Plant damage can be divided into four non-lethal categories:

(1) rapid leaf drop; **(2)** tissue chlorosis or discoloration; **(3)** tissue distortion and tip burn; and **(4)** marginal and interveinal necrosis.

The degree of plant damage depends on the amount of chlorine in the air, its duration of exposure, susceptibility of the plant to damage, and environmental conditions such as moisture content and temperature.

Lower concentrations of chlorine in the atmosphere will do more visible damage when humidity is high.

Under high humidity (more than 80 percent) or when fog or dew is present, chlorine combines with water vapor to form a hydrochloric acid aerosol mist on plant surfaces. Under these conditions, droplets may form on leaf surfaces, causing necrotic spots or burns to form.

Under low humidity, the chlorine gas forms an anhydrous hydrogen chloride which may cause less visual damage but has been speculated to cause more severe damage because of the dehydrating action on exposed tissue.

Acute damage happens so rapidly that chlorine is not assimilated by the plant and cannot be detected easily in tissue samples.

Table 2

SEVERITY OF DAMAGE TO PLANTS IN SOUTHERN NEVADA

NONE	SLIGHT	MODERATE	SEVERE
asparagus fern	Algerian ivy	agave dianthus	apricot
barrel cactus	ash	heavenly bamboo	bird of paradise
cholla cactus	canna	honeysuckle	chinaberry
dusty miller	bush morn. glory	stone pine	Chinese/Sib. elm
euonymus	English ivy	Jap. black pine	lilac
hesperaloe	fortnight lily	lavender	marigolds
ice plant	photinia	magnolia	nectarine
juniper	iris	Mexican primrose	olive
myrtle	pampasgrass	mulberry	peach
palms	pittosporum	mums	plum
pyracantha	salvia	oleander	poplars
rosemary	snapdragon	pansy	rose
santolina	verbena	pomegranate	
turfgrasses	Italian cypress	Idaho locust	
wisteria	heavenly bamboo	silk tree	
yucca	arborvitae	privet	
Texas ranger	almond		
athel	chrysanthemum		
star jasmine	Indian hawthorn		

Source: The authors

The Nevada burn

■ Early in the morning of May 6, 1991, a large blue-green cloud was released from a broken two-inch line that led to a 150-ton storage tank of liquid chlorine. An industrial plant in southern Nevada accidentally released 60 tons of chlorine that rapidly vaporized and caused the evacuation of 10,000 residents in a 20-square mile area. Nine people were hospitalized. In the affected area, landscape plants bathed in an unknown concentration of chlorine gas for several hours.

A team of commercial horticulture volunteers surveyed landscape plant damage in a neighborhood within 1/2 mile of the chlorine leak one week after the accident. Recorded plant damage is shown in Table 1. Table 2 lists the plants that were found to have probable chlorine emission damage.

Within 24 hours after emission, partial to total leaf drop occurred on elm, cottonwood, chinaberry, all stone fruits, some pome fruits, rose, olive, mulberry, pomegranate, Texas privet and Indian hawthorne.

Flowers were not affected and were more tolerant of exposure to chlorine with one exception: leaf and flower drop on Indian hawthorne. Chlorosis and necrosis occurred three to five days after emission. New growth began to cover damaged tissue, and refoliation occurrred in seven to 10 days.

All pines suffered some sort of damage, ranging from twisting and dieback of new growth (candles) to needle tip burn and needle drop.

Turfgrasses (tall fescue, bluegrass and bermuda) all tolerated the exposure with no visible damage. In some cases, chlorine damage was difficult to separate from previous winter damage.

—Dr. Morris, Ms. Lawson-Dyka

Treat now for pythium rots

This is the time of year to make sure pythium rots don't take away valuable turf areas.

■ Although this disease is most frequently associated with established bentgrass/annual bluegrass putting greens, it can also be a serious problem on highly managed home lawns and newly-seeded areas. It is particularly severe on ryegrasses, bentgrasses and bluegrasses.

To minimize turfgrass losses from pythium root rot (PRR), Dr.Eric Nelson of Cornell University says, manage to reduce plant stress or eliminate prolonged wet periods.

Early symptoms of PRR may be visible in the early spring immediately after snow melts, but are most common in the late spring. Symptoms may be evident any time during the growing season, and may continue into late autumn.

Symptoms:

- small diffuse yellow or reddish brown patches about two to three inches in diameter, often resembling early stages of pink snow mold;
- plants slow to come out of winter dormancy;
- less vigorous growth;

• during summer, small tan to brown or bronze patches similar to dollar spot patches;

• severe development may mean large yellow areas and a general weakened condition; and

• as season progresses, large areas may wilt, turn yellow to brown, and die.

Control:

1) Maintain extensive and vigorous plant root system.

2) Use management practices to reduce plant stress.

3) Eliminate prolonged wet periods.

4) Use broad-spectrum fungicides sparingly.

5) If necessary, use pythium-labelled fungicides and thoroughly water in. Areas with PPR history should be treated between October and November, followed up by another application in the spring. See chart for effective fungicides.

FUNGICIDES FOR ROOT-ROTTING PYTHIUM DISEASES

Fungicide	Trade Name	Formulation	Rate/1000 sq.ft.
ethazole	Koban	30W	7-9 oz.
		1.3G	8 lb.
	Terrazole	35W	8 oz.
metalaxyl	Subdue	2E	2 oz.
		2G	1.5 lb.
		5G	10 oz.
	Scott's Pythium Control	1.2G	2.5 lb.
phosetyl-al	Aliette	80W	4-8 oz.
proamocarb	Banol	65	2.4 oz

Source: Cornell University Turfgrass Times

Recognizing herbicide injuries to ornamentals

Lawn/landscape herbicides can cause damage to non-target ornamentals.

■ Are the leaves of ornamentals under your care turning yellow and dying? Have you already ruled out disease and insects, and don't have another answer?

Perhaps you should consider herbicide injury as the culprit.

"A lot of other problems can mimic these herbicide injury symptoms," notes Dr. Jeff Derr of VPI-SU's Hampton Roads Ag Experiment Station. "However, there is no cure for herbicide injury. In most cases, the plant will outgrow it."

Some herbicide injury symptoms include chlorosis, bleaching, spotting and distorted growth. Each herbicide has a specific set of injury symptoms that it causes.

Chlorosis is a yellowing effect that can be either veinal, interveinal, marginal or general (see illustration). It is caused primarily by root-absorbed herbicides.

Bleaching occurs when some herbicides are taken up through the plant's roots or leaves. The plant's leaves turn white.

Spotting is a browning of leaves, while distorted growing patterns are generally the result of plant growth regulator injury.

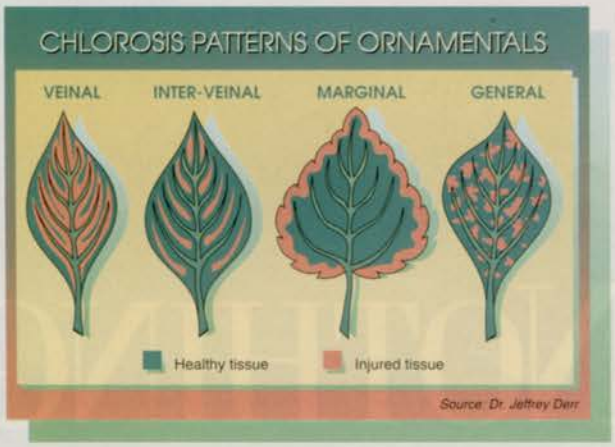
The 2,4-D group of growth regulators produces a distorted appearance, twisting and downward bending. The Roundup group (Roundup, imidazolinone herbicides, sulfonylurea herbicides) of growth regulators produces tip chlorosis and distorted growth, but no twisting.

"Using Roundup in the fall, you may not see symptoms until budbreak next spring," Derr notes.

The dinitroanilines produce root inhibition and occasionally swelling and brittleness of the stem at the soil line.

Amides, anilides and thiocarbamates inhibit roots and shoots.

If you suspect herbicide damage, consult a reference text such as "Herbicide Injury to Trees and Shrubs: A Pictorial Guide to Symptom Diagnosis." (Available from Blue Crab Press, P.O. Box 5055, Virginia Beach, VA 23455-5055.)



Injuries produced by common herbicides

Here are some common herbicides and the types of injury they can produce:

CHLOROSIS: triazines (Atrazine, Simazine), ureas (Karmex, Spike), uracils (Hyvar, Sinbar), Casoron, Norosac, Basagran

BLEACHING: amitrole, Amazine

SPOTTING: diquat, paraquat (Gramoxone Extra), Goal, Ornamental Herbicide 2 (OH2), Rout, Ronstar

DISTORTION: 2,4-D group: 2,4-D, dicamba (Banvel), triclopyr (Garlon), picloram (Tordon), Weedone DPC, Trimec, Turflon
Roundup group: glyphosate (Roundup), Oust, Classic, Escort, Arsenal, Sceptor, Image

ROOT INHIBITION: dinitroanilines (Surflan, Treflan, Balan, XL, Team, Southern Weedgrass Control)

ROOT & SHOOT INHIBITION: amides (Devrinol), anilides (Lasso, Dual, Pennant), thiocarbamates (Eptam)

— Dr. Derr