling, then pine wilt disease may not be the cause of mortality. The common presence of the pinewood nematode in forest products due to secondary transmission has resulted in restrictions on wood exports from North America. Sawyer beetles — Pine sawyer beetles (*Monochamus spp.*), also referred to as long-horned beetles, serve as vectors of the pinewood nematode. Primary transmission occurs when sawyer beetles feed on the bark of young branches. Pine sawyers infested with the pinewood nematode can transmit the nematode by the way of feeding wounds to a susceptible host, and pine wilt can develop under favorable conditions for the disease. Pine sawyer beetles are attracted to weakened trees, or recently cut logs, where they mate and lay eggs. The beetles will deposit eggs only on trees or logs with the bark attached. The beetle larvae hatch within a week and feed on the phloem. The larvae tunnel into the xylem (wood) to form an oval entrance hole and U-shaped galleries. The sawyer beetles overwinter as larvae and then pupate within an enlarged portion of the gallery. The pinewood nematode larvae, introduced by infested beetles along with their eggs, invade the thoracic spiracles and tracheae of the beetle pupa in numbers as high as 289,000. The adult beetle emerges from the tree, leaving a round, ¼-inch-diameter exit hole. Because beetle development is temperature dependent, the number of generations is lower in northern climates and higher in southern climates. In the central Midwest there is generally more than one generation per year.

Disease cycle — The pinewood nematode is vectored from diseased to healthy pines by certain wood boring beetles known as Cerambycids. These beetles breed in dead and recently killed pines. In diseased trees, developing beetles become contaminated with the pinewood nematode. When the beetles complete development, adults emerge from the wood carrying the nematode and fly to healthy pines where they feed on succulent pine and introduce the nematode into feeding wounds. Following infection, the nemas migrate to resin ducts in the wood and feed on the cells lining the ducts. Under summer temperatures, the nematode reproduces very quickly: each female lays approximately 80 eggs, and it can complete its life cycle (from egg hatch to maturity) in four to five days. Huge populations of the nematode develop throughout the tree, which impedes water transport and causes the wilt symptoms. Highly susceptible pines usually die within three months of infection. If infection occurs late in the growing season, the tree probably will survive to the following spring or summer. Adult female Cerambycids lay eggs in trees weakened or killed by the pinewood nematode and the disease cycle is repeated.

Presence in wood products — The pinewood nematode has been found in shipments of conifer wood chips, in unseasoned lumber, and in packing case wood. The *Monochamus* spp. vectors of the nematode have been found in wood pallets, crates, and dunnage. Because of the close relationship between the nematode and its vector, shipments from areas where the nematode occurs can be assumed to be at risk of also carrying the nematode and/or its vector.

Present Pest Management

Pine wilt disease — Management of pine wilt disease is currently and primarily limited to prevention. There are no cures for pine wilt disease once a susceptible tree becomes infested with the pinewood nematode. The most effective prevention strategy is to avoid planting non-native pines, such as Scotch and Austrian pine, where the mean summer temperature is greater than 20°C. Where these non-native pines already exist, landowners can reduce susceptibility of high-value landscape trees by watering to avoid drought stress. If they discover infestations, landowners can consider removing and chipping infested trees to limit the spread to nearby susceptible trees.

Pinewood nematode — The pinewood nematode can be prevented from infesting softwoods by removing the bark at the time of felling and by avoiding harvesting when the *Monochamus* beetles lay their eggs (typically July-September). Immediate removal and destruction of pines killed by the pinewood nematode will help prevent spread of the pest to adjacent, healthy pines. Wood from the dead pines should be chipped, buried in a landfill or immediately burned. Maintaining the vigor of pines through periodic fertilization and irrigation during dry periods may help prevent disease development. In established pine plantings such as landscape settings, windbreaks, and Christmas tree farms, the only control measure is to remove affected trees and burn, bury or chip the wood before May 1. Trees should be removed to ground level. No stumps should be left. This prevents further spread of the nematode and its vector before they emerge from the trees in the spring. The pine sawyer bark beetles are attracted to stressed trees so, plantings should be kept from stress situations by controlling diseases and insects as well as providing water during extended dry periods. Consider planting less susceptible Austrian or

Ponderosa pines or deciduous trees in areas where pine wilt has been a serious problem.

Many methods have been investigated for treating wood products to eliminate the pinewood nematode. Heat treatments and fumigation currently have some practical use. The pinewood nematode has been eliminated in wood when kiln-dried, or heated to a core temperature of 56°C or greater for 30 minutes. Fumigation with aluminum phosphine has been effective in eliminating the nematode from wood chips. Over time, other treatments may be discovered or become more practical.

Distribution outside of the USA

The pine wood nematode, *Bursaphelenchus xylophilus* (Steiner & Buhner) Nickle, causes the serious pine wilt disease. In Japan, the nematode is carried by the vector beetles, *Monochamus alternatus*. There are several reasons for pine mortality: drought and hot summer conditions both diminish the resistance of pine tree to this disease.

The potential risks to the European Union (EU) from *Bursaphelenchus xylophilus* have been evaluated using Pest Risk Analysis (PRA) guidelines being developed by FAO and EPPO. The PRA showed: following detailed evaluation of published and unpublished information, that there is a significant risk to the EU, especially to the forests in the warmer south of the region. The greatest risks come from importation of both *B. xylophilus* and its vectors in the genus *Monochamus*, but it also recognised that nematodes in wood could come into contact with suitable breeding sites. Measures to prevent importation could include effective forest selection of healthy trees, heat treatment or chemical treatment. These require evaluation before use.

Several measurements have been taken to control the disease, they are: clearing away the forest stand, burning branches and roots, fumigating wilted wood and spraying chemical insecticide. It is most effective measurement that all of forest stand infected with the disease should be cleared away.

Some isolations and culture experiments were conducted to learn the role of fungi associated with pine wood nematode, *Bursaphelenchus xylophilus* parasitizing *Pinus massoniana* in Shenzhen, China. The following fungi were isolated from *Pinus* of associated beetles: *Pestalotiopsis*, *Fusarium*, *Ceratocystis*, *Colletotrichum*, *Alternaria*, *Sordaria*, *Chaetomium*, *Nigrospora*, *Phomopsis*, *Curvularia*, *Monochaetia*, *Trichoderma*, *Rhizopus*, *Penicillium*, *Aspergillus* and more than ten other genera of unidentified fungi. The nematode multiplied on colonies of *Colletotrichum*, *Pestalotiopsis*, *Monochaetia*, *Alternaria*, *Ceratocystis*, *Phomopsis*, *Sordaria*, *Fusarium*, *Nigrospora* and two unidentified fungus genera grown on PDA plate medium. It could also multiply on wood discs with fungi, but not on wood discs sterilized with hot steam.

Beauveria bassiana was found to be the most promising agent for the control of *Monochamus alternatus* in a survey of its pathogens. Attempts to utilize an isolate of *B. bassiana* in ordinary spraying onto beetle-infested pine tree trunks have shown only moderate mortalities of the larvae although this isolate was highly virulent in laboratory tests. Some novel methods of application of this fungus to improve contact between the fungus and the larvae under the bark were investigated. Methods involving implantation of the wheat bran pellets on which *B. bassiana* was cultured into the infested trees, and placing non-woven fabric strips having *B. bassiana* conidia onto the infested trees, have produced high mortality of the larvae. The difficulties and importances for the control pine wood nematode (PWN) and its control strategy

Personal notes: The beetles can be safely controlled with the Safe Solutions Enzyme Cleaner with Peppermint and sodium borate or food-grade DE whenever they hatch. The Author thinks he would like to try colloidal silver drenches to help prevent this disease. He has several other ideas, but he would need to work with the problem directly.

Fungus in the garden can cause a large amount of frustration for people. In the past, individuals often had to result to using toxic chemicals to treat their fungus problems. Now though, there is a solution for fungus that is totally natural- cornmeal.

Cornmeal can be purchased from most garden centers and feed stores in large 25-pound bags. Cornmeal actually controls fungus more efficiently than any of the toxic chemical pesticides you can purchase. Cornmeal can be used for root or soil borne fungus problems at 10 - 20 pounds per 1,000 square feet. Cornmeal fights disease in

the soil by stimulating beneficial microorganisms that already exist that feed on pathogens like as rhizoctonia. Rhizoctonia is also known as brown patch found in St. Augustine. Cornmeal used at around 2 pounds per 100 squares can work on seedlings to stop damping off. Cornmeal is also useful in both food and ornamental crops on any fungal diseases that are soil borne. Although you may only need to apply the cornmeal once, if you need to apply it more often that is fine. Numerous applications are okay because cornmeal acts as a slight organic fertilizer and soil builder. To activate its fungus fighting abilities, cornmeal needs moisture. Rain however will not harm the cornmeal's ability to be effective. This is because, like all other organic products, cornmeal is not water-soluble.

It is essential to know that cornmeal will only work in an organic program. If toxic chemical products are used, any benefits from the cornmeal will be gone. To prepare your plant beds use a wheat bran cornmeal soil amendment with molasses. The product should be used at 10 - 50-lbs/100 sq ft. This will provide a source of nutrients, organic matter and a natural disease control. This mix can be used as the main preparation material for your plant bed. To create your own version of this product at home, use 65% wheat bran, 35% horticultural cornmeal and 10% dry molasses. Use Horticulture Cornmeal as an efficient method for controlling of disease. If root and soil borne fungal diseases are your problem, use the mixture at 10 - 20 pounds per 1,000 square feet.

Garlic (*Allium sativum*) cold pressed garlic juice inhibits plant pathogens, e.g., *Botrytis*, *Colletotrichum*, *Erwinia*, *Gleospotum*, *Puccinia*, etc. Garlic can be used to control fungal pathogens that cause powdery mildew and other fungus pathogens. Garlic will also kill or control nematodes, snails, ticks, mosquitoes, white flies, caterpillars, etc. Be sure to add a little soap to your spray mix. (Use the smelliest garlic you can find.) **Sweet basil**, cold pressed with a little soap in the mix, will give antifeedant and/or repellent protection to help control fungus, mosquitoes, bacteria, soil pathogens, etc.

Fungi, bacteria and protozoa - environmental survivors. There are more species of fungi, bacteria and protozoa in a scoop of soil than there are plants and vertebrate animals in all of North America, and these microorganisms are the great recyclers of our plant. The mycomagicians disassemble large organic molecules into smaller forms, which then can nourish other members of the ecological community. Fungi are truly the interface organisms between life and death. Yet we are killing them whenever we use synthetic pesticides and fertilizers.

Caution: Before spraying anything on your plants, test spray a few leaves first to see if the spray mix will hurt them.

Humates - or soft coal are registered for use as foliar fertilizers; if you apply them with an electrical charge in a power duster, they will cover the plant's surfaces and suffocate any insect that is in the area at the time.



“Put your hand on a hot stove for a minute, and it seems like an hour. Sit with a pretty girl for an hour, and it seems like a minute. THAT’S relativity.” — Albert Einstein

“Great spirits have always encountered violent opposition from mediocre minds.” — Albert Einstein

“Live innocently; G-d is here.” — Linnaeus

**The Jewish ideal is ‘Tikkun Olam’, which means that we are obligated to repair...to mend...to heal...to perfect...the world.
Shtark zich!**

“Whether you think you can or you think you can’t, you are right.” — Henry Ford

“Progress is the activity of today and the assurance of tomorrow. He that is good will infallibly become better, and he that is bad will as certainly become worse; for vice, virtue and time are three things that never stand still.” — Ralph Waldo Emerson

As Robert Fulgham so aptly observed: Most of what I really need to know about how to live, and what to do, and how to be, I learned in kindergarten. True wisdom was not found at the top of the graduate school mountain,

but there in the sandbox back at nursery school.

These are the things I learned. Share everything. Play fair. Don't hit people. Put things back where you found them. Clean up your own mess. Don't yell. Don't take things that aren't yours. Say you're sorry when you hurt somebody. Wash your hands before you eat. Flush. Warm cookies and cold milk are good for you. Live a balanced life. Learn some and think some and draw some and paint some and sing some and dance some and play some and work some every day.

Take a nap every afternoon. Listen more than you speak - you have 2 ears and only 1 mouth. When you go out into the world, watch for traffic, hold hands, and stick together. Be aware of wonder. Remember the little seed in the plastic cup. The roots go down and the plant goes up and nobody really knows how or why, but we are all like that.

Remember dear one, goldfish and hamsters and white mice and even the little seed in the plastic cup - they all will die. So will we. So relax and enjoy this moment.

And then remember the book about Dick and Jane and the first word you learned, the biggest word of all: LOOK. Everything you need to know is in there somewhere. The Golden Rule and life and basic sanitation. Ecology and politics and sane living.

Think of what a better world it would be if we all - the whole wide world - had cookies and milk about 3 o'clock every afternoon and then lay down with our blankets for a nap. Or if we had a basic policy in our nation and other nations to always tell the truth and put things back where we found them and cleaned up our own messes. And it is still true, no matter how old you are, when you go out into the world, it is best to hold hands and stick together.

There, obviously, is a lot more to learn. Don't ever give up. Keep an open mind. Learn to study and read both sides. Never stop questioning; always look for a better, safer way; never stop trying and last, but most important, always try to do everything in love.



“Man has entered the forest.” — from the Bambi movie.

**And no matter what, don't let the Silly Old Bears, “mansters”, “regulators” or “banksters” get you!
G-d bless, Steve**



“We don't receive wisdom; we must discover it for ourselves after a journey that no one can take for us or spare us.” — Marcel Proust

Procrastination is the fertilizer that makes your pests and difficulties grow. Failure will always overtake and destroy those who have the power to act, but will not act. — S.L.T.

“It is easy to make a buck; it is not so easy to make a difference.” — Tom Brokaw



Pests and Diseases Image Library: <http://www.padil.gov.au/>

“After my office burned down “accidentally”, I wrote this entire book (2nd edition) on my kitchen table, so I apologize in advance for any errors that might have slipped by me.” — Steve Tvedten

On April 28, 1999 Scot Miller of MSNBC reported the City of Seattle, Washington will (now) only use natural lawn care at 20 library branches, needing less water, less fertilizer and no pesticides.

On 5/23/99 an article appeared in Dear Heloise: Every year we fertilize our yard and use a fertilizer that is said to be safe for pets. This year we used another kind, name brand, but we neglected to read the label. After my husband scattered the fertilizer, our Shih Tzu romped in his area on the grass. Four days later, Harley tumbled as he tried to run and finally became paralyzed. We brought him to the vet and he said he thought it was some kind of seizure. I told the vet that I suspected fertilizer poisoning. He immediately called poison control and our suspicions were confirmed. We brought Harley home and hand-fed him food and water for about four days. He began to respond. Our story turned out happily, as Harley is beginning to run again and eat by himself. The reason I am writing this is to alert people to the danger.

EPA RELEASES REPORT OF 1996-97 ESTIMATED PESTICIDE SALES AND USAGE IN THE UNITED STATES (Press Advisory 1/6/00) - EPA has released its biennial pesticide usage report “Pesticide Industry Sales and Usage - 1996-1997 Market Estimates”. This publication reports estimates based on available information taken from Agency records, United States Department of Agriculture surveys of pesticide usage, and other public and proprietary sources. The report indicates a continuation of recent trends in pesticide use in 1996 and 1997. The overall total U. S. use for all types of **active ingredients** is about 4.6 billion pounds per year. Agriculture use accounted for slightly more than three-fourths of the total of 1.23 billion pounds of conventional pesticides (including sulfur and petroleum products) in 1997. The remaining nearly one-fourth of conventional pesticide use is split about evenly between applications by homeowners (11 percent) and professional applications in non-agriculture sectors (12 percent). The report contains estimates of use in 1997 for other types of pesticide active ingredients as follows: 0.66 billion pounds for wood preservatives, 0.27 billion pounds for specialty bio-cides (for water treatment, disinfection, sanitizers, etc.), and nearly 2.5 billion pounds for chlorine/hypochlorites (used for various disinfectant and water treatment uses). To obtain a copy of the report, call or write: U. S. EPA, NCEPI, P. O. Box 42419, Cincinnati, Ohio 45242-2419; telephone 513-489-8190. The report is available on the Agency’s home page at: <http://www.epa.gov/oppbead1/pestsales>.



<http://www.highplainsipm.org/> will put you online with the High Plains Integrated Pest Management Guide.

CNN noted 5/8/00 that U. S. farmers spent \$185 billion on feed, fertilizer and pesticides.

01/05/00 - Fertilizer Reported Deadly to Frogs - CORVALLIS, Ore. (AP) - Fertilizer levels the Environmental Protection Agency says are safe for human drinking water can kill some species of frogs and toads, according to a new study. Oregon State University researchers found some tadpoles and young frogs raised in water with low levels of nitrates typical of fertilizer runoff ate less, developed physical abnormalities, suffered paralysis and eventually died. In control tanks with normal water, none died. “We’re looking at levels of nitrates so low we

didn't think we'd get any effect," said Andrew Blaustein, a zoology professor.

In addition, the fertilizer runoff may be encouraging the growth of algae that feeds tiny parasitic flatworms called trematodes, blamed for causing deformities in frogs around the United States.

The study indicates EPA water quality criteria does not guarantee the survival of some protected and endangered amphibians, Blaustein said. "I think this is clearly a significant problem," he said. "The question I have to ask is, are you comfortable drinking water with levels of fertilizer that kills off frogs?" Officials at the Environmental Protection Agency regional office in Seattle said they could not comment until they have reviewed the study, published last month in the journal *Environmental Toxicology and Chemistry*.

Why are the pests eating our food? When G-d created "pests" they were to be used as "garbage collectors" and/or as predators to remove the sick, dying or dead plants and animals. The plants we are producing with synthetic pesticides and fertilizers are not healthy, that is why the plants are being attracted by pests. Sick soil can not produce healthy plants or food crops. We are starving to death nutritionally and are overweight eating sick food that no longer sustains us and that constantly needs our "help" to be "protected" with synthetic fertilizers and poisons! We and the plants are now experiencing many analogous diseases G-d did not create this planet to self-destruct nor do healthy plants need man's "help" to survive!

Glassy-winged Sharpshooters - are ½" long insects that can transmit a deadly plant bacterium or microbe called *Xyella fastidiosa* into plants during feeding. The bacterium can then form colonies or clusters that shut off the flow of water and nutrients in the grapevine or plant. When grapevines are so infested with this bacterium, the infection is called Pierce's Disease. Infested vines become weak and then die. Antibiotics such as colloidal silver could help prevent the growth of these bacteria. There are also two tiny wasps that were found in Northern Chile and northwestern Argentina that are stingless/harmless to humans that only attack sharpshooter eggs (There may be many other biological controls), but *Gonatocerus tuberculifemar* and *Gonatocerus metanotalis* look like the best prospects for the immediate future.

Aspirin - Dissolving 2 uncoated aspirin in a quart of water will produce a spray or drench that can induce systemic acquired resistance in plants; this resistance will help protect against viruses, fungi, insects and/or bacteria. You can add hydrogen peroxide and/or food-grade DE. Stronger solutions can be used on some plants; always test a small area first before applying anything to the total area.

Compost Tea and/or Compost - will protect plants against disease and increase plant growth and naturally inhibit pathogens. The three main components of compost tea are microbials, nutrients and water. The microbials are various aerobic organisms that perform several beneficial functions, especially if synthetic, inorganic fertilizers and pesticides have killed the beneficial organisms, e.g., bacteria and fungi; if they are destroyed, pathogens and diseases grow in the vacuum created. Compost/compost tea beneficials consume pathogens and produce compounds that inhibit the growth of disease-causing organisms and help chelate minerals and nutrients vital to healthy plant growth. The nutrients in compost/compost tea feed the organisms in the tea and/or soil and feed the plant, making it healthy and strong and able to fight disease-causing organisms. Beneficial microorganisms also help detoxify the soil and water and build soil structure so air and water can reach the plant's roots. If it smells bad, something is wrong with your compost. Note: Beneficial species are almost always aerobic; the "stink" smell is anaerobic, so aerate the compost/compost tea. Be sure to use well water or remove the chlorine before making compost tea. Nutrients in the compost feed the microbes and plants so use good compost, good water and a bit of molasses to maximize fungal biomass and bacteria. Don't forget to spray the foliage with your completed compost tea.

Disulfides that occur naturally in garlic, onions and mahogany trees are known to have antifungal, anticancer and antibacterial properties. Perhaps the EPA should require G-d to register these plants.

Sunshine is still the best disinfectant.

As the Author was completing this chapter, he had just begun the final testing of an exempted herbicide called "Not Nice to Weeds." Note: A steam cleaner using vinegar and a dash of soap is the quickest way to kill weeds.

Nothing dies harder than a bad idea...that's why we have so much "pestisucide".

According to the U. S. National Safety Council, more than two million poisoning incidents each year involve children less than six years of age.

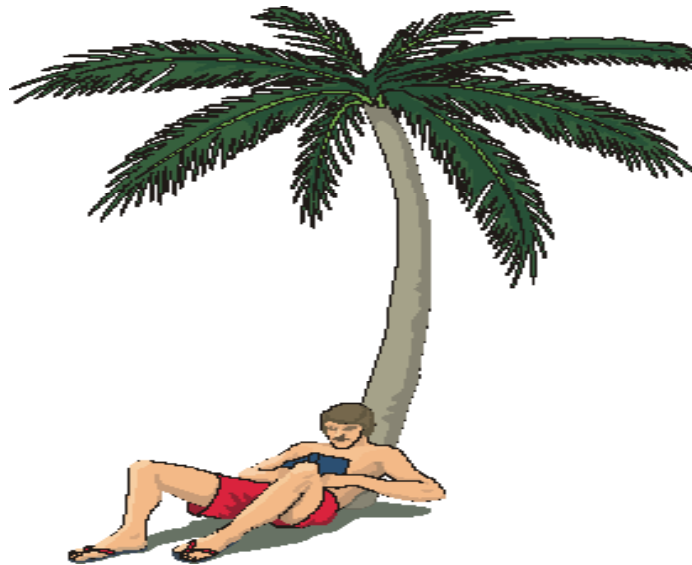
Poison Ivy/Oak Caution - Poison ivy and poison oak have a resin called urushiol that irritates both the skin and mucous membranes of many people. Urushiol has little or no effect on most animals, but the animals may carry the substance on their fur and, thereby, transmit it to people. Goats will eat it. Vines left on trees or fences - even if they look dead - still may carry the allergic oils and should be handled with great care. See Chapter 11 on poison ivy.

CAUTION NOTE: Safe Solutions, Inc. Enzyme Cleaner with Peppermint is at least 4 times more efficient than the old preformed Safe Solutions #2 Enzyme Cleaners and smells a whole lot better, so remember that when you use this new cleaner!

How much more pollution, sickness and death do we have to bear before we finally change our ways? I am still not sure, but personally I have decided that even one more drop of "registered" poison is too much, especially when there are safer and far more effective alternatives. Never forget that 71% of our plant earth is water; keep it unpolluted. — S.L.T.

"Nothing in this world can take the place of persistence. Talent will not; nothing is more common than unsuccessful people with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. Persistence and determination alone are omnipotent. The slogan "press on" has solved and always will solve the problems of the human race" — Calvin Coolidge

Mazel Tov! Selah!



Safe Solutions products may be purchased online at:

<http://www.safesolutionsinc.com>

or by telephone at:

1-888-443-8738.