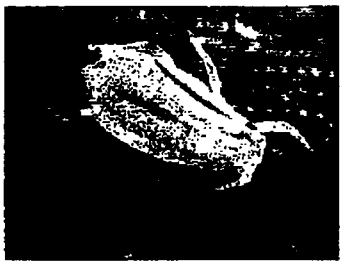
grow green

earth-wise guide to



aphid, magnified

description

Tiny (1/16-1/8") insect with soft body, long legs and antennae; 250 species; reproduce faster than any other insect; attack new growth or underside of leaf; tend to be plant specific

infestation

Suck sap from leaves and excrete clear, sticky "honeydew" that often causes black, sooty fungus that blocks sunlight from leaves; aphids can stunt growth, deform and discolor, or cause leaves to drop prematurely. Some aphids transmit plant diseases

attack

- Bedding plants
- Crape myrtle
- Hibiscus
- Oaks
- Oleanders
- Pecans
- Roses
- Vegetables

Least-Toxic solutions

- Monitor often for early detection and to determine if control is needed
- For minor infestations, spray host plants with water at high pressure to dislodge aphids
- Use sticky barriers to prevent ants from tending aphids and protecting them from natural predators
- Introduce ladybugs or allow small infestations of aphids to attract lady beetles and other beneficial insects to your landscape - for best results, follow release instructions carefully
- Help control aphids with insecticidal soaps and horticultural oils
- Most aphids are host-plant specific and usually don't move to other species

If You Must Use a Pesticide...

- Systemic pesticides are taken up by the plant and make its tissues and fluids toxic to the feeding aphids. Non-systemic must be applied to all infested plant surfaces for best results, because they must come into direct contact with the insects
- Never use systemic pesticides on plants you intend to eat
- Avoid applying the more toxic pesticides - they destroy beneficial insects as well as pests and leave trees or shrubs unprotected if pests return
- Apply only to plants specified on the label - some formulations injure tender ornamental plants and new growth
- Mix according to directions and apply only recommended dosage
- Several pesticide applications at 7-10 day intervals, or as instructed by the product label, may be needed for control
- Avoid overuse of chemicals - many pests have become resistant to certain pesticides

aphids and associated sooty mold

product toxicity comparisons*

(not for endorsement purposes)

Toxicity/Threat: ○ low ◔ low to moderate ◑ high ● highest
N/A not applicable ? unknown toxicity

	Hazards: human toxicity		aquatic life	birds, bees, pets	soil mobility	environmental persistence
	acute	*chronic*				
Safer® Insecticidal Soap Multi-Purpose Insect Killer, Ready to Use *(potassium salts of fatty acids)*	◔	?	◔	○	○	○
Safer® BioNEEM® *(azadirachtin/neem oil extract)*	◔	?	◔	◔	○	○
Bonide® Hot Pepper Wax™, Ready to Use *(capsaicin) [repellant only]*	◔	?	◔	○	?	?
Concern® Pesticidal Spray Oil™, Dormant and Growing Season Insect Spray *(canola oil)*	◔	○	◔	◔	?	?
Sunspray® Ultra Fine® Year-Round Pesticidal Oil *(paraffinic oil)*	◔	?	◑	◔	◔	◔
Schultz® Fruits & Vegetables Insect Spray *(piperonyl butoxide, pyrethrins)*	◔	○	◑	◑	○	○
Bayer Power Force Multi-Insect Killer *(cyfluthrin)*	◔	?	◑	◑	○	◑/◔
Green Light® Neem II Ready to Use *(neem oil extract, pyrethrins, piperonyl butoxide)*	◔	●	◔	◑	○	○
Hi-Yield® Malathion Insect Spray *(malathion)*	◔	?	◑	●	○	◔
Concern® Multi-Purpose Insect Killer *(piperonyl butoxide, pyrethrins)*	◔	●	◑	◑	○	○
Bonide® Eight™ Insect Control Garden Dust *(permethrin)*	◔	◑	●	◑	○	◑/◔
Orthene® Systemic Insect Control *(acephate)*	◑	◑	◔	●	◔	◔
Ortho® Bug-B-Gon® Ready-Spray *(permethrin)*	◔	?	●	●	○	◑/◔
Green Light® Sevin 5% Dust Carbaryl Insecticide *(carbaryl/Sevin)*	◔	◔	●	●	◔	◔

least toxic ↓ most toxic

*The City of Austin and the Texas Cooperative Extension provide this information as a comparative reference only. Listing of specific product trade names does not constitute an endorsement of its use . Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. The goal is to reduce the amount of landscape chemicals that runoff into waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the City of Austin Watershed Protection and Development Review Department and Texas Cooperative Extension. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

Watershed Protection Development Review
974-2550

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

www.growgreen.org

02/04

grow green

earth-wise guide to

description

Many sizes, shapes and colors; chewing mouth parts and thickened coverings over abdomen meet in straight line on back

infestation

Chew leaves, fruit and tender stems of plants

attack

Over 126 garden and landscape plants, including but not limited to:

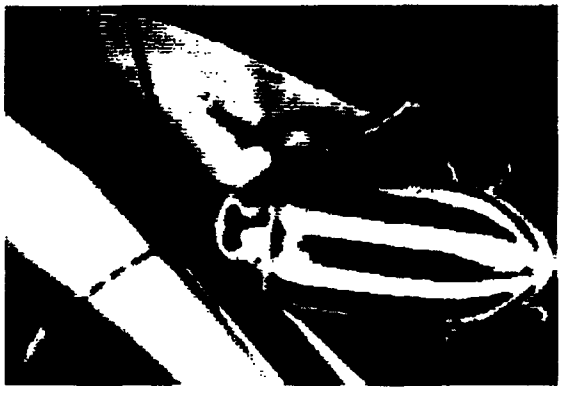
- Fruit Trees
- Pecan
- Shade Trees
- Vegetables

least-toxic solutions

- Evaluate infestation; most beetle infestations are not a significant threat to the health of the plant
- Row covers are an effective barrier in vegetable gardens

if you must use a pesticide

- Avoid applying the more toxic pesticides — they destroy beneficial insects as well as pests and leave trees or shrubs unprotected if pests return.
- Apply only to plants specified on the label — some formulations injure tender ornamental plants and new growth
- Mix according to directions and apply only recommended dosage
- Systemic pesticides are taken up by the plant and make its tissues and fluids toxic to the feeding beetles. Non-systemic must be applied to all infested plant surfaces for best results, because they must come into direct contact with the insects



- Several pesticide applications at 7-10 day intervals, or as instructed by the product label, may be needed for control
- Avoid overuse of chemicals — many pests have become resistant to certain pesticides

products*

Hazard: ○ low ◔ low to moderate ◑ high ● highest

	Hazard to:					
			aquatic	birds, bees,	soil mobility	1/2 life persis
Safer® BioNEEM® (azadirachtin/neem oil extract)	○	?	○	○	○	○
Bonide® Hot Pepper Wax™, Ready to Use (capsaicin) [repellant only]	○	?	○	○	?	?
Green Light® Neem Concentrate (neem oil extract)	○	?	○	◑	○	○
Concern® Multi-Purpose Insect Killer (piperonyl butoxide)	○	?	◑	◑	○	○
Schultz® Fruits & Vegetables Insect Spray (piperonyl butoxide and pyrethrins)	○	○	◑	◑	○	○
Hi-Yield® Malathion Insect Spray (malathion)	○	?	◑	●	○	◔
Ortho® Orthene® Systemic Insect Control Concentrate (acephate/Orthene®)	◑	?	○	●	◔	○
Bonide® Eight™ Insect Control Garden Dust (permethrin)	○	◑	●	◑	○	◑/○
Green Light® Sevin 5%® Dust Carbaryl Insecticide (carbaryl/Sevin)	○	◑	●	●	◔	◔

** Texas Agricultural Extension Service and the City of Austin provide this information as a comparative reference, only, and do not necessarily agree with the ratings provided. Listing of specific product trade names does not constitute an endorsement of its use or lack thereof. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.*

Products rated by the Washington Toxics Coalition.
Contact Philip Dickey at 206-632-1545 for rating information.

Use pesticides as a last resort. Never fertilize before a rain.

why grow green?

The Grow Green program aims to educate Austin area residents on the least toxic approach to pest management and responsible fertilizer use in order to reduce the amount of landscape chemicals that "run-off" into our waterways and degrade our water quality.

Grow Green is a partnership between the Texas Agricultural Extension Service Water 2000 Plus Program and the City of Austin Watershed Protection Department.
Call 854-9600 or 974-2550 for more information. Or visit our website at www.growgreen.org

Texas Agricultural Extension Service
The Texas A&M University System

854-9600

City of Austin
Watershed Protection

974-2550

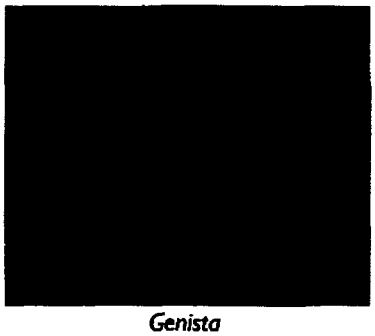
grow green

earth-wise guide to

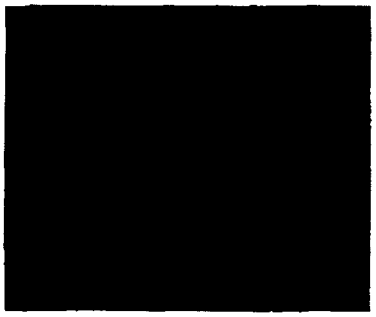
pest caterpillars

Tomato Horn Worm

Tent Caterpillar



Genista



Spring Cankerworm

Least Toxic Solutions

- Monitor infestations of very young caterpillars to see if natural controls like predators, parasitic wasps or harsh weather will eliminate infestation
- Do not treat native trees; infestations are natural and rarely threaten tree health unless tree is stressed or weakened
- For butterfly gardening enthusiasts, expect some caterpillar damage - caterpillars are the larval stage of butterflies (see photos below)
- Egg masses and groups of caterpillars found on trees or branches can be removed by hand or pruned out of the tree and destroyed
- Dislodge young (small) tent caterpillars with high-pressure water sprays or a broom
- Use row covers - they are an effective barrier in vegetable gardens
- Encourage wasp and fly parasites which often attack caterpillars (see Beneficial Insects fact sheet for details)
- Treat young caterpillars with Bacillus thuringensis (B.t.), but do not use near butterfly gardens

If You Must Use a Pesticide...

- Avoid applying the more toxic pesticides - they destroy beneficial insects as well as pests and leave trees or shrubs unprotected if pests return.
- Apply only to plants specified on the label - some formulations injure tender ornamental plants and new growth
- Mix according to directions and apply only recommended dosage
- Avoid systemic pesticides on vegetables and edible plants. Systemic pesticides are taken up by the plant and make its tissues and fluids toxic to the feeding caterpillars
- Non-systemic pesticides must be applied to all infested plant surfaces for best results, because they must come into direct contact with the insects
- Avoid overuse of chemicals - many pests have become resistant to certain pesticides

*product toxicity comparisons**

(not for endorsement purposes)

Hazards:

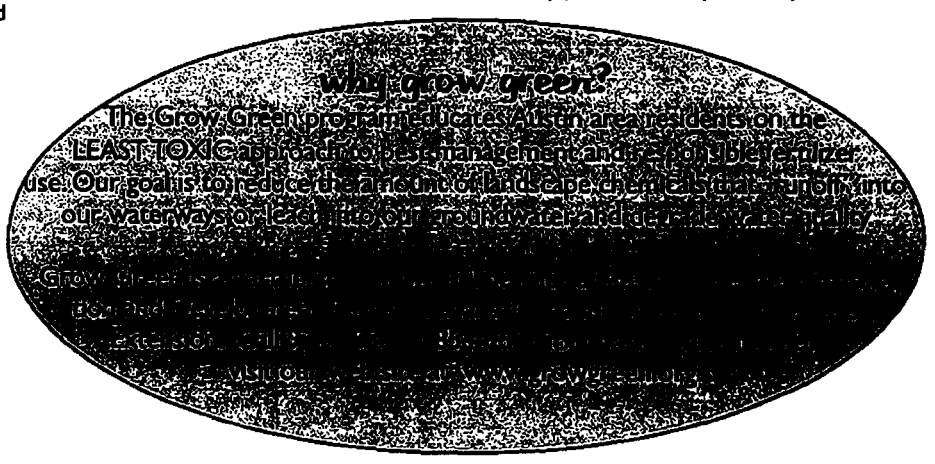
Toxicity/Threat: ○low ◐low to moderate ◑high ●highest N/A not applicable ? unknown toxicity

		human toxicity		aquatic life	birds, bees, pets	soil mobility	environmental persistence
		acute	*chronic*				
least toxic	Bonide® Dipel 150 Dust For Vegetables, Ready to Use (B.t. kurstaki/dipel)	○	?	○	○	○	○
	Safer® BioNEEM® (azadirachtin/neem oil extract)	○	?	○	○	○	○
	Safer® Caterpillar Killer (B.t. kurstaki/dipel)	○	?	○	○	○	○
	Green Light® Neem Concentrate (azadirachtin/neem oil extract)	○	?	○	◑	○	○
	Concern® Multi-Purpose Insect Killer (pyrethrins, piperonyl butoxide)	○		◑	◑	○	○
	Schultz® Fruits & Vegetables Insect Spray (pyrethrins, piperonyl butoxide)	○	○	◑	◑	○	○
	Sunspray® Ultra Fine® Year-Round Pesticidal Oil (paraffinic oil)	○	?	◑	○	○	○
	Orthene® Systemic Insect Control (acephate®)	◑	◑	○	●	○	○
	Bonide® Eight™ Insect Control Garden Dust (permethrin)	○	◑	●	◑	○	●/◑
	Green Light® Sevin 5%® Dust Carbaryl Insecticide (carbaryl/Sevin)	○	◑	●	●	○	○
most toxic	Hi-Yield® Lindane Spray (lindane)	○	●	◑	●	◑	●

*The City of Austin and Texas Cooperative Extension provide this information as a comparative reference of products commonly found at local retailers only. Listing of a specific product trade name does not constitute an endorsement of its use. Many pesticides and pesticide products other than those listed in these tables are available and may be suitable for use.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

If you have unwanted or banned chemicals (Dursban or Diazinon) in your garage, please take them for safe disposal to a household hazardous waste facility. In Austin call 974-4343 for information.



Grow Green encourages least toxic solutions

www.growgreen.org

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

Watershed Protection Development Review
974-2550

02/05

grow green

earth-wise guide to

Fire Ants

Enlarged photo of fire ants

description

Fire ant colonies contain the queen(s), winged males and females, and wingless, sterile female workers and brood who feed and protect the queen.

infestation

Fire ants create mounds up to 18" tall in any type of soil. They prefer open sunny areas such as lawns, pastures, parks and disturbed areas, often nest under side walks, slabs or at the base of trees.

problems

Fire ants don't injure turfgrass but mounds become unsightly; ants are aggressive and cause painful stings that are easily infected. They can invade electrical equipment by chewing insulation and cause short circuits.

Fire ant mound

Least Toxic Solutions

- Properly identify as fire ants — many other species occur in Texas and some are their natural predators; call the Extension office at 854-9600 for details, or visit http://fireant.tamu.edu
- Carefully pour a large pot (about 3 gallons) of boiling water on each mound. This will kill a mound about 60% of the time
- Nematodes (Steinernema carpocapsae) are small round worms that attack fire ant larvae, as well as grubs and other soil-dwelling larvae. They work best when applied to moist soil at dusk
- Choose baits over contact products; baits are safer to use because they are ant-specific and formulated with very small percentages of the active ingredients
- For less than 5 mounds per 1/4 acre, treat mounds individually
- For more than 5 mounds per 1/4 acre, broadcast ant BAIT products once or twice a year, mid-April – September (fall application reduces spring infestations)
- Before using baits, toss a potato chip next to an active mound in the yard and check back in 15 minutes to see if ants are feeding
- In hot weather, apply in evening when temperatures are cooler
- Use fresh bait—opened containers may last only a few months
- Consider sharing leftover bait with a neighbor before it goes stale
- Avoid application before rain (at least 8 hours)
- DO NOT USE GASOLINE OR DIESEL FUEL TO TREAT
- If you feel you must use a contact pesticide, make the most earth-friendly choice. Avoid using any leftover products in your garage containing chemicals such as diazinon or Dursban (chlorpyrifos). They have been banned by the EPA for residential use
- Use insecticides only where recommended on the product label — for instance, do not use them in the vegetable garden unless specified

Neighborhood Ant-Out!

Organize your neighbors to treat fire ants at the same time—you share the cost of the bait and control the pests rather than driving them from yard to yard. Call 854-9606 for information.

product toxicity [illegible]

(not for endorsement purposes) [illegible] hazards

Toxicity/Threat: ○ low ◔ low to moderate ◑ high ● highest

N/A - not applicable ? - unknown toxicity

☠ banned for residential use by EPA

	Baits						
least toxic ↓ most toxic	Eliminator® Fire Ant Killer Bait *(spinosad)*	○	?	◑	◔	○	○
	Extinguish™ Professional Fire Ant Bait *(methoprene)*	○	?	◑	○	?	◔
	Amdro® Fire Ant Bait *(hydramethylnon)*	○	◑	◑	◔	○	○
	Spectracide® Fire Ant Bait *(pyripoxyfen)*	○	?	○	?	?	?
	Ascend™ Fire Ant Bait *(avermectins/Abamectin B1)*	○	?	◑	◑	○	◔
	Logic® *(fenoxycarb)*	◔	●	◑	◔	○	○
	Contact						
least toxic ↓ most toxic	Boiling Water *(use 3 gallons per mound)*	*non-chemical control*					
	Flea Destroyer™ Beneficial Nematodes *(Steinernema carpocapsae)*	*non-chemical control*					
	Victor® Ant Killer *(mint oil)*	?	○	?	?	?	?
	Citrex™ Fire Ant Killer *(d-limonene)*	◑	?	◔	◔	○	○
	Organic Solutions™ MultiPurpose Fire Ant Killer *(silicon dioxide, pyrethrins, piperonyl butoxide)*	◔	●	◑	◑	○	○
	Ortho® Fire Ant Killer *(acephate)*	◔	◑	◔	●	◔	◔
	Ortho® Fire Ant Killer Granules 2 *(bifenthrin)*	◔	?	●	◑	○	◔
	Green Light® Fire Ant Killer *(permethrin)*	◔	◑	●	◑	○	◑/◔
	Enchem's™ Rapid Kill Fire Ant Mound Drench *(fenvalerate/Pydrin)*	◔	?	●	◑	○	◑
	☠ Ortho® Fire Ant Killer Granules *(diazinon)*	◔	?	●	●	◔	◑
	☠ Hi-Yield® Ant Killer Granules *(diazinon)*	◔	?	●	●	◔	◑

*Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of specific product trade names does not constitute an endorsement of its use. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

why grow green?

The Grow Green program educates Austin are residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. Our goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the Texas Cooperative Extension and the City of Austin Watershed Protection and Development Review Department. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

Watershed Protection Development Review
974-2550

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

Grow Green encourages least toxic solutions

www.growgreen.org

3/03

grow green

earth-wise guide to

Enlarged photo of a flea

description

Fleas are tiny insects with hind legs modified for jumping; they are found on pets, in carpet and in shady, moist soil in the yard; they leave black droppings around pet sleeping areas and hop when disturbed

infestation

Fleas can attack pets and people - flea bites are mostly on the lower legs, and can turn red and itch. Most adult fleas live on the animal host (pets or other animals in the area), however, flea eggs and larva can be found in bedding, carpeting and areas where pets spend time resting and sleeping. An effective program to eliminate fleas must include controlling fleas on pets, and removing eggs and larva from the living area.

If you have fleas but do not have pets, you could have animals entering your attic or crawlspace.

Least Toxic Solutions

- Keep your house well vacuumed, especially where your pet rests; dispose of vacuum bags after use to prevent fleas from escaping back in to your home
- Steam clean carpets to remove organic material which is food for flea larvae
- Wash your pet's bedding regularly in hot water; wash your bedding if pets sleep with you
- Use a flea comb to remove fleas from your pet. Dip the flea comb into soapy water to remove and kill any fleas that you encounter while combing your pet
- Shampoo your pet regularly with a gentle shampoo. Shampoos containing chemical pesticides are not necessary, because ANY soapy water kills fleas, and washing your pet removes fleas and flea eggs from their fur
- Try flea traps that utilize light, heat and sticky boards to trap any adult fleas living in your carpeting
- Test your yard for flea infestation by walking around in white socks and noticing if fleas jump on your legs. If areas of your yard are heavily infested, treat them using a spray of beneficial nematodes (*Steinernema carpocapsae*). These organisms kill flea larva, but are not harmful to the environment

If You Must Use a Pesticide

- Many new products target fleas specifically. Try spray products containing insect growth regulators that stop fleas from maturing into adults, eliminating the flea population
- Very effective once-monthly pills or spot treatments for pets are available through veterinarians. These products contain chemicals that kill fleas and stop flea larvae from developing, but are of low toxicity to people and pets
- If you have a severe infestation, diatomateous earth or boric acid can be used in cracks and crevices around the house. These dessicants penetrate the surface of the fleas and dry them out
- Some pesticides, such as those containing d-limonene (from citrus), kill fleas on contact. These can be sprayed on fleas indoors and outdoors. Do NOT spray them on pets!
- If you feel you must use a pesticide, make the most earth-friendly choice. Avoid using any leftover products in your garage containing chemicals such as diazinon or Dursban (chlorpyrifos). They have been banned by the EPA for residential use
- Always follow the instructions on the label of any product that you use

product toxicity comparisons*

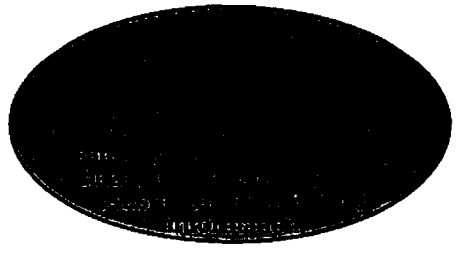
(not for endorsement purposes)

Toxicity/Threat: ○ low ◐ low to moderate ◑ high ● highest
N/A not applicable ? unknown toxicity

	Products for Pets (Check with your veterinarian.)	Hazards: human toxicity acute	human toxicity chronic	aquatic life	birds, bees, pets	soil mobility	environmental persistence
least toxic	Frontline® Spray Treatment *(fipronil)*	○	◐	N/A	N/A	N/A	N/A
	Frontline® Top Spot® *(fipronil)*	○	◐	N/A	N/A	N/A	N/A
	Frontline® Plus *(fipronil, methoprene)*	○	◐	N/A	N/A	N/A	N/A
	Advantage® *(imidacloprid)*	◑	?	N/A	N/A	N/A	N/A
	Capstar™ *(nitenpyram)*	?	?	*ingested by pet*			
most toxic	Program® Flavor Tabs® *(lufenuron)*	?	?	*ingested by pet*			
	Products for Home and Yard						
least toxic	"The Flea Trap" Sticky Flea Trap	*non-chemical control*					
	Victor® Ultimate Flea Trap Sticky Flea Trap	*non-chemical control*					
	Flea Destroyer™ Beneficial Nematodes *(Steinernema carpocapsae)*	*non-chemical control*					
	Bioganic Crawling Insect Killer *(eugenol, phenethyl propionate)*	◐	○	?	?	?	?
	Orange Guard Home Pest Control™ *(d-limonene)*	◐	?	◑	◐	○	○
	Bayer Advanced Lawn™ Power Force Multi-Insect Killer *(cyfluthrin)*	◐	?	◑	◑	○	◑/◐
	Precor® Plus Fogger *(methoprene, permethrin)*	◐	?	N/A	N/A	N/A	N/A
	Organic Solutions Multi-Purpose Insecticide *(diatomaceous earth, pyrethrins)*	◐	●	◑	◑	○	○
	Ortho® Bug-B-Gon® Multipurpose Insect Killer, Ready to Use Granules *(carbaryl)*	◐	●	◑	◑	○	○
	Green-light® Sevin 5% Dust *(carbaryl)*	◐	●	◑	◑	○	○
most toxic	Hi-Yield® Lindane Spray *(lindane)*	◐	●	◑	◑	○	○

* Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of specific product trade names does not constitute an endorsement of its use. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.



why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. Our goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the Texas Cooperative Extension and the City of Austin Watershed Protection and Development Review Department. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

Watershed Protection Development Review

974-2550

Texas Cooperative EXTENSION
The Texas A&M University System

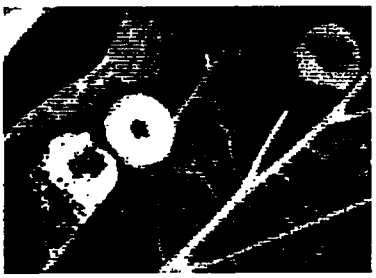
854-9600

www.growgreen.org

02/05

grow green

earth-wise guide to



description
Abnormal growth of plant cells caused by insects, mites, nematodes, bacteria or fungi; various size, shapes and colors

infestation
Unsightly; don't usually damage plants, although leaves with insect-induced galls may fall from the plant earlier than non-infested leaves; twig and stem galls usually persist for more than a year, weakening stems and twigs and causing them to drop during storms

attack
- Apple
- Cypress
- Cottonwood
- Elm
- Grape
- Hackberry
- Hickory
- Oaks
- Pecan
- Poplar
- Willow
- Yaupon Holly

least toxic solutions
- Chemical treatment is usually unwarranted because damage to plants is insignificant
- Chemical treatment is usually ineffective because the gall protects the insect inside
- Unsightly galls can be hand-picked or infested plant parts pruned and discarded
- Do not destroy beneficial wasps that parasitize gall-forming insects

products
No effective chemical treatment available

Use pesticides as a last resort. Never fertilize before a rain.

why grow green?

Grow Green is a partnership between the Texas Agricultural Extension Service Water 2000 Plus Program and the City of Austin Watershed Protection Department. Call 854-9600 or 974-2550 for more information. Or visit our website at www.growgreen.org

Texas Agricultural Extension Service
The Texas A&M University System

854-9600

Watershed Protection

974-2550

IPM PLAN for
ROACHES
(6/26/00)

1. Pest(s) to be controlled: cockroaches

2. Biology of the German cockroach, Blattella germanica:

   There are five species of cockroaches that commonly infest houses, with the German cockroach being one of the most widely distributed. Roaches are tropical insects that have adapted to living with man by seeking areas where they can get warmth and moisture, such as bathrooms and kitchens. Female roaches glue egg cases, called ootheca, to the surfaces of any dark place. The average development time for the German cockroach from egg to adult is 55-68 days. Adults can live more than 200 days. They are active at night.

3. Control tactics:

   a. Physical control tactics will include the sealing of cracks and crevices and the screening of windows and vents to limit access from the outside. Roach traps will be used to monitor to pest population.

   b. Cultural control tactics will include good sanitation, including the proper storage of food and regular cleaning.

   c. There are currently no biological control tactics available for control of cockroaches.

   d. Non-toxic and less persistent control tactics will insecticidal dusts and baits, and insect growth regulators.

Active Ingredient(s)	Product Name
Boric acid powder	Roach Rid®
Silica aerogel and Pyrethrum	Drione®
Hydramethylnon	Combat®
Hydroprene	Gencor™

4. This IPM plan is a dynamic document. If other control tactics are found to be effective, then this plan will be amended to include those tactics. No regularly scheduled pesticide applications are planned.

IPM PLAN for
MOSQUITOES
(6/26/00)

1. Pest(s) to be controlled: mosquitoes

2. Biology of the mosquito, Order Diptera, Family Culicidae:

   Adult mosquitoes are small, slender, long-legged flies with a long piercing mouthpart called the proboscis. Mosquitoes develop through four distinct stages: egg, larva, pupa, and adult. Adult females feed on animal blood for the protein needed to produce eggs. Eggs are laid singly or in clumps on still or slow-moving water. Some mosquitoes lay eggs in temporary water basins such as tree holes or at the edges of flood prone areas.

   Mosquito eggs may lie dormant for months before hatching, but under most circumstances hatch within 2 to 6 days. The aquatic larva and pupa stages each take from 4 to 10 days to develop and represent the most vulnerable stages. Adults can live up to 2 months after emergence. Most mosquitoes die within yards of where they emerged.

   The most effective method of controlling mosquitoes is to limit the number of water basins where eggs can hatch. Examples of temporary basins include cans and jars, clogged roof gutters, used tires, plant saucers, plastic sheeting, and wheelbarrows. Larger, more permanent water basins can be drained or filled in. However, not all water basins can or should be altered for environmental reasons. In addition, the excessive use of fertilizers should be discouraged as fertilizers in water will promote algae blooms that protects the mosquitoes from predation by fish.

3. Control tactics:

   a. Physical control tactics will include the use of screens on windows and doors. Electric "bug zappers" will not be used, as they are not effective at reducing mosquito populations since they target only adults, and affect non-target insect populations as well.

   b. Mechanical control tactics will include the use of suffocating surface film where practical. This will include those basins not subject to runoff. The films to be used are highly refined and biodegradable, with no effect on human or non-target species.

   c. Biological control tactics will include the use of native mosquito-eating fish (Gambusia) in permanent pools, where a viable fish population can be maintained.

   d. Least toxic and less persistent chemical control tactics will include the use of Bacillus thuringiensis israelensis or pyrethrum larvicides. These products will be applied to water basins where mosquito larvae develop.

Active Ingredient(s)	Product Name
Bacillus thuringiensis israelensis	Mosquito Dunks®
Encapsulated pyrethrum	Tossits®

4. This IPM plan is a dynamic document. If other control tactics are found effective, then this plan will be amended to include those tactics. No regularly scheduled pesticide applications are planned.

IPM PLAN for
RODENTS
(6/26/00)

1. Pest(s) to be controlled: rodents.

2. Biology of the common house mouse, Mus musculus, roof rat, Rattus rattus and Norway rat, Rattus norvegicus:

   The house mouse, roof and Norway rats are rodents intimately associated with people, and are found almost everywhere humans live or work. While wild mice and rats will invade houses when weather changes, these pests are dependent on man for shelter and food. The reproductive rate of rodents in general and mice in particular is very high. Female mice produce 10 litters a year, 6-7 young per litter. Rats are almost as productive, but suffer high mortality. All rodents respond to trapping or other declines in their population by producing more litters.

   Strategies to control rodents involve primarily preventative steps to limit access to shelter and food, trapping to reduce small populations, and poisoning.

3. Control tactics:

   a. Physical control tactics will include the filling of access holes, making food storage rodent-proof, and the use of barriers. These measures will include the inspection of sewer lines into dwellings and cracks in foundations.

   b. Mechanical control tactics will include the trapping of rodent populations in snap traps or glue boards. A large number of traps will be placed to have the desired effect on the population.

   c. The use of domestic cats will be considered as a biological control tactic, if they will not become pests themselves.

   d. Non-toxic and less persistent control tactics will include the use of cholecalciferol, which will not lead to secondary poisoning.

Active Ingredient(s)	Product Name
Cholecalciferol	Quintox®

   e. More persistent chemical control tactics will include the use of anticoagulants placed in bait boxes to prevent secondary poisoning.

Active Ingredient(s)	Product Name
Warfarin and Sulfaquinoxaline	Prolin®

4. This IPM plan is a dynamic document. If other control tactics are found effective, then this plan will be amended to include those tactics. No regularly scheduled pesticide applications are planned.

grow green

earth-wise guide to

spider mite magnified

description

Adults are tiny (1/150-1/50"), varied in color; spider-like, with eight legs and no antennae; eggs are laid on the underside of leaves and on buds; there are many species

infestation

Leaves lose color as numerous yellow specks appear; often turn bronze and curl under; may be covered with a fine web; often becomes noticeable during dry, hot summer weather

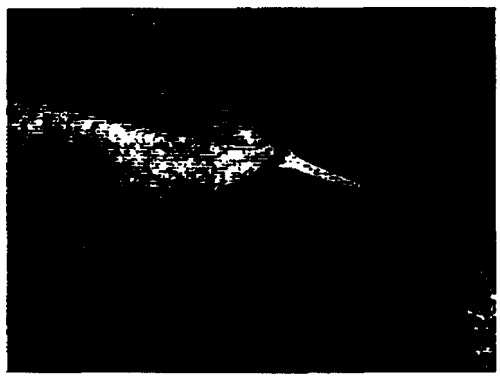
attack

- Fruit trees
- Tomatoes
- Marigolds
- Strawberry
- Buddleia
- Rose
- Junipers
- Rosemary
- Many house plants

Least Toxic Solutions

- Monitor often for early detection. Be sure to look under leaves and inspect new houseplants. Spider mites can often be detected by taking a white piece of paper and striking some affected leaves on it. The mites can be seen crawling slowly on the paper
- For minor infestations, spray host plants weekly with water upwards from beneath the plant at high pressure
- Help to manage populations with predatory mites, lady bugs and lacewings
- Apply insecticidal soaps or horticultural oils; direct spray upward from beneath plant foliage
- Keep plants adequately watered to prevent stress
- Encourage natural enemies like green lacewing larvae and predatory mites by avoiding use of broad-spectrum pesticides

If You Must Use a Pesticide



spider mite damage

- Avoid applying the more toxic pesticides - they destroy beneficial insects as well as pests and leave trees or shrubs unprotected if pests return.
- Apply only to plants specified on the label - some formulations injure tender ornamental plants and new growth
- Mix according to directions and apply only recommended dosage
- Systemic pesticides are taken up by the plant and make its tissues and fluids toxic to the feeding spider mites. Non-systemic must be applied to all infested plant surfaces for best results, because they must come into direct contact with the insects
- Several pesticide applications at 7-10 day intervals, or as instructed by the product label, may be needed for control
- Avoid overuse of chemicals — many pests have become resistant to certain pesticides

product toxicity comparisons*

(not for endorsement purposes)

Toxicity/Threat: ○ low ◐ low to moderate ◑ high ● highest
N/A not applicable ? unknown toxicity

	Hazards: human toxicity (acute)	human toxicity (chronic)	aquatic life	birds, bees, pets	soil mobility	environmental persistence
least toxic						
Safer® Insecticidal Soap Multi-Purpose Insect Killer, Ready to Use *(potassium salts of fatty acids)*	◐	?	◐	○	○	○
Safer® BioNEEM® *(azadirachtin/neem oil extract)*	◐	○	◐	◐	○	○
Bonide® Hot Pepper Wax™, Insect Repellent *(capsaicin) [repellent only]*	◐	?	◐	○	?	?
Concern® Pesticidal Spray Oil™, Dormant and Growing Season Insect Spray *(canola oil)*	◐	○	◐	◐	?	?
Schultz® Fruits & Vegetables Insect Spray *(piperonyl butoxide, pyrethrins)*	◐	◐	◑	◑	○	○
Green Light® Neem II Ready to Use *(neem oil extract, pyrethrins, piperonyl butoxide)*	◐	●	◐	◑	○	○
Concern® Multi-Purpose Insect Killer *(piperonyl butoxide, pyrethrins)*	◐	●	◑	◑	○	○
Sunspray® Ultra Fine® Year-Round Pesticidal Oil *(paraffinic oil)*	◐	?	◑	◐	◐	◐
Hi-Yield® Malathion Insect Spray *(malathion)*	◐	?	◑	●	○	◐
Orthene® Systemic Insect Control *(acephate)*	◑	◑	◐	●	◐	◐
Bayer Power Force Multi-Insect Killer *(cyfluthrin)*	◐	?	◑	◑	○	◑/◐
most toxic						
Bonide® Eight™ Insect Control Garden Dust *(permethrin)*	◐	◑	●	◑	○	◑/◐

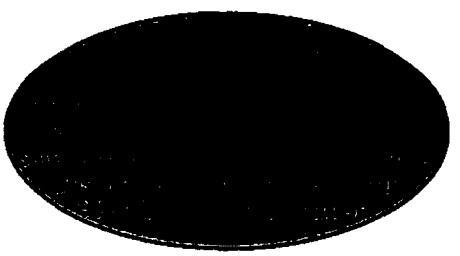
* The City of Austin and the Texas Cooperative Extension provide this information as a comparative reference only. Listing of specific product trade names does not constitute an endorsement of its use. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. Our goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the City of Austin Watershed Protection and Development Review Department and Texas Cooperative Extension. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.



Watershed Protection Development Review
974-2550

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

www.growgreen.org

02/05

grow green

earth-wise guide to Snails and Slugs

Enlarged photo of a snail

description

These members of the mollusk family have fleshy, soft, slimy, legless bodies that range in color from whitish-yellow to black; 1/2-4"; slow moving; require moisture for survival

Snails have a hard spiral shell on their backs that provide protection from predators and during periods of excessive heat and dryness

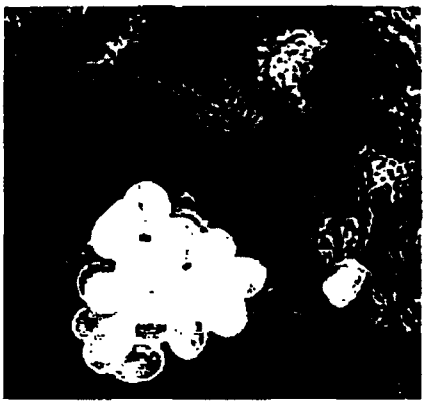
infestation

Feed on plants by scraping off the tissue or eating holes in the leaves or flowers; leave glistening trails of slime wherever they crawl

attack

Leaves, flowers and stems of plants. Snails and slugs can completely devour young vegetable seedlings overnight.

Least Toxic Solutions



Slug with egg cluster

- Get rid of excessive moisture through efficient irrigation
- Treat for snails and slugs only if significant plant damage begins to appear
- Get out your flashlight and hand pick snails and slugs when they are active at night
- Snails and slugs hide in moist places such as under flower pots and landscape timbers during the day. Eliminate hiding places, or collect and destroy pests found there
- Snail and slug eggs look like crystal beads. Find them in large clusters in soil under rocks and debris and destroy them
- Place barriers of copper stripping around planters to prevent snails and slugs from accessing plants
- Use window screen material to make covers for seedlings, or cover with row cover. Be sure to bury the edges.
- Attract snails overnight to a hollowed out melon rind or a shallow container filled with beer or apple cider. Dispose of them in the early morning.
- Use snail and slug baits as a last resort

If You Must Use a Pesticide

- Place baits close to hiding places where snails will cross them
- Baits are less effective in hot/dry or cold weather because snails are less active
- Beware that metaldehyde baits are very toxic to dogs

Slugs are attracted to moist places

product toxicity comparison

(not for endorsement purposes)

Toxicity/Threat: ○ low ◐ low to moderate ◑ mid ● high
N/A - not applicable ? - unknown toxicity

	Hazards					
	human toxicity acute	human toxicity chronic	aquatic life	pets	soil organisms	persistence
least toxic ↓ *most toxic*						
Copper Barrier Tape	*non-chemical control*					
Slug and Snail Pitfall Trap	*non-chemical control*					
Sluggo® (iron phosphate)	○	?	◐	○	N/A	○
Ortho® Bug-Geta Snail and Slug Killer (metaldehyde)	◐	?	◐	●**	◐	◐
Green Light® Bug and Snail Bait (carbaryl, metaldehyde)	◐	◑	◐	●**	◐	◐

*The City of Austin and Texas Cooperative Extension provide this information as a comparative reference of products commonly found at locat retailers. Listing of specific product trade names does not constitute an endorsement of its use. Many alternative products are available and may be suitable for use.

Products rated by the Washington Toxics Coalition.
Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

**hazardous to dogs

why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. Our goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the City of Austin Watershed Protection and Development Review Department and the Texas Cooperative Extension. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

Watershed Protection Development Review
974-2550

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

Grow Green encourages least toxic solutions

www.growgreen.org

1/04

grow green

earth-wise guide to

scale on stem, magnified

description

Very small, sucking insects found on leaves, twigs, stems and sometimes fruits of plants; often mistaken for part of plant since they look like natural bumps and do not move when mature; sometimes mistaken for fungal growth

infestation

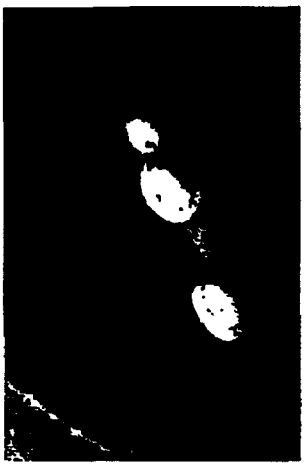
Insects suck plant's fluids; in large numbers, can cause yellowing of leaves, leaf drop and dieback of twigs and limbs; may kill plant; scale excrete "honeydew," a sticky substance that attracts ants and often causes black "sooty mold"

attack

- Many landscape trees and shrubs as well as fruit and nut trees

heavy scale can look like bumps on the bark, but can easily be scraped off with a thumbnail

Least Toxic Solutions



scale on leaf, magnified

- Monitor plants regularly for honeydew, yellowing or wilting
- Use sticky barriers to control ants in the garden- this will help control scale
- For small infestations, rub off by hand using garden gloves, a toothbrush or cotton swab dipped in alcohol
- For severe infestations, sections of plants can be pruned and discarded
- Use dormant oil during late winter, or highly refined horticultural oil during spring and summer
- Repeat applications over the course of the season; several applications will probably be necessary
- When possible, discard heavily infested ornamental plants and replant with native and adapted plant species

If You Must Use a Pesticide...

- Treat scales when in the "crawler" stage for best results
- Systemic pesticides are taken up by the plant and make its tissues and fluids toxic to the feeding scale insects. Non-systemic pesticides must be applied to all infested plant surfaces for best results, because they must come into direct contact with the insects. Never use systemic pesticides on food crops
- Avoid applying the more toxic pesticides - they destroy beneficial insects as well as pests
- Apply only to plants specified on the label - some formulations injure tender ornamental plants and new growth
- Mix and use according to directions and apply only recommended dosage
- Avoid overuse of chemicals - many pests have become resistant to certain pesticides

product toxicity comparisons*

(not for endorsement purposes)

Toxicity/Threat: ○ low ◐ low to moderate ◑ high ● highest N/A not applicable ? unknown toxicity

		Hazards:					
		human toxicity		aquatic life	birds, bees, pets	soil mobility	environmental persistence
		acute	*chronic*				
least toxic	Safer® Insecticidal Soap Multi-Purpose Insect Killer, Ready to Use *(potassium salts of fatty acids)*	○	?	◐	○	○	○
	Bonide® Hot Pepper Wax™, Insect Repellent *(capsaicin) [repellent only]*	◐	?	◐	○	?	?
	Concern® Pesticidal Spray Oil™, Dormant and Growing Season Insect Spray *(canola oil)*	◐	○	◐	◐	?	?
	Schultz® Fruits & Vegetables Insect Spray *(piperonyl butoxide, pyrethrins)*	◐	◐	◑	◑	○	○
	Green Light® Neem II Ready to Use *(neem oil extract, pyrethrins, piperonyl butoxide)*	◐	●	◐	◑	○	○
	Concern® Multi-Purpose Insect Killer *(piperonyl butoxide, pyrethrins)*	◐	●	◑	◑	○	○
	Sunspray® Ultra Fine® Year-Round Pesticidal Oil *(paraffinic oil)*	◐	?	◑	◐	◐	◐
	Bayer Power Force Multi-Insect Killer *(cyfluthrin)*	◐	?	◑	◑	○	◑/◐
	Hi-Yield® Malathion Insect Spray *(malathion)*	◐	?	◑	●	○	◐
	Orthene® Systemic Insect Control *(acephate)*	◑	◑	◐	●	◐	◐
most toxic	Bonide® Eight™ Insect Control Garden Dust *(permethrin)*	◐	◑	●	◑	○	◑/◐

* The City of Austin and the Texas Cooperative Extension provide this information as a comparative reference only. Listing of specific product trade names does not constitute an endorsement of its use. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. The goal is to reduce the amount of landscape chemicals that runoff into waterways or leach into groundwater and degrade water quality.

Grow Green is a partnership between the Texas Cooperative Extension and the City of Austin Watershed Protection and Development Review Department. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

Watershed Protection Development Review

974-2550

Texas Cooperative EXTENSION
The Texas A&M University System

854-9600

Grow Green encourages least toxic solutions

www.growgreen.org

02/04

grow green

earth-wise guide to

and similar insects

Brown Stink Bug

description

Brown Stink Bug: Adults are brown with checkered border beneath their wing covers; shield-shaped and 1/2" long

Southern Green Stink Bug: Adults are light green; 1/2" long; nymphs are round and bluish-gray with red marks

Leaf-footed bug: Adults are dark gray to brown/black; 1" long and 1/3" wide with a yellowish stripe across the back

All emit a distinct odor when handled

damage

Stink bugs suck juices from leaves, stems and fruits, causing deformed growth; pecan kernels develop black spots

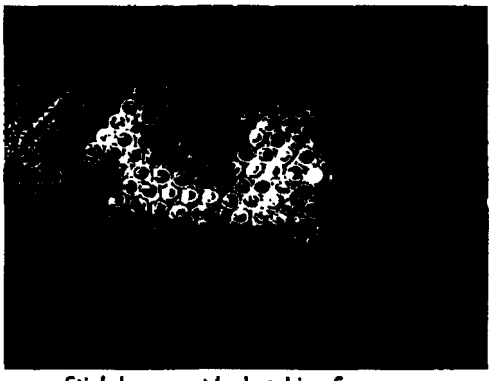
attack

Many fruits and vegetables, and are especially fond of:

- Tomatoes
- Southern Peas
- Peaches
- Pecans

Least Toxic Solutions

- Control stink bugs only if you have excessive damage to your fruit and vegetable crops
- Control weeds to prevent heavy infestations
- Use row covers as an effective barrier in vegetable gardens
- Properly identify before treating; some stink bug species and their close relatives are beneficial insects; call the Cooperative Extension Office at 854-9600 for more information

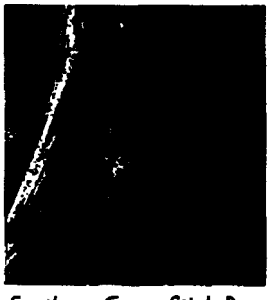


Stink bug nymphs hatching from eggs

- Avoid chemicals and make your yard a haven for beneficial insects. Insects such as pill bugs (sow bugs, roly polys) eat stink bug eggs
- Destroy egg masses and clusters of young nymphs feeding close together; they are particularly damaging to developing fruit, beans, nuts and seeds

If You Must Use a Pesticide...

- Avoid applying the more toxic pesticides — they destroy both beneficial insects and pests and leave trees or shrubs unprotected if pests return
- Apply pesticides only to plants specified on the label — some formulations injure tender ornamental plants and new growth
- Use pesticides according to directions and apply only recommended dosage



Southern Green Stink Bug

- Systemic pesticides are taken up by the plant and make its tissues and fluids toxic to the feeding stink bugs. Because they remain in plant tissue, systemics are NOT recommended for use on vegetables or fruits

Leaf-footed bug feeding on tomato

- Non-systemic pesticides must be applied to all infested plant surfaces for best results, because they must come into direct contact with the insects
- Avoid overuse of chemicals — many pests have become resistant to certain pesticides

Product Toxicity Comparisons*

(not for endorsement purposes)

Toxicity/Threat: ○ low ◐ low to moderate ◑ high ● highest
N/A not applicable ? unknown toxicity
☠ banned for residential use by EPA

	Hazards: human toxicity (acute)	human toxicity (chronic)	aquatic life	birds, bees, pets	soil mobility	environmental persistence
least toxic						
Floating Row Cover	*non-chemical control*					
Safer® Insecticidal Soap Multi-Purpose Insect Killer, Ready to Use *(potassium salts of fatty acids)*	◐	?	◐	○	○	○
Safer® BioNEEM® *(azadirachtin/neem oil extract)*	◐	?	◐	◐	○	○
Bonide® Hot Pepper Wax™, Ready to Use *(capsaicin) [repellant only]*	◐	?	◐	○	?	?
Concern® Pesticidal Spray Oil™, Dormant and Growing Season Insect Spray *(canola oil)*	◐	○	◐	◐	?	?
Schultz® Fruits & Vegetables Insect Spray *(piperonyl butoxide, pyrethrins)*	◐	◐	◑	◑	○	○
Green Light® Neem II Ready to Use *(neem oil extract, pyrethrins, piperonyl butoxide)*	◐	●	◐	◑	○	○
Concern® Multi-Purpose Insect Killer *(piperonyl butoxide, pyrethrins)*	◐	●	◑	◑	○	○
Sunspray® Ultra Fine® Year-Round Pesticidal Oil *(paraffinic oil)*	◐	?	◑	◐	◐	◐
Hi-Yield® Malathion Insect Spray *(malathion)*	◐	?	◑	●	○	◐
Orthene® Systemic Insect Control *(acephate)*	◑	◑	◐	●	◐	◐
Bayer Power Force Multi-Insect Killer *(cyfluthrin)*	◐	?	◑	◑	○	◑/◐
Green Light® Sevin 5% Dust Carbaryl Insecticide *(carbaryl/Sevin)*	◐	◑	●	●	◑	◑
Bonide® Eight™ Insect Control Garden Dust *(permethrin)*	◐	◑	●	◑	○	◑/◐
Ortho® Bug-B-Gon® Ready-Spray *(permethrin)*	◐	?	●	◑	○	◑
Hi-Yield® Lindane Spray *(lindane)*	◐	●	◑	●	◑	●
most toxic						

**Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of specific product trade names does not constitute an endorsement of its use. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.*

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

If you have leftover or banned (such as Diazinon or Dursban) chemicals in your home, please call the Austin Household Hazardous Waste Facility in Austin at 974-1930 for information.

why grow green?

The Grow Green program educates Austin area residents on the **LEAST TOXIC** approach to pest management and responsible fertilizer use. Our goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the Texas Cooperative Extension and the City of Austin Watershed Protection and Development Review Department. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

Watershed Protection Development Review

974-2550

Texas Cooperative EXTENSION
The Texas A&M University System

854-9600

www.growgreen.org

11/03

IPM PLAN for
TERMITES
(6/26/00)

1. Pest(s) to be controlled: termites.

2. Biology of the eastern subterranean termite, Reticulitermes flavipes:

   Subterranean termites are social insects that live in colonies of winged reproductives, sterile workers and soldiers. Overcrowded conditions prompt reproductives to swarm, usually during the first warm humid days of spring. Winged termites are often confused with ants but their equal-sized pair of wings can identify them. It is important that a positive identification be made of suspected termite infestations. Subterranean termites are different from other termites in that they must have regular contact with moisture. This is generally accomplished by building earthen tubes to the soil. Water leaks in structures provide a good environment from which termites can build tubes. In most structures, these tubes are visible on exterior walls, but they may be present on interior walls as well if termites have gained access through cracks in slabs.

   The important first step in a termite control program is the elimination of conditions that favor termite survival. These steps include the removal of wood debris around structures, eliminating areas of earth-to-wood contact and constructing barriers to termite entry. It is also important to regularly monitor structures for signs of moisture, damaged wood, or earthen termite tunnels and to act only if these signs are present. The most vulnerable stages of the termite colony are the eggs and immatures.

3. Control tactics:

   a. Physical control tactics will include the plugging of cracks and crevices in structures that may provide access. Any exterior feature that leaks water such as guttering and water pipes will be repaired. Physical controls also include the use of a stainless steel wire mesh perimeter barrier around the building. Installers should be trained and accredited for quality control.

Material	Product Name
316 marine grade stainless steel w/appropriately-sized aperture	Termi-Mesh™

   b. There are no mechanical control tactics currently available to control termites. However, sand barriers have been tested as a deterrent to tunneling and may soon be recommended as a control alternative.

   c. There are no biological control tactics currently available to control termites.

   d. Least-toxic chemical control tactics will involve the use of insect growth regulators (used as baits) and/or chemical barriers that are undetectable by termites.

Active Ingredient	Protection Method	Product Name
Fenvalerate	Chemical barrier	Pydrin™
Imidacloprid	Chemical barrier	Premise®
Hexaflumuron	Insect growth regulator	Sentricon™

4. This IPM plan is a dynamic document. If other control tactics are found effective, then this plan will be amended to include those tactics. No regularly scheduled pesticide applications are planned.

grow green

earth-wise guide to

Professional

for Pest Control and Maintenance

to reduce the chemical exposure to people and the environment, ask for pest control services that are natural, organic, least-toxic, or that use IPM. (integrated pest management)

did you know...

- Fertilizers and pesticides can be washed away by rainwater to pollute creeks or groundwater.
- Landscape chemicals are commonly found in springs and waterways in Austin.

Landscape Professional fertilizing.

Your Service Professional Should...

Communicate the Following to You Before Work Starts

- What the problem is and how it will be treated
- How long the treatment period will take
- What results can be expected
- What is guaranteed and what is not
- Whether products used present any hazards to people or pets

Your Service Professional Should...

Rely on Chemicals as Just One Part of a Total Yard Management Program

- Begin with a thorough inspection to identify the source of the problem
- Offer replacement alternatives for poorly-placed or disease-prone plants
- Use physical pest controls such as traps and barriers when possible
- Use biological pest controls (see the Grow Green sheet on Beneficial Insects)
- Never apply chemical sprays to prevent infestations
- Apply chemicals only to the problem area
- Select the most effective and least toxic chemical if chemicals are necessary

Pest Control Tips

- With monthly service contracts, make sure that pests are monitored regularly but treated only when there is a problem
- Be wary of pest management professionals who seem anxious to sell a treatment that you didn't know you needed - ask for proof of the problem first
- Do your part by following pest control company recommendations about cleanup, home repairs or other steps to prevent future pest problems
- Be patient - sometimes when less-toxic pest controls are used, pests will die back gradually
- Shop value, not price; what appears to be a bargain may need a second look

Termite Infestation

- Refer to the City of Austin Green Building website: www.ci.austin.tx.us/greenbuilder/gbppestmgmt.htm. You will find a listing of professionals who can manage the pests in an environmentally-sensitive manner

Fertilizer Tips

- Have your soil tested before fertilizing. A soil analysis will tell you whether or not needed nutrients are already present in the soil. Soil test envelopes are available at local Grow Green displays
- DO NOT OVER-FERTILIZE! Grow Green **fertilizer application rates are much lower** than those recommended in the past. Ask your professional to follow the recommended rates in the Lawn Care Fact Sheet and to not bag grass clippings
- Store any leftover fertilizer for future use; it has a long shelf life
- Find out the type of fertilizer that will be used. Organic or natural fertilizers are preferred
- DO NOT FERTILIZE BEFORE RAINFALL!

When Selecting a Professional, You Should...

- Check the company's records with the Better Business Bureau
- Ask for proof of insurance for liability and worker's compensation
- Ask for references, then follow up by calling referrals

Your Service Professional Should...

Maintain All Necessary Licenses

- The state of Texas requires licenses for:
  - Applying pest and weed control chemicals
  - Installing irrigation systems
- The state of Texas does not require licenses for:
  - Mowing and yard care
  - Tree pruning
- To stay current with new technical information, most quality-oriented landscape companies are members of a professional trade association. (Check with the Texas Nursery and Landscape Association (TNLA) for referrals at (800) 880-0343 or http://txnla.org)
- Look for arborists certified by the International Society of Arboriculture

Some lawn services provide less toxic lawn care

Licensing, Certification and Health Information		
International Society of Arboriculture (ISA)	*arborist certification*	*(217) 355-9411 www.isa-arbor.com*
National Pesticide Telecommunications Network	*chemical or health issues related to pesticides*	*(800) 858-7378*
Poison Control Center	*poison emergency*	*(800) 222-1222*
Texas Commission on Environmental Quality (TCEQ)	*irrigation licensing*	*(512) 239-6719*
Texas Department of Health	*non-emergency health information*	*(512) 458-7111 (ask for the lab)*
Texas Department of Agriculture	*formulation and registration of pesticides*	*(512) 463-7407*
Texas Structural Pest Control Board	*structural pest control laws and licenses*	*(512) 305-8250 www.spcbtx.org*

Watershed Protection Development Review

974-2550

Texas Cooperative EXTENSION
The Texas A&M University System

854-9600

www.growgreen.org

11/03

grow green

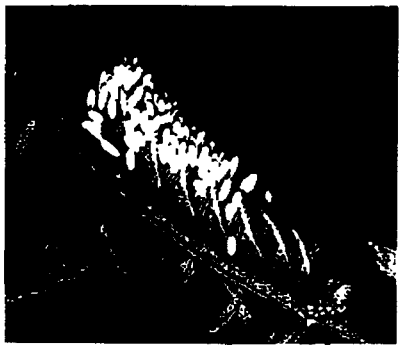
earth-wise guide to

don't kill the good guys!

more than 90% of insects aren't pests. some pollinate our flowers and vegetables, while many others feed on pests in our gardens. by allowing them to do their job, we can reduce the need for pesticides and maintain austin's water quality.

resources

- *A Field Guide to Common Texas Insects* Drees & Jackman
- *The Texas Bug Book—the Good, the Bad, and the Ugly,* Malcolm Beck and Howard Garrett
- *Natural Enemies Handbook -The Illustrated Guide to Biological Pest Control,* University of California Press
- *Common Sense Pest Control,* William Olkowski, et al.
- *http://hortipm.tamu.edu/pestprofiles/beneficials.html*



1. Know Who the "Good Guys" Are

- Learn to recognize the egg, larval, pupal and adult stages of beneficial insects
- Learn about their life-cycles and feeding habits
- Learn to recognize signs of beneficial insects at work, such as hollow-looking, tan-colored aphids, which are the remains of aphids that have been parasitized
- Don't be afraid of stinging insects like wasps and bees; they help pollinate garden vegetables and fruits and are only aggressive around their nests or when provoked

2. Have Patience

- It may take awhile for beneficial populations to build up to control a pest outbreak
- Be willing to tolerate a minor amount of damage
- Monitor outbreak areas to determine whether a population of beneficials is rising and may soon control a pest outbreak

Adult lady beetles (top); Parasitic wasp pupae on a tomato hornworm (left)

3. Make Wise Product Choices

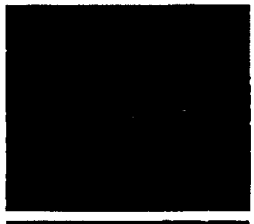
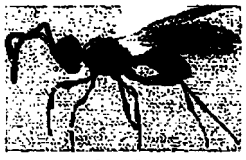
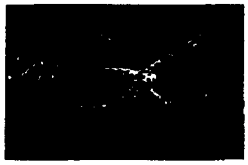
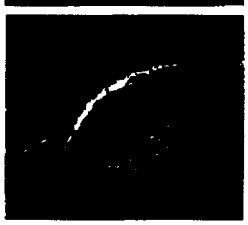
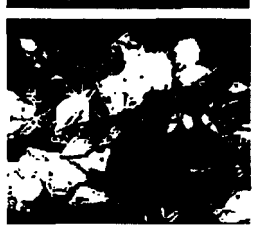
- When spraying is necessary, select a narrow spectrum product whenever possible. Broad-spectrum insecticides don't discriminate between pests and beneficial insects - they kill both
- Choose an insecticide that won't harm other insect-eating garden creatures like birds, bats, spiders, lizards, and toads (see the Grow Green Products Fact Sheet for ratings)
- Treat only the area of the outbreak
- Choose products that break down quickly like soaps, oils, or pyrethrum sprays

4. Make a Home for Beneficials in Your Yard

- Provide an accessible source of water, such as a birdbath or periodic sprinkling
- Plant flowering plants that provide nectar for adult beneficials to feed upon; better nectar sources include plants with umbrella-shaped bloom heads (Yarrow, Anise, Dill), daisy-like flowers (Chamomile), and flowering herbs (Thyme, Pineapple Sage, Chives)
- Plant a few Tropical Milkweed or Gaura plants to maintain aphids for beneficials to feed on; the species of aphid they attract are not pests of most other landscape plants

Good Guys:

Some Common Beneficial Insects

	Insect	Food Source	Stage	Description	
	Assassin Bug	larvae and adults of beetles, caterpillars, and many other pests	nymphs and adults	many species; dark brown to red to black; long slender bodies with narrow heads; 1/2" to 1" long	
	Bigeyed bugs	larvae and eggs of fleahoppers, lygus bugs, mites, thrips and whiteflies	nymphs and adult	adults range in size from 1/8" to 1/4" , broad-headed with large, curved eyes	
	Ground Beetles	snails, slugs, rootfeeding insects	adults and larvae	medium to large fast moving insects, black to reddish or metallic	
	Lacewings	many species, including aphids	larvae	larvae: 1/2", mottled tan adults: 5/8", green or brown with long, delicate wings	
	Lady Beetle	aphids, scales, soft-bodied insects and mites	larvae and adults	larvae: 3/8", wingless, spiny; orange and black markings adults: orange with dark spots or black with two red spots	
	Minute Pirate Bug	aphids, mites, thrips, insect eggs, small larvae on plants	nymphs and adults	1/12" to 1/5", long, oval, black with white markings and triangular head	
	Parasitic wasps	most insect groups are affected	larvae	gnat-like, attack all life stages of insects, from 1/100" to 3/4"	
	Predatory Wasps	many species, including caterpillars	adults	various types of paper wasps and muddaubers	
	Spiders	flying insects, caterpillars	immatures and adults	eight-legged, various sizes, usually specialized as either roaming hunters or web builders	
	Syrphid flies (hover flies)	aphids	larvae	larvae: creamy -white to green or brown adults: 1/4 to 3/4", black or brown with yellow banded abdomens; resemble small wasps or bees	

Watershed Protection Development Review

974-2550

Texas Cooperative EXTENSION
The Texas A&M University System

854-9600

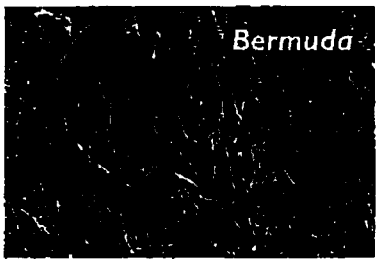
www.growgreen.org

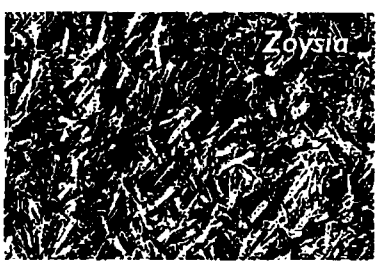
02 /05

grow green earth-wise guide to

in this fact sheet:

- **Starting a New Lawn**
- **Choosing Turf**
- **Irrigation**
- **Mowing, Aerating and De-thatching**
- **Fertilizing**
- **Weeding**





grow green encourages the use of native and adapted, drought-resistant plants and grasses. these plants conserve water and protect water quality by requiring fewer pesticides and fertilizers.

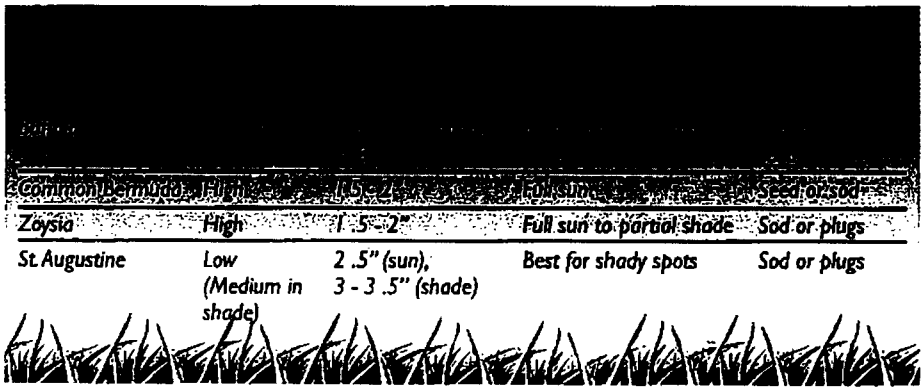
Starting a New Lawn

- **Minimize your total lawn area.** Consider lawn alternatives such as plant beds, mulched areas, wildflowers and native grasses to reduce water and fertilizer needs
- **Test your soil** to know how to prepare it for your new lawn. Look for soil test bags in the Grow Green display or contact the Cooperative Extension office at 854-9600
- A minimum of six inches of soil is to needed to grow a healthy lawn.
- Prepare the soil by removing perennial weeds and tilling in at least 2" of compost
- Level your lawn area to avoid low spots where water will pool
- Consider sun, shade and water needs in choosing the best grass for your location—look at the chart below for some suggestions
- Choose between seed, plugs, or sod, then keep soil moist until the lawn becomes established
- Avoid overwatering newly seeded lawn to prevent grass seed from washing away

Caring for an Established Lawn

Irrigate Efficiently

- Water in the early morning to help prevent fungal diseases
- Water more deeply and less frequently to encourage deeper roots
- Water so that the soil is wet to a depth of 4-6 inches. This takes 1/2 to 1 inch of water, depending on your soil type. To check on the amount applied, collect water from sprinklers in a small can or rain gauge



Common Bermuda	High	1 .5" - 2"	Full sun to partial shade	Seed or sod
Zoysia	High	1 .5" - 2"	Full sun to partial shade	Sod or plugs
St Augustine	Low (Medium in shade)	2 .5" (sun), 3 - 3 .5" (shade)	Best for shady spots	Sod or plugs

- Because water is more likely to run off clay soils and sloping lots, it may be necessary to irrigate slowly or in multiple short cycles to prevent water run-off
- Allow soil to dry out between waterings
- Watering is seldom necessary during the dormant season (December-February)

Mow Properly

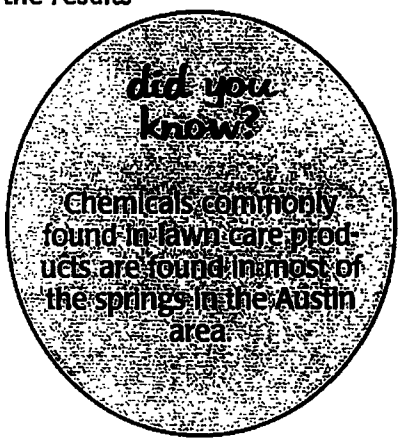
- Mow grass frequently enough so that no more than 1/3 of the leaf blade is removed at one time
- Mow when the grass is dry to prevent spread of turf diseases
- Cut the grass higher in the summer to help establish a deeper root system
- Sharpen mower blades regularly; sharp blades do less damage to grass
- **Do not bag your grass clippings** and use a mulching mower if possible — cut grass left on the lawn returns 60% of the nitrogen and 100% of the phosphorus to the soil

Maintaining a Healthy Lawn

- Aerate your lawn at least once a year to improve drainage and bring more oxygen to the soil
- Moisten your soil the day before aerating to make the job easier and more effective
- Use a hollow-tined aerator that removes the plugs to increase water and oxygen to the soil
- After aerating, apply compost for added nutrients (Call 972-1954 for information on Dillo Dirt, an organic compost produced by the City of Austin's Water Utility.)
- De-thatch your lawn every 1-2 years by raking up matted grass in excess of 1/2" (do not use a vertacutter or dethacher on St. Augustine)

Don't Fertilize or Apply Herbicides Automatically

- Do not use "weed and feed" products; the time to use herbicides and the time to fertilize are different and many herbicides are harmful to the environment
- Test your soil (see above) and base your fertilizer purchase on the results



Buy the Right Type of Fertilizer

- Choose natural or certified organic fertilizers that are low in phosphorus
- Utilize natural compost and fertilizer instead of synthetic fertilizer to improve soil pH, texture and fertility, and cause less leaching to groundwater
- Choose fertilizers based on the needs of your soil. Most lawns in Austin have more than enough Phosphorus (P) and Potassium (K), but are low in Nitrogen (N)
- Use the chart on the right to calculate how many pounds of fertilizer you need.
- Save any excess fertilizer until the next time you fertilize. Never use more than you need "just to finish off the bag."

Apply Fertilizers Properly

- To improve BOTH soil texture and soil nutrient levels, apply 1/4" compost to the top of your lawn INSTEAD of fertilizer
- Sweep any fertilizer granules that land on sidewalks and driveways back onto your lawn

How much fertilizer do you need?

Soil in Austin is high in phosphorus and potassium, therefore fertilize based ONLY on nitrogen needs.

Soil test results:	Application Rate:	Application time:
Low to Very Low Nitrogen	1/2 pound of nitrogen per 1000 square feet of lawn area applied TWICE per year (total of one pound per 1000 square feet per year)	mid-spring AND fall
Moderate Nitrogen	1/2 pound of nitrogen per 1000 square feet of lawn area applied ONCE per year (total of 1/2 pound per 1000 square feet per year)	mid-spring
High Nitrogen	DO NOT FERTILIZE! Excess nitrogen promotes shallow rooting and some disease and insect problems	

- After fertilizing, carefully water the area to help fertilizer soak in, but avoid over-watering and washing fertilizer off of your lawn
- NEVER FERTILIZE BEFORE A RAIN

avoid combined products such as weed and feed.

Herbicides and fertilizers should be used at different times.

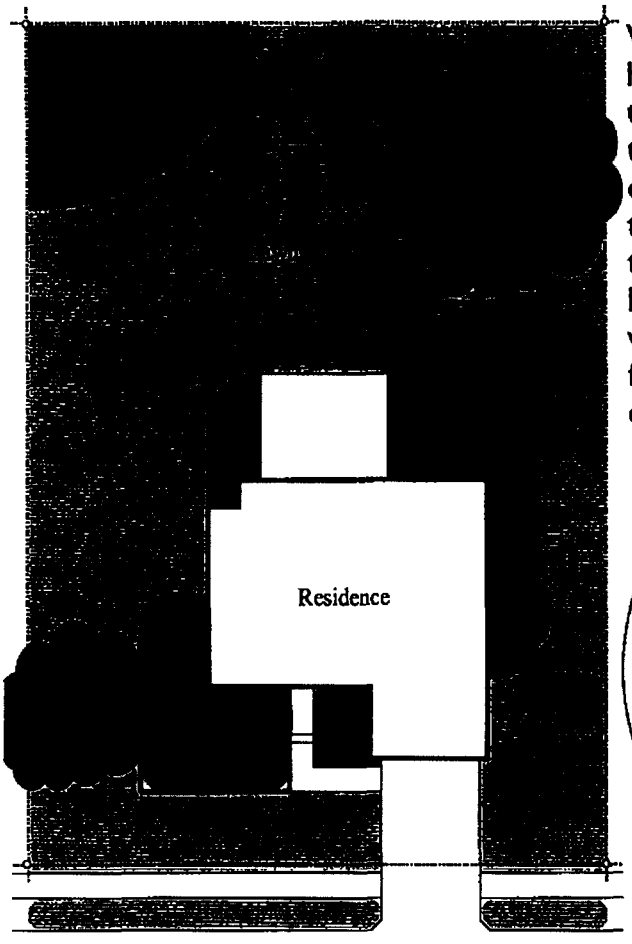
Weed Appropriately

- Tolerate low levels of weeds; as you develop a dense, healthy turf most weed problems will go away
- Avoid using herbicides. The most effective, least toxic way to remove weeds is pulling them by hand
- Do not let weeds bloom and release their seeds! One plant can send hundreds of seeds into your yard
- Fill in bare spots in your lawn with grass plugs or seed
- If you decide to treat chemically:
  - Identify your weeds to ensure that you choose the most effective product
  - Start with the least toxic prod uct (for product ratings, see the back page of this fact sheet)

look for...

Natural or certified organic fertilizers with low phosphorus* (8-2-4, 6-2-4, 9-1-1, 6-1-1)

* Phosphorus is the middle number in the fertilizer ratio; it is the 2 in 8-2-4



When calculating how much fertilizer to apply, be sure to take into account only the lawn areas that you will be treating. Subtract house, driveway, walkways, and beds from the total area of your property.

If you have unwanted or banned chemicals in your garage, please take them for safe disposal to a household hazardous waste facility. In Austin call 974-4343 for information.

This chart shows how many pounds of fertilizer to apply per thousand square feet of lawn area, based on the percentage of nitrogen in the product at an application rate of 1/2 pound nitrogen per thousand square feet.

Fertilizer Ratio: *Comparison of Nitrogen (N) to Phosphorus (P) to Potassium (K)*	**Fertilizer Analysis:** *Percentage of each ingredient in the product (%N-%P-%K); this is the number written on the bag*	**To apply 1/2 pound of nitrogen use the following amounts:**
21-0-0 →	21-0-0	2.5 lbs./1000 sq ft.
4-1-2 →	8-2-4 * 16-4-8 20-5-10	6 lbs./1000 sq ft. 3 lbs./1000 sq ft. 2.5 lbs./1000 sq ft.
3-1-2 →	6-2-4 * 12-4-8 15-5-10 21-7-14	8 lbs./1000 sq ft. 4 lbs./1000 sq ft. 3 lbs./1000 sq ft. 2.5 lbs./1000 sq ft.
9-1-1 →	9-1-1*	5.5 lbs./1000 sq ft.
6-1-1 →	6-1-1*	8 lbs./1000 sq ft.

*best choices for Austin's soils

product toxicity comparisons*

(not for endorsement purposes)

Toxicity/Threat: ○ low ◐ low to moderate ◑ high ● highest N/A not applicable ? unknown toxicity

Hazards:

	human toxicity: acute	human toxicity: chronic	aquatic life	birds, bees, pets	soil mobility	environmental persistence
CedarCide Lawnsafe Chemical Free Weed and Feed *(corn gluten)*	○	○	◐	?	?	○
Concern® Weed Prevention Plus™ *(corn gluten)*	○	○	◐	○	?	?
Concern® Fast Acting Weed Killer™ *(ammoniated soap of fatty acids)*	◐	?	◐	○	○	○
EcoEXEMPT™ HC *(2-phenethyl propionate, eugenol)*	◐	○	?	?	?	?
CedarCide Ridaweed *(acetic acid/horticultural grade vinegar)*	●	○	◐	○	○	○
BurnOut *(acetic acid/horticultural grade vinegar)*	●	?	◐	○	○	○
Green Light® Com-Pleet® Systemic Grass & Weed Killer *(glyphosate)*	◐	?	◐	○	○	◑
Round-Up Weed and Grass Killer *(glyphosate)*	◐	?	◐	○	○	◑
Scythe® *(pelargonic acid)*	◑	●	◐	?	?	○
Hi-Yield® MSMA Weed Killer *(MSMA)*	◐	●	◐	○	○	●/◑
Hi-Yield® POAST® *(sethoxydim)*	◑	?	◑	○	◐	○
Hi-Yield® Crabgrass Control *(benefin, trifluralin)*	◐	◑	◑	○	○	◑
Scotts® Turf Builder® with Plus 2™ Weed Control *(2,4-D and mecoprop/MCPP)*	◐	◑	◐	○	●	◐
Vigoro® Weed & Feed *(2,4-D, mecoprop/MCPP, dicamba)*	◐	◑	◐	○	●	◐
Uniroyal Turfcide® 10% Granular *(PCNB)*	◐	●	◑	○	○	●
Image® Weed and Grass Killer *(imazaquin)*	◐	?	◐	○	●	◑
Ortho® Brush-B-Gon® Ready to Use *(triclopyr)*	◐	?	◐	○	●	◑
Green Light® WIPE-OUT® Broadleaf Weed Killer *(mecoprop/MCPP, 2,4-D, dicamba)*	◐	◑	◑	○	●	◐
Ortho® Weed-B-Gon® Weed Killer2 concentrate for Northern and Southern lawn grasses *(mecoprop/MCPP, 2,4-D, dicamba)*	◐	◑	◑	○	●	◐
Ortho® Weed-B-Gon® Lawn Weed Killer Ready-to-Use *(mecoprop/MCPP, 2,4-D, dicamba)*	◐	◑	◑	○	●	◐
Green Light® Grass & Weed Killer *(sodium cacodylate, dimethylarsinic acid)*	◐	●	◑	◑	○	●/◑
Hi-Yield® Atrazine *(atrazine)*	◐	◑	◑	○	●	◑
Vigoro® Ultra St. Augustine Weed and Feed w/Atrazine 29-3-5 *(atrazine)*	◐	◑	◑	○	●	◑

least toxic ↓ *most toxic*

*Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of a specific product trade name does not constitute an endorsement of its use. Many pesticides and pesticide products other than those listed in these tables are available and may be suitable for use.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

www.growgreen.org

Grow Green encourages least toxic solutions

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

Watershed Protection Development Review
974-2550

05/04

grow green

earth-wise guide to Lawn Problems

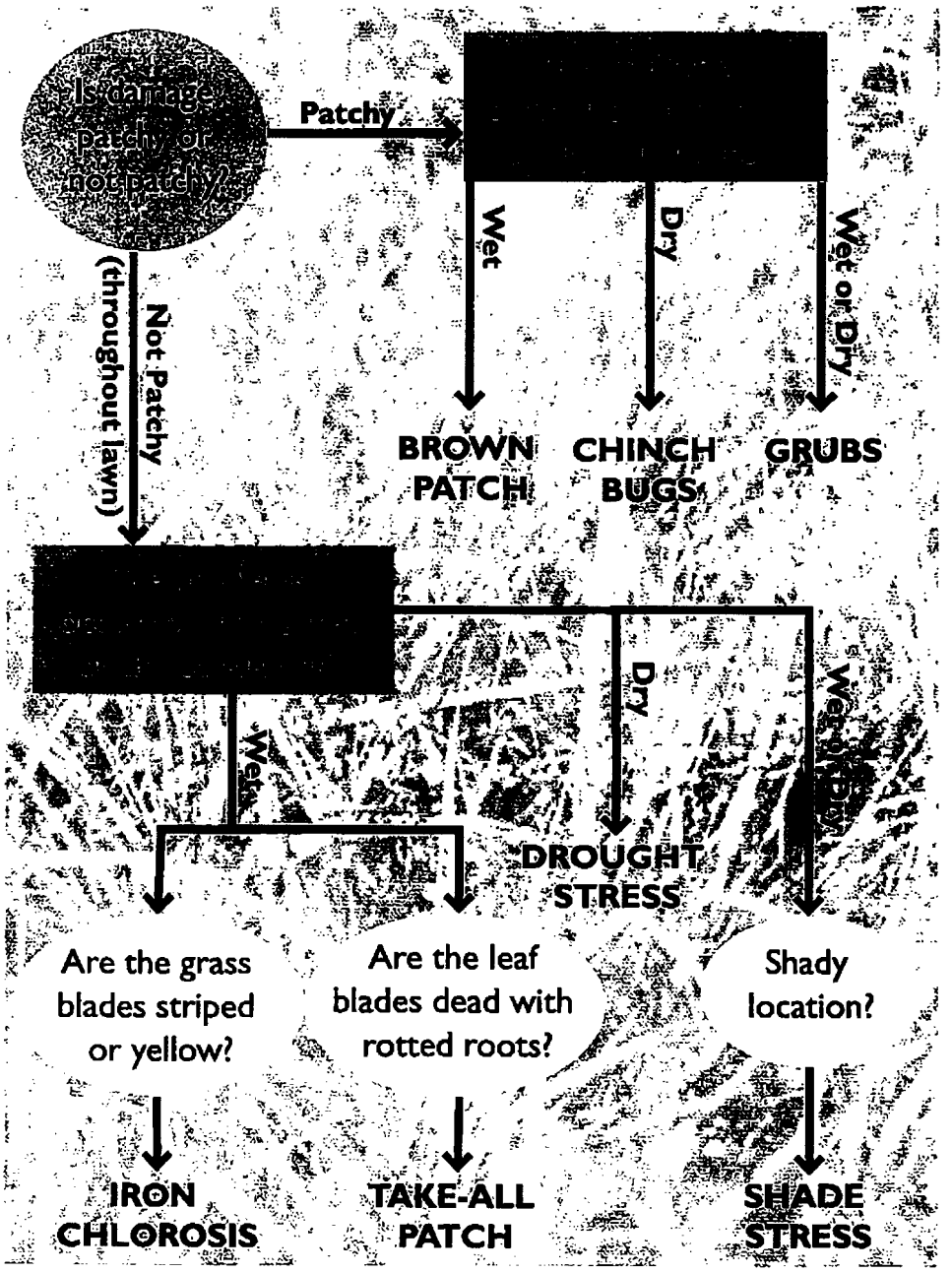
in this fact sheet:

- Chinch bugs
- Grubs
- Brown Patch
- Take All Patch
- Drought Stress
- Iron Chlorosis
- Shade Stress

quick tips to avoid lawn problems

- Establish a healthy soil depth (at least six inches under your turf)
- Choose the correct turf for your light conditions and lawn use
- Aerate your lawn once a year to improve drainage and reduce soil compaction
- Irrigate efficiently (water in the morning, wet soil to a depth of 4-6 inches, and allow the soil to dry out between waterings)
- Mow properly, taking no more than 1/3 of the leaf blade off with each mowing
- Test your soil periodically to determine which nutrients are lacking BEFORE you decide whether or not to fertilize
- Choose natural or certified organic fertilizers
- Build a healthy turf to avoid the need for herbicides

Follow the flow chart to identify what may be damaging your lawn:



Insects

Testing for Chinch Bugs:
Cut the bottom out of a coffee can and push the can one inch into your turf near the edge of a dead patch. Fill the can with water. If present, chinch bugs will float to the surface.

Chinch Bugs

Description:

Adults are small and slender; 1/6" to 1/5" long with black bodies and whitish wings; wings are clear with black "bases" on forewings; recently hatched nymphs are wingless, pinkish-red, with a light-colored band across their backs.

Infestation:

Cause expanding, irregular patches of dead or stunted grass surrounded by a halo of yellowing, dying grass; typically begins in a sunny location adjacent to a concrete walkway or curb. Damage can increase rapidly, especially in sunny locations during hot, dry weather.

Attacks:

Primarily St. Augustine grass; may feed on zoysia or bermuda grass

Prevention/Solutions: Prevent drought stress in your lawn. Irrigate efficiently (see quick tips). Make your yard a haven for beneficial predator insects, such as big-eyed bugs, and birds by avoiding the wide use of lawn chemicals. Check for chinch bug infestation on the grass blades at the edges of affected areas. Use insecticidal soap or other least toxic treatments (see tables). Spot treat only infested areas if there are signs of damage.

Testing for Grubs:
Cut out one square foot of turf in an area you suspect of having grubs. Look for grubs in the soil directly under the turf, then press the turf back into place and water it in.

Grubs

Description:

Creamy white and C-shaped with three pairs of legs; grow to 1/2 - 1" long; June Beetle larvae.

Infestation:

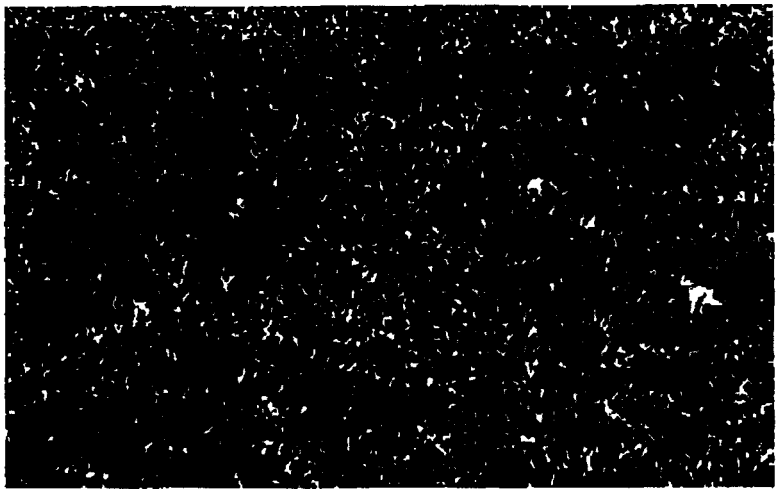
Feed on roots and other underground plant parts; severely damaged lawns lose vigor and turn brown and can be lifted by hand like a carpet; most lawn damage occurs during summer and fall months.

Attacks:

St. Augustine, bermuda, zoysia, buffalo grass

Solutions: Promote healthy roots in your lawn by mowing high and watering effectively. Only treat when more than 5-10 grubs per square foot are found. The most effective time for treatment is mid-June to late July. Apply beneficial nematodes, (tiny worms that kill grubs) to affected areas--be sure to water them in.

Fungal Disease



Take-All Patch

Description:

Yellowing of grass and darkening of grass roots is the first symptom of take-all patch, followed by the turf thinning in irregular shapes. The roots can become so rotted that the grass can be easily pulled up. Take-all patch spreads mainly from fall through spring when there is abundant moisture and cool, mild temperatures, but dieback symptoms appear in the hot, stressful days of summer.

Infestation:

Grass roots rot, and eventually kills lawn

Attacks:

St. Augustine, zoysia, and bermuda grass

Solutions: Maintain good drainage in lawn area. Irrigate efficiently (see quick tips). Avoid heavy fertilization of turf areas, as excessive nitrogen seems to promote take-all patch. Raise the mowing height on your mower to reduce stress to your turf. Avoid the use of broadleaf herbicides which may weaken turf. Avoid urea-based fertilizers.

Some differences between take-all patch and brown patch: With take-all patch the roots rot, with brown patch the grass blades rot. Brown patch is circular in shape, take-all patch has an irregular shape. Brown patch mainly occurs during the cool season, while take-all patch appears mostly during the warm season.

Brown Patch

Description:

Circular patterns of dead grass blades; in 2-3 weeks, new leaves may emerge in the center of the circular patch giving diseased areas a donut-shaped appearance; occurs in late fall through early spring when temperatures range between 55-85 degrees. Promoted by wet weather or frequent irrigation.

Infestation:

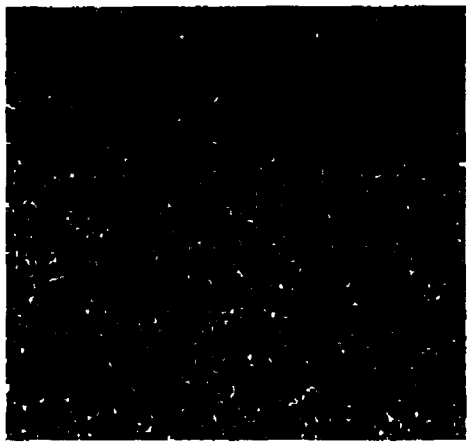
Turf turns brown and grass blades rot off of the runners; can spread in an area from 1 - 50 feet

Attacks:

Primarily St. Augustine grass

Solutions: When you irrigate, water early in the morning to allow the grass blades to dry out during the day. Irrigate efficiently (see quick tips). Avoid overfertilization of your lawn. Aerate your lawn once a year. Fungicides are most effective when used at the first sign of disease.

Other Stresses



Drought Stress

Description:

Grass looks blue-green or silverish. The individual leaf blades in the lawn curl. Footprints remain in the lawn when you step on it. The soil under the lawn is dry.

Tolerance to drought:

All turf can survive some drought stress, although some types of turf require less water than others:

Buffalo VERY DROUGHT TOLERANT

Bermuda, Zoysia DROUGHT TOLERANT

St. Augustine DROUGHT TOLERANT IN SHADE ONLY

Solutions: Choose drought tolerant turf grass. Irrigate efficiently by watering deeply and infrequently; water to a depth of 4 to 6 inches every time you water, and allow soil to dry out between waterings. Steeply sloped areas can be difficult to water effectively. Consider alternatives to turf for sloped areas.

Iron Chlorosis

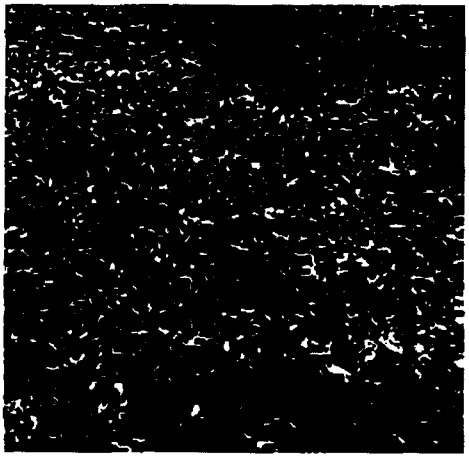
Description:

Leaf blades of the grass are striped green and yellow or completely yellow. Iron chlorosis occurs in alkaline (high pH) soils with high phosphorus levels, and also under cool wet soil conditions.

Affects:

St. Augustine grass

Solutions: DO NOT use fertilizers that are high in phosphorus. Top dress turf with 1/4 - 1/3" compost. Aerate your lawn once a year. Iron supplements provide temporary relief.



Shade Stress

Description:

Turf grass thins and disappears, leaving bare patches of soil or areas of weeds.

Affects:

Buffalo grass and bermuda grass do not grow well in shaded areas

Solutions: Choose shade tolerant groundcovers or shade tolerant turf grasses (such as zoysia and St. Augustine) to plant in shady areas. Thin out branches of trees a bit to "brighten" shady areas. Set mower higher to allow more leaf blade to capture sunlight. Minimize foot traffic or pet activity in shady areas.

Pest Control product toxicity

(not for endorsement purposes)*

Toxicity/Threat: ○ low ◐ low to moderate ◑ med ● high
N/A not applicable ? unknown toxicity
☠ banned for residential use by EPA

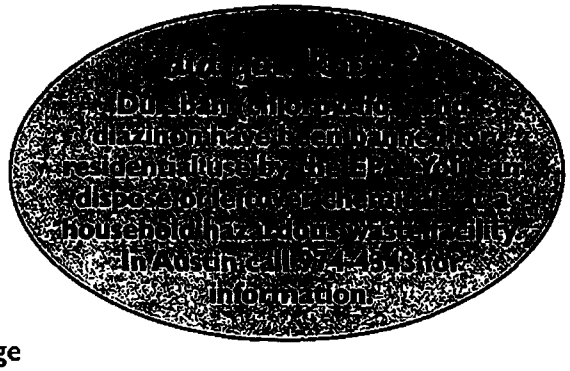
		Hazards					
	Chinch Bugs						
least toxic	Safer® Insecticidal Soap Multi-Purpose Insect Killer, Ready to Use *(potassium salts of fatty acids)*	○	?	○	○	○	○
	Safer® BioNEEM® *(azadirachtin/neem oil extract)*	○	?	○	○	○	○
	Bioganic Lawn and Garden Spray *(thymol, eugenol)*	○	○	?	?	?	?
	Green Light® Neem II Ready to Use *(pyrethrins, piperonyl butoxide)*	○	●	○	◑	○	○
	Organic Solutions Multipurpose Insecticide *(diatomaceous earth, pyrethrin)*	○	●	◑	◑	○	○
	Bayer Power Force Multi-Insect Killer *(cyfluthrin)*	○	?	◑	◑	○	◑/○
most toxic ☠	Ortho® Bug-B-Gon® Ready-Spray *(diazinon)*	○	?	●	●	○	◑
	Grubs						
	Beneficial Nematodes *(Steinernema carpocapsae)*	*non-chemical control*					
least toxic	Ortho® Grub-B-Gone™ *(halofenozide)*	○	?	○	○	●	?
	Organic Solutions Multipurpose Insecticide *(diatomaceous earth, pyrethrin)*	○	●	◑	◑	○	○
	Bayer Advanced Lawn™ 24 Hour Grub Control Granules *(trichlorfon)*	○	◑	◑	◑	●	○
	Bayer Advanced Lawn™ Season Long Grub Control *(imidacloprid)*	○	?	●	◑	◑	◑
	Ortho® Bug-B-Gone® Multipurpose Insect Killer Granules *(carbaryl)*	○	●	◑	◑	○	○
most toxic ☠	Ortho® Bug-B-Gone® Ready-Spray *(diazinon)*	○	?	●	●	○	◑

**Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of a specific product trade name does not constitute an endorsement of its use. Many pesticides and pesticide products other than those listed in these tables are available and may be suitable for use.*

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

If You Must Use a Pesticide

- Avoid applying the more toxic pesticides — they destroy beneficial insects as well as pests and leave trees or shrubs unprotected if pests return
- Avoid highly mobile or persistent products
- Apply only to plants specified on the label — some formulations injure tender ornamental plants and new growth
- Mix according to directions and apply only recommended dosage
- Systemic pesticides are taken up by the plant and make its tissues and fluids toxic to the feeding chinch bugs and grubs. Non-systemic must be applied to all infested plant surfaces for best results, because they must come into direct contact with the insects
- Avoid overuse of chemicals — many pests have become resistant to certain pesticides



Fungicide product toxicity

(not for endorsement purposes)

○ low ◐ low to moderate ● high ? unknown toxicity

Toxicity/Threat: N/A not applicable

	Brown Patch/Take-All Patch						
least toxic ↓	Concern® Weed Prevention Plus *(corn gluten meal)*	○	○	◐	○	?	?
	Green Light® Systemic Fungicide Disease Control *(thiophanate methyl)*	◐	●	◐	○	○	◐
	Hi-Yield® Bordeaux Mix Fungicide *(copper)*	◐	◑	◐	○	○	N/A
	Green Light® Fung-Away® Systemic Lawn Fungicide Spray *(triadimefon)*	◐	◑	◐	○	◑	◐
	Kocide® 2000 *(copper hydroxide)*	◑	◑	◑	○	?	N/A
	Turfcide® 10% Granular *(PCNB)*	◐	●	◑	○	○	●
	Bonide® Fung-onil™ Multi-Purpose Fungicide, Ready-to-Use *(chlorothalonil)*	◑	●	◑	○	◐	◑/◐

* Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of a specific product trade name does not constitute an endorsement of its use. Many pesticides and pesticide products other than those listed in these tables are available and may be suitable for use.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

If You Must Use a Fungicide

- Avoid applying the more toxic fungicides
- Avoid highly mobile or persistent products
- Apply only to plants specified on the label — some formulations injure tender ornamental plants and new growth
- Mix according to directions and apply only recommended dosage
- Systemic fungicides are taken up by the plant and make its tissues and fluids toxic to the fungus. Non-systemic must be applied to all infested plant surfaces for best results, because they must come into direct contact with the fungus
- Avoid overuse of chemicals

never spray pesticides or fungicides before a rain.

why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. Our goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the Texas Cooperative Extension and the City of Austin Watershed Protection and Development Review Department. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

Watershed Protection Development Review
974-2550

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

Grow Green encourages least toxic solutions

www.growgreen.org

8/03

grow green

earth-wise guide to landscape

benefits of a green garden:

- Reduce water usage
- Reduce the need for pesticides and fertilizers
- Lower the overall impact on the surrounding environment
- Provide wildlife habitat
- Preserve the look and feel of Central Texas

steps to a green garden :

- Analyze conditions in your yard
- Start with a plan
- Plant trees to create shade
- Select tough plants
- Choose efficient irrigation
- Improve soil and use mulch
- Use recycled and earth-friendly building materials
- Avoid toxic chemicals

Choose a style that appeals to you (clockwise from top left): A calming Zen design or the bright colors of a cottage garden, the structural elegance of sun-loving xeric plants or the tailored formal yard .

Green Garden, Central Texas Style

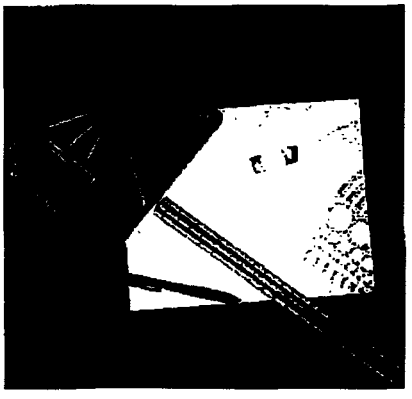
Green Gardens come in many styles. They range from cottage gardens full of color, to soothing Zen gardens, to hot cactus rock gardens. Each of these styles can be created using a plant palette tailored to the unique conditions of the Central Texas area, and more specifically, to the conditions in your own yard. An array of native and adapted plants makes a Green Garden a beautiful, earth-friendly landscape that reflects the character of our local environment, and gives your yard and your community a distinct sense of place.

In addition, Green Gardens require less water and are less prone to insect and disease problems and the need for chemical maintenance. Less chemical input reduces run-off into our creeks and streams. By creating a Green Garden, you are helping to protect Austin's environment one yard at a time.

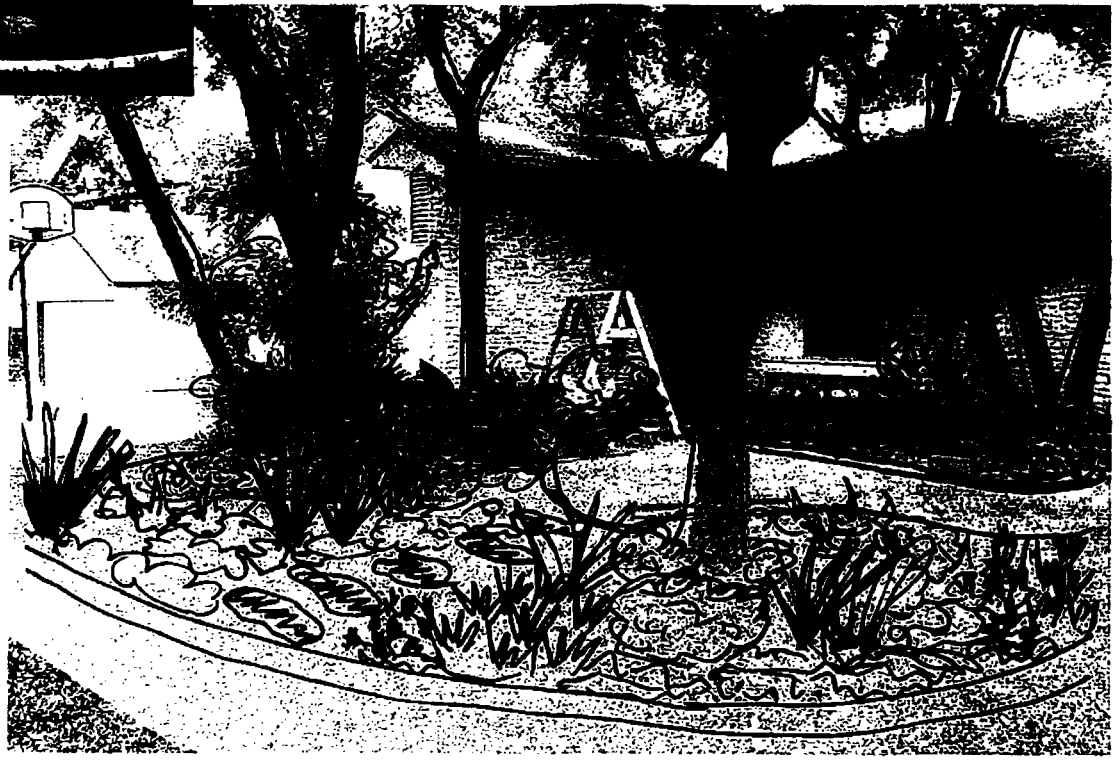
Planning is...

...the evaluation of what you already have in your landscape, and the creation of a clear road map to what you would like to achieve. Begin with the end in mind!

- **Lifestyle** - Think about **how you use your yard now**, and how you would like to use it in the future, so you can design with those needs in mind. Lawns can demand significant maintenance (time, chemicals and water), so minimize turf areas when possible
- **Current Conditions** - Evaluate the **current conditions in your yard**...where are the sun and shade? What views would you like to hide or enhance? How can you accommodate difficult conditions such as steep slopes, deer, or poor drainage?
- **Seasons** - Take into account the **different seasons**. For example, many landscapes look great in spring, but lack winter interest. Once identified, this problem is easily corrected by adding a few interesting structural plants or evergreens
- **Budget** - Realize that landscaping can be costly. As a rough estimate, **allow for a budget** of $3-5 per square foot to be landscaped if you are doing the work yourself. Then create a budgetary timeline for completion of your project
- **Timing** - Implement your plan in the following sequence:
  - Install hardscapes (sidewalks, paths, edges, etc) and underground irrigation system if desired. *Installing hardscapes after planting endangers plants that are already in the ground*
  - Plant trees and shrubs
  - Create beds and reduce turf area
  - Install beds according to your own priorities-complete them in the order that is most satisfying to you



Some tools for drawing plans.



Taking photos may help you to better analyze your current conditions. Use tracing paper over a "before" photo to outline existing features and then pencil in new plants and beds. Incorporate plants of different heights, structures and textures to add aesthetic interest

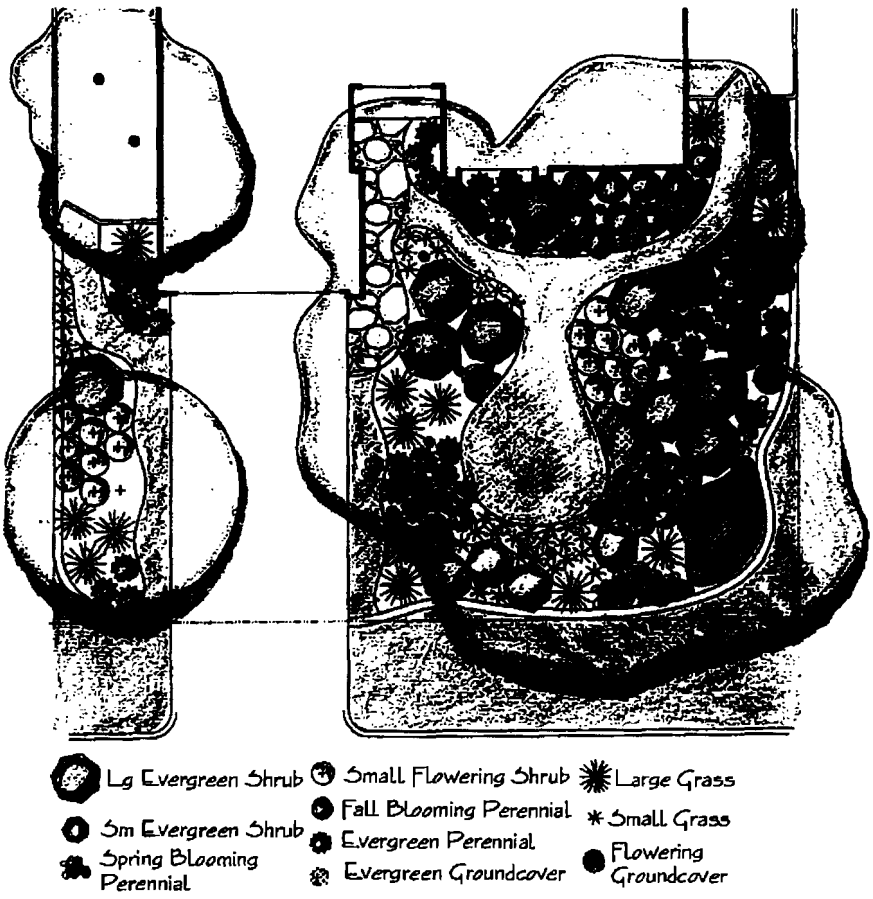
Design is...

... the arrangement of plant and structural elements to satisfy your landscape plan

Use graph paper to draw up your design, and choose a scale of 1 inch=10 feet (10 little squares per inch on your paper). This scale is good for many residential size projects, and using graph paper facilitates the placing of plants when you are ready for installation

Consider the following in your design

- **Proportion** - keep the size of your plants proportional to the house and environment around you, i.e., smaller plants for smaller spaces, larger plants for larger spaces
- **Variation in height** - an interesting design has a variety of plant heights, from groundcover underfoot to vines and trees overhead
- **Combination of evergreen and deciduous plants** - having only evergreen plants creates a static, unchanging landscape... deciduous plants often have no winter appeal...use a combination of both
- **Plant texture** - coarse textured plants have large sturdy leaves that stand still and silent; fine textured plants have feathery leaves that dance in the wind. Use a combination for added interest
- **Foliage color** - In the heat of the summer it is possible to have a colorful landscape, even in the absence of flowers...use plants with different foliage color
- **Seasonal interest** - choose plants for interest in each season-structure, berries and bark for winter, flowers and foliage for the other seasons



The creation of your landscape on paper. This plan view shows the finished design for the house in the photo at left.

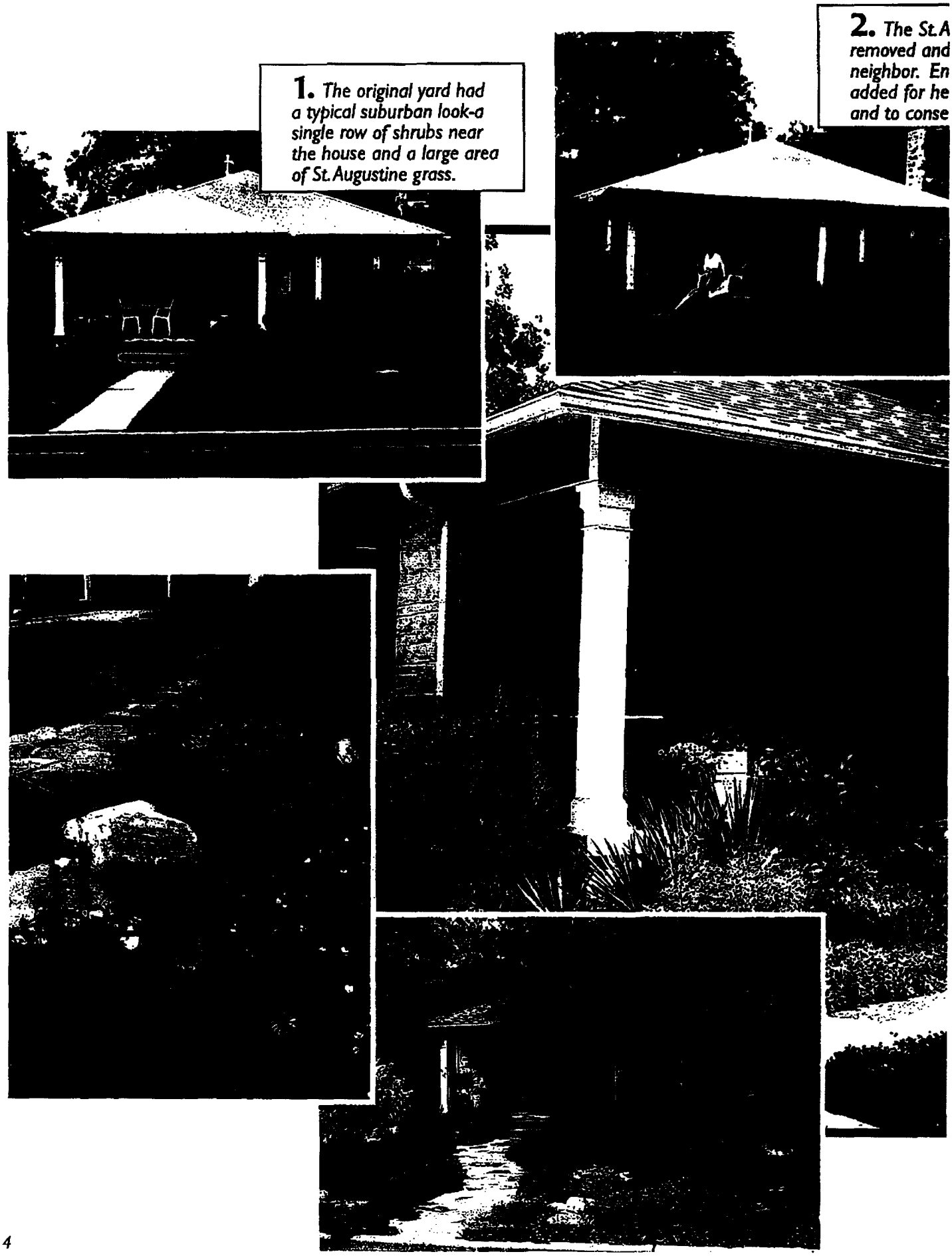
Plants to Avoid

Invasives: Some plants escape from yards to take over natural areas, choking out native species and upsetting the balance of the surrounding ecosystem.

Disease Prone: Some plants, despite many good characteristics, tend to fall prey to insects and diseases.

For a list of these plants, see the Grow Green Native and Adapted Landscape Plant Guide, or check the web at www.growgreen.org

- **Plant Choice and Placement**
  - Choose native plants and those well-suited to Central Texas conditions (see the Grow Green Native and Adapted Landscape Plant Guide for excellent choices). Native plants can also attract wildlife
  - Even native and well-adapted plants can have differing water and drainage requirements. Choose mainly drought-tolerant plants, and group them with others of similar needs.
  - If you select a few more water-needy plants, group them together, and close to a source of water
  - Put the right plant in the right place - shade-loving plants in the shade, and sun-loving plants in the sun
  - Pay careful attention to plant spacing. Even the tiniest acorn grows into a mighty oak. Plant young plants according to their adult space requirements to minimize crowding, pest and disease problems
  - Design your yard to create more shade. It is an excellent way to save on water and cooling costs through the summer months

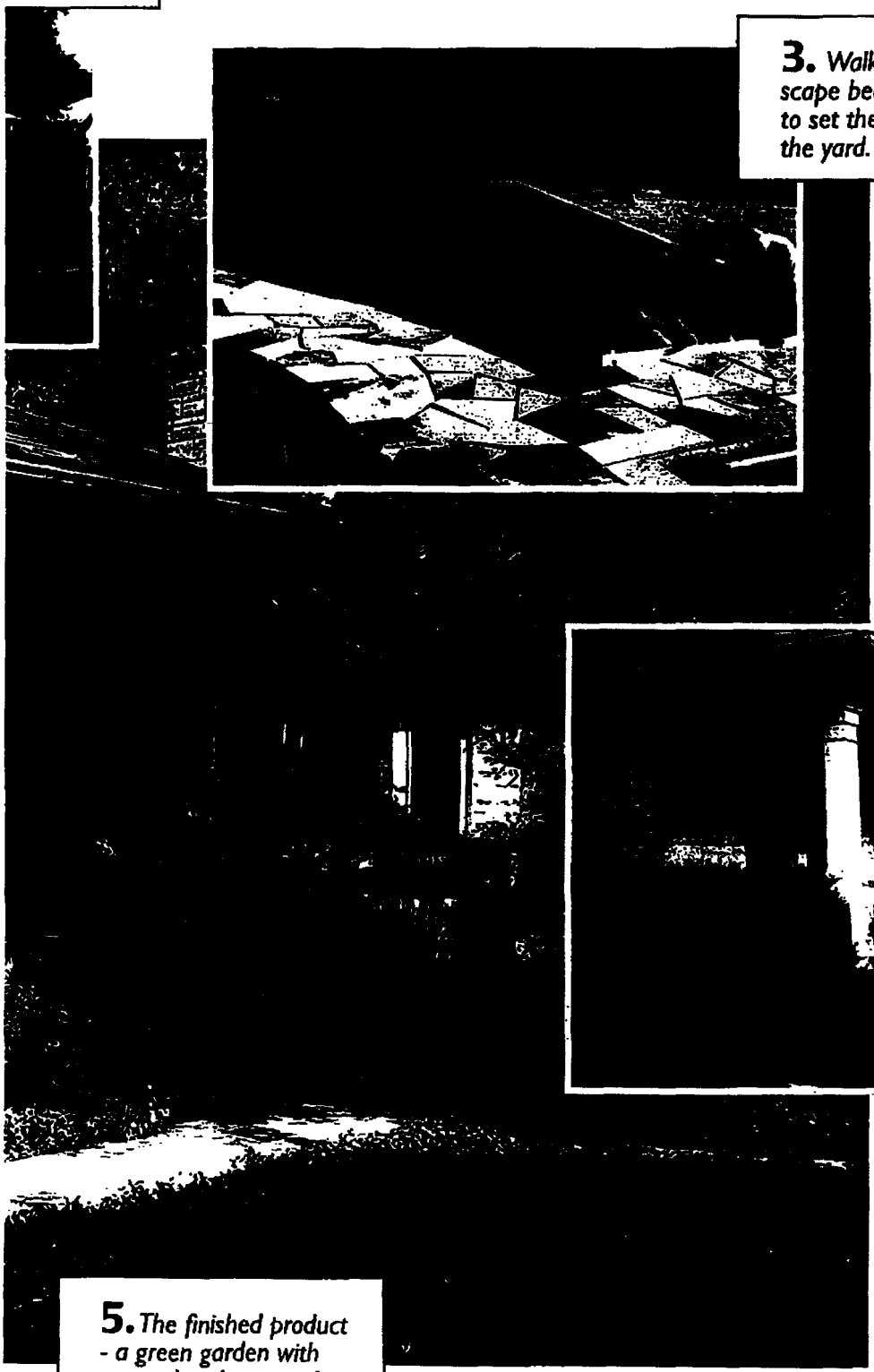


1. *The original yard had a typical suburban look-a single row of shrubs near the house and a large area of St. Augustine grass.*

2. *The St.A removed and neighbor. En added for he and to conse*

Step-by-Step Transition

gustine was lonated to a ched soil was thier plants e water.



3. *Walkways and landscape beds were installed to set the framework for the yard.*

4. *Trees and plants were placed to anticipate growth and shade*

5. *The finished product - a green garden with textural and seasonal variety for all to enjoy!*

Garden Preparation

Bed Preparation

- Lay out a garden hose following the contours of the beds in your design. This will help you to visualize the space
- Once the beds are shaped the way you like them, use landscape paint or small flags to outline where to dig
- Use edging (rock, brick, metal or plastic) to define beds
- Clear new planting areas completely of existing weeds and grass
- To completely remove **bermuda grass**, the underground roots must be killed:
  - In sunny areas, dig the grass out, then solarize (see right) the area to kill the roots with steam
  - In shady areas with excessive weeds, careful use of least-toxic, post-emergent herbicides may be effective as a last resort (see the Grow Green Lawn Care fact sheet or call the Texas Cooperative Extension office at 854-9600)

How to Solarize

Solarization works to clean the soil of weed seeds in sunny areas when temperatures exceed 80°F

1. Remove existing plants and grass
2. Moisten soil
3. Cover with clear or semi-transparent plastic (clear is more effective than black in creating steam underneath)
4. Let the sun steam the soil under the plastic for two weeks

Solarization at Howson Library

Irrigation

- Use drip irrigation or a soaker-hose in shrub and flower beds to minimize evaporation and runoff and to prevent disease
- Use low flow irrigation in narrow spaces such as medians and parking strips to minimize over spraying
- Water according to plant need rather than an automatic schedule
- Choose sprinklers that throw large drops of water (not a mist) close to the ground
- Consider rainwater harvesting to collect rainwater - it saves money and recycles water
- For automatic irrigation, choose a system with:
  - Rain shut-off device
  - Pressure reducing valves
  - Low volume, low-angle spray heads
  - Multiple cycle controllers
- Monitor automatic irrigation systems regularly for broken heads
- When you irrigate apply enough water to moisten soil to a depth of 4-6 inches, then let soil dry out before watering again.
- For a list of the City's certified, WaterWise licensed irrigation professionals, or for an irrigation audit, call 974-2978

Installing Hardscapes

- For pathways and patios, use materials such as gravel, crushed granite or wood chips which allow water to soak in instead of running off
- Where lumber is being used, consider sustainably-produced wood or wood alternatives like recycled plastic lumber; avoid using railroad ties that contain creosote

Granite and limestone pathway

Preparing Soil

- Test the soil in your yard to determine if nutrient amendments are necessary. Soil testing materials are available at Grow Green retailers
- Be sure that the depth of soil before installing plants or lawn is at least 6 inches for turf and most plants (some native plants require less)
- Bring in good quality soil if your soil is not deep enough. A good landscaping mix has about a 20% compost, 70% loam, 10% sand ratio
- Most Central Texas soils can be improved by mixing in 2-3 inches of organic compost

starting from scratch... tips for new construction

- Save your topsoil
- Take special care to have only good quality, weed-free soil brought on site
- Protect existing trees with sturdy fencing around the edge of the canopy to limit damage to trunks, branches and roots
- Have any trees that must be removed, ground into mulch and left on site
- It is cheaper and easier to conserve and preserve existing vegetation than to replace it

Choosing Mulch

- Mulch is a covering for soil. Mulch can be organic (shredded hardwood, straw, bark chips, shredded newspaper) or inorganic (crushed granite, river rock)
- Mulch helps retain soil moisture, moderates soil temperature, keeps weeds in check, and creates a finished look for your landscape
- Mulch your planting beds with at least two inches of mulch at establishment, and add another inch once a year or as needed to maintain a covering over soil
- Use local mulches when possible to help recycling effort and to conserve resources
- Once groundcovers become established, they provide a "green mulch"

Good choice for many perennial beds

Good choice for truly desert- adapted plants and rock gardens

Fire Ants
(garden pest)

Praying Mantis
(beneficial insect)

Identify before you spray - most pesticides kill beneficial bugs as well as harmful ones.
DON'T KILL THE GOOD GUYS!

Turf Tips

- Minimize turf to meet your life style needs. Turf can be high maintenance (water, chemicals, time)
- Choose turf types that are well suited to your area (See Grow Green Lawn Care fact sheet)
- St. Augustine grass is not drought-tolerant in the sun, but it can be a good choice for shade
- If you plan to install bermuda grass, realize that keeping up with edging around plant beds could be very labor intensive
- When to seed/sod:
  - Warm season grass can be seeded from March through September in Austin
  - Sod can be laid at anytime of year in Austin; however, the best time is from March through October
  - If you are starting a lawn during the winter months, you may choose to seed with winter rye and wait to place sod until spring (avoid over-seeding existing grass with rye)
- Don't bag grass clippings - they return nutrients to the soil naturally
- Choose fertilizers carefully - organic and natural fertilizers outperformed synthetic ones in recent tests for looks and water quality benefit

Tips for Maintaining a Less Toxic Yard

- Monitor often for insect and disease damage to keep small problems from becoming large ones
- Refer to the Grow Green fact sheets to properly identify pest and disease problems and to learn the least toxic solutions
- Do not use routine pest and fertilizer treatments. Monitor and identify pests and diseases before choosing treatment options.
- Use pesticides as a last resort, most kill both harmful and beneficial bugs.
- If you must use pesticides, follow labels directions exactly to avoid overuse and don't spray when it's windy
- Never use chemicals before a rain- they can run off to harm our creeks rather than helping your yard
- Do not use weed and feed products- the best time to treat weeds is not the best time to fertilize and herbicides are showing up in our local springs!

For additional yard care tips, visit
www.growgreen.org
or contact the Master Gardener desk at the Texas Agricultural Extension office--854-9600

Watershed Protection
Development Review
974-2550

Texas Cooperative EXTENSION
The Texas A&M University System
854-9600

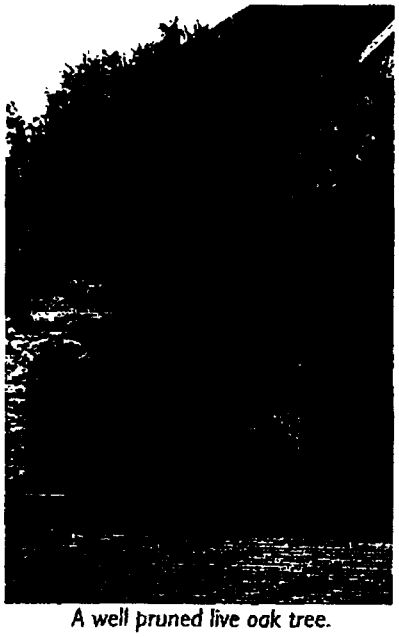
06/05

grow green earth-wise guide to

improper pruning methods can lead to plants that are weakened or deformed. increase your knowledge of proper pruning techniques to improve the health, beauty, and value of your landscape.

reasons for pruning—

- *To train a new plant*
- *To maintain plant health*
- *To improve the quality of flowers, fruit, foliage or stems*
- *To restrict growth*



A well pruned live oak tree.

1. Select the proper plant for the location

- Check the plant's maximum size; avoid those that will outgrow the space
- Select plant species and varieties that require minimal pruning

2. Plan before you prune

- First remove all dead, broken, diseased or problem limbs by cutting them at the point of origin or back to a strong lateral branch
- Next remove weak or narrow angled branches and eliminate undesirable trunks in multi-trunk plants
- Finally, make any needed cuts, keeping in mind the plant's natural growth habit
- Look at your work; if a lot of additional pruning is necessary, you may want to do so in several stages over several months to a year to prevent excessive re-growth and allow the plant time to recover
- Major pruning jobs such as significant size reduction may require two or more years to complete

3. Prune at the appropriate time of year

- In general it is best to prune in late winter, when most plants are dormant (see the back side for a pruning calendar)
- Avoid pruning immediately after new growth develops in spring; allow the plant time to regain the energy it spent in expansion
- If growing a plant for its flowers, time your pruning to minimize disruption to blooming; prune spring flowering shrubs soon after they bloom and summer flowering shrubs by late winter
- Many perennials require regular prunning to maintain desired shape. Refer to the maintenence tips in the Grow Green Plant Guide for specifics
- Pruning in late summer to early fall may encourage new growth which is susceptible to winter damage

4. Maintain pruning equipment

- Store equipment in a dry room and apply oil after each use to inhibit rust
- Maintain sharp cutting edges; cuts made with sharp, properly adjusted tools heal faster
- When pruning diseased plants, disinfect all blades after each cut with alcohol, spray disinfectant, or a mixture of one part bleach to nine parts water to avoid spreading disease; rinse and oil tools after bleach treatment to inhibit rust

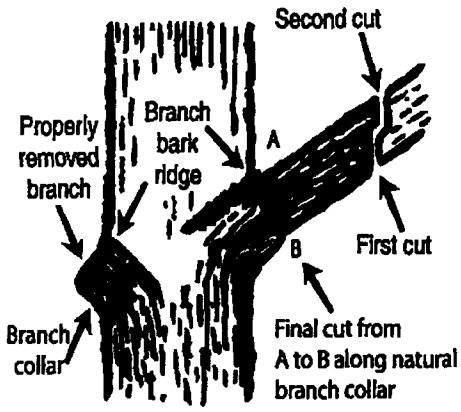
5. Make cuts correctly

- Prune evergreen hedges with a wide base and narrow top to allow light to reach the lower branches and maintain dense foliage in lower sections
- When cutting back to an intersecting branch, choose one that forms an angle of no more than 45 degrees with the one being removed
- To encourage rapid healing of wounds, make all cuts clean and smooth

- The bud or branch nearest to the cut usually produces rapid new growth; for more side branching, remove the tips of shoots
- Make cuts 1/2 inch above the bud or branch you want to flourish
- Select buds that point to the outside of the plant to avoid crisscrossing of branches through the plant's interior

6. Pruning large trees

- Cut branches without removing the branch collar (raised bark ridge) at the base of the branch. Avoid leaving stubs or making flush cuts
- When cutting branches more than 1 1/2 inches in diameter, use a three-part cut:
  1. First saw an undercut 6 to 12 inches from the trunk and about one third of the way through the branch
  2. Make the second cut from the top of the branch, about 3 inches out beyond the under cut, until the branch falls away
  3. The final cut (from A to B) can be easily cut back to the collar of the branch



7. Less is more

- Immediately after pruning apply pruning paint to wounds on oaks susceptible to oak wilt
- Avoid excessive pruning which only results in vigorous unnatural regrowth and poorly oriented branches
- Thin, don't top; thinning creates a more natural looking, stronger tree
- With young trees, leave branches on the main trunk to create a thicker trunk more quickly; remove these branches when they reach one inch in diameter

Pruning Guide*

Jan/Feb *when dormant*	**April / May / June** *after spring flowering*
Shade Trees Ash Elm Maple Oak Pecan Pistache Sycamore	**Spring Flowering Trees** (light trimming if needed) Anacacho Orchid Tree Roughleaf Dogwood Fringe Tree Saucer Magnolia Mexican Buckeye Mountain Laurel Redbud
Summer Flowering Trees Crape Myrtle Desert Willow Vitex	
Summer Flowering Shrubs Abelia Butterfly Bush Kidneywood Mexican Oregano Pavonia Possumhaw Holly Roses (repeat bloomers) Texas Sage	**Spring Flowering Shrubs** Flowering Quince Mock Orange Viburnum Wisteria Roses (one-time bloomers)

Broadleaf and Needleleaf Evergreens

Shear or trim anytime to maintain form and size.

Cherry Laurel	*Euonymus*	*Evergreen Sumac*
Holly	*Juniper*	*Ligustrum*
Photinia	*Pittisporum*	*Southern Wax Myrtle*
Yaupon	*Yew*	

**Plants included because commonly found in landscapes; not necessarily recommended.*

Texas Cooperative EXTENSION
The Texas A&M University System

854-9600

Watershed Protection Development Review

974-2550

www.growgreen.org

05 /04

New for Austin! Fertilizer Recommendations

grow green

1. **Test your soil** (soil test envelopes available at the Grow Green display)
2. **If your soil test shows:** [redacted] **Use:** [redacted]

(Apply to medium or [illegible])

3. **Don't bag grass clippings.** (Recycle them back to the lawn)
4. **Choose carefully — organic and natural fertilizers out-performed synthetics in a recent study.**
5. **Do not over-fertilize!** (see below)*

	Fertilizer N-P-K (Nitrogen-Phosphorus-Potassium)	Fertilizer needed to supply 1/2 pound of nitrogen/1000 sq. feet
Natural	6-1-1	8 pounds fertilizer / 1000 sq. feet
Natural	8-2-4	6 pounds fertilizer / 1000 sq. feet
Natural	9-1-1	5.5 pounds fertilizer / 1000 sq. feet
Synthetic	15-5-10	3 pounds fertilizer / 1000 sq. feet
Synthetic	21-0-0	2.5 pounds fertilizer / 1000 sq. feet
Synthetic	29-3-4	1.5 pounds fertilizer / 1000 sq. feet

See details in the Grow Green Lawn Care Fact Sheet

[redacted]

EXTENSION