You're responsible for a course worth millions. Sod webworms should be the least of your worries.

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SEVIN® brand SL carbaryl liquid effectively controls over 25 common turf insects, including sod webworms, white grubs, chinchbugs, billbugs, crickets, even ants, ticks and fleas.

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So it's ideal for insect control in golf courses, parks, and other recreational turf areas used by people.

In fact, you can put greens, fairways and other golf course areas treated with SEVIN® brand SL back into play as soon as the spray is dry.

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Ask your turf chemicals supplier about SEVIN® brand SL carbaryl insecticide. It can help put your pest problems into perspective.

From the turf care group at Union Carbide

SALINE *from page 58*

soluble salt levels.

In the interior regions of the country, ancient saline marine deposits in geological layers add soluble salts to rainwater as it passes through the layers. This process has occured throughout the country and virtually all the fresh water supplies have some amount of dissolved salts.

Amount of salts

The amount of salts in water determines the degree of salinity and to a large extent the overall water quality. Salinity is determined by a conductivity meter which measures the electrical conductivity (EC) of a water sample.

This is determined as the inverse of the resistance of an electric current as it is passed between two probes in a salt solution.

Electrical conductivity is determined in units of Siemans per meter (S/m) or in the older units of mhos per centimeter (mhos/cm). Generally, electical conductivity is reported in tenths of Siemans or Deci-Siemans per meter (dS/m) which are equal to the old reporting unit of millimhos per centimeter (mmhos/cm).

Electrical conductivity is the preferred salinity measurement because it expresses all the salts that are associated with possible salt stress on plants from saline irrigation. The electrical conductivity and concentration of dissolved salts (parts per million - ppm) are directly related units depending on the salts present.

A sodium chloride solution of 1 dS/m is equal to 640 ppm soluble salts. Other salt solutions vary from 550 to 700 ppm for every 1 dS/m. Salinity of water samples are often compared to seawater which has an EC of 41.5 dS/m and about 35,000 ppm dissolved salts. Irrigation water has been classified into four catagories based on the salinity hazard (See Table 1). These limits were determined by the U.S. Salinity Laboratory based on the relationship between the electrical conductivity of the water and the electrical conductivity of soils to which the water has been applied.

TABLE 1.
Classification of Saline Irrigation Water.

Salinity Class	Electrical Conductivity (dS/m)	Concentration of Dissolved Salts (ppm)	Comments
Low	<0.25	<160	Low salinity hazard.
Medium	0.25-0.75	160-480	Some leaching required.
High	0.75-2.25	480-1440	Good drainage required & salt tolerant plants.
Very high	>2.25	>1440	Excellent drainage required & very salt tolerant plants.

TABLE 2.
Recommended Irrigation Amounts For Saline Water.

Irrigation Water EC (dS/m)	Maximum Plant Salinity Tolerance Level, Measured By Saturated Soil Paste Extract (dS/m).		
	4 (Low)	8 (Medium)	16 (High)
	inches of water required to replace evapotranspiration losses and provide adequate leaching.		
0.00	1.5	1.5	1.5
1.00	2.0	1.7	1.6
2.00	3.	2.0	1.7
3.00	6.0	2.4	1.8

Obtaining ample quantities of good quality water is becoming difficult ...

Water with EC readings of less than 0.75 dS/m are considered to be suitable for irrigation without many problems. The successful use of water above this level depends on the soil conditions and plant tolerance to salinity. The quality of irrigation water is also influenced by other specifications.

Amount of sodium

The amount of sodium is of prime concern because it is often found in the largest amounts. Excessive sodium destroys soil structure. Sodium is also an antagonistic ion that will displace potassium and can limit the availability of iron, manganese and phosphorus in soils.

Boron in irrigation water is rarely a problem with turfgrasses because boron accumulates in leaf tips which are removed by regular mowing. Other landscape plants may be more sensitive to boron levels.

High concentrations of chloride, sulfate, and bicarbonate ions can cause specific injury under certain soil conditions.

Soils are a key to the continued use of saline irrigation water. Good drainage is essential to leach soluble salts through the soil profile. The better the drainage, the more successful saline irrigation can keep the soil level of soluble salts within tolerable limits.

Soil texture

Soil texture also influences the use of saline irrigation water.

Sand soils with low moisture holding capacities will concentrate the soluble salts quicker than finer textured soils as moisture is lost by evapotranspiration. Sand soils are usually the best-suited for saline irrigation applications, but they must not be allowed to dry in order to prevent intolerable salt levels.

continued on page 66

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SALINE *from page 62*

TABLE 3.
Salt Tolerance of Turfgrass Species.

Salt Tolerance	Species
Good	Zoysiagrass
	Seashore paspalumgrass
	Bermudagrass
Fair	Creeping Bentgrass
	St. Augustinegrass
	Tall Fescue
Poor	Perennial Ryegrass
	Red Fescue
	Bahiagrass
	Kentucky Bluegrass
	Centipedegrass
	Colonial Bentgrass

Soluble salts are measured in soils by the same basic method as water samples. A conductivity instrument measures the electrical conductivity from a water extract from a soil. The electrical conductivity readings of soils are two to 10 times greater than the irrigation water applied to them.

Good drainage is essential to leach soluble salts through the soil profile.

Soils with EC readings of 2.0 to 4.0 dS/m are considered to have low salt levels. Soils with EC readings of 4.0 to 12.0 dS/m have medium salinity levels. When soil readings are above 12.0 dS/m, soils are considered to have high salt levels.

To maintain a certain salt level in the soil for plant tolerance, saline water must be applied at rates exceeding evapotranspiration to leach excess salts through the soil (See Table 2).

For example, to replace 1.5 inches of water lost by evapotranspiration, approximately a week's worth of plant water use, rainwater with 0 dS/m would not increase the salinity, so 1.5 inches of irrigation would be sufficient.

TABLE 4.
Salt Tolerance of Various Turf Cultivars Used For Golf Courses.

Salt Tolerance	Creeping Bentgrass	Bermudagrass
Most	Seaside	Tifdwarf
	Arlington	Tifgreen
	Congressional	Tifway
	Cohansey	Tiflawn
Least	Penncross	Common

As the salinity of irrigation water increases, irrigation amounts more than the evapotranspiration amount must be applied because of the tendency to concentrate salts in the soil.

The larger amounts of water applied as irrigation salinity increases tend to keep soil salts at tolerable levels and to leach excess salts. Rainfall with saline irrigation is a definite benefit because it will aid in leaching and diluting soluble salts.

Salt stress

Applying saline water can cause salt stress and injury to plants by both direct and indirect means. Direct salt injury occurs with the accumulation of salts on the surface or ions within the plant. Reduction in plant growth and other metabolic processes such as photosynthesis are a result of direct salt injury.

Indirect salt stress and injury are caused by altering the plant environment particularly in the soil.

Osmotic stress is dehydration of the plant by removing water from the plant into the soil because of a salt concentration gradient. Some nutrient deficiencies are an indirect result of saline conditions causing suppression of nutrient absorption.

The most common example of this is the antagonistic effects of sodium on the uptake potassium into the plant. Plant resistance to salt stress varies greatly. Some plants avoid salt stress by either excluding salt absorption, extruding excess salts, or by diluting absorbed salts.

Other plants tolerate salt stress by adjusting their metabolism to withstand direct or indirect injury. In most cases the mechanism of salt tolerance in plants is a combination of methods.

Salt tolerance

Evaluation of salt tolerance of turfgrasses and ornamental plants has largely been done by observation of plants growing along the ocean or in saline sites. These observations have been further investigated by researchers in California and Florida.

Turfgrass species have been classified according to salt tolerance (See Table 4). Only a few turf species grow well under saline conditions. The grasses require good drainage and moist conditions to produce good quality turf.

Adequate leaching is also essential. Cultivars within a species often show a wide range of salt tolerance (See Table 4).

Indirect salt stress and injury are caused by altering the plant environment particularly in the soil.

Sometimes cultivar differences are greater than species differences. Most turfgrass comparisons are based on the salt levels which cause a 50 percent reduction in top or root growth.

Landscape plants like turfgrasses have a wide range of salt tolerances. Problems with these plants are often more pronounced because of direct salt injury. Landscape plants do not often have leaves removed like mowing turf, hence salts can accumulate in the leaves. Local soil and environmental conditions greatly influence salt tolerance.

More specific recommendations of salt tolerant landscape plants are available from most cooperative extension offices.

A few simple guidelines should be followed to successfully grow plants using saline irrigation.

First, use the best quality water available. Provide excellent drainage and excess irrigation to leach excess salts.

Finally, use the most salt tolerant plants for your location. **WT&T**

Augustin is Extension Turf and Water Specialist, University of Florida, IFAS, Ft. Lauderdale Research and Education Center.

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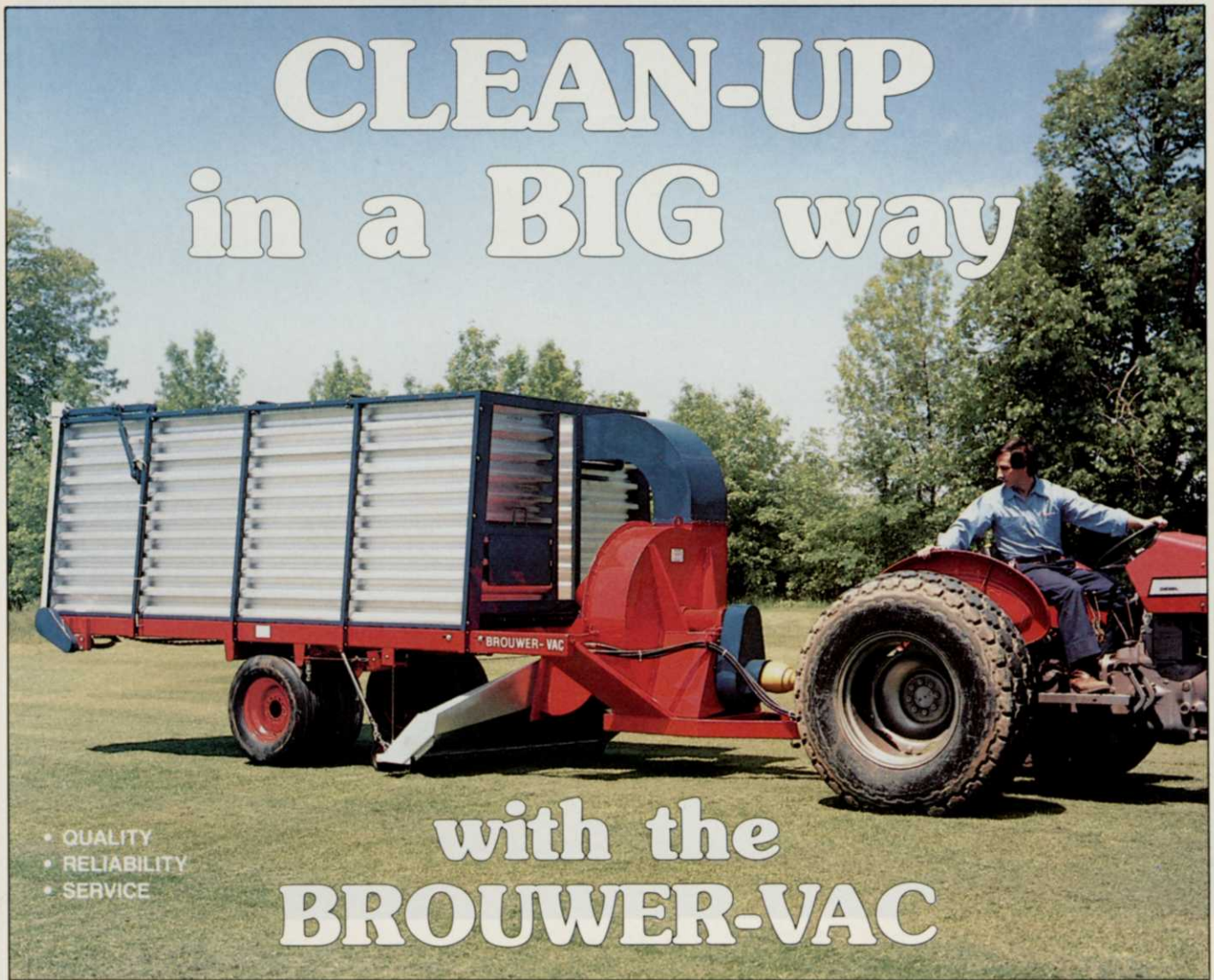

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Digital Dominance

Electrical and mechanical controllers, move over. Solid state is making its presence felt in the irrigation industry.

by Jack Schember

"If it sells in California, it'll sell anywhere."

This often-quoted axiom may be accurate in describing the phenomenal success of the waterbed, hot tub and Apple computer, but will it ring true for the solid-state irrigation controller?

Manufacturers of irrigation equipment think so. They believe the digital controller will be a big hit with the nation's landscape architects and contractors.

The solid-state controller is already a hit in California. According to a survey by Irri-Trol Mfg. Inc., 70 percent of the irrigation market in California is using solid-state controllers while 30 percent are employing the electrical or mechanical versions.

"But the reverse is true once you get outside California," says Irri-Trol's Chuck Hoover. "Here we found that 30 percent were using solid-state and 70 percent were still using electrical or mechanical.

These odds help pinpoint a potentially huge market for sophisticated irrigation equipment, according to Hoover. "I think solid-state will be big everywhere pretty soon," he says.

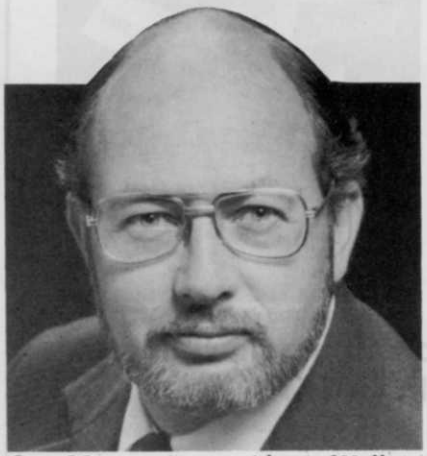
Components dominate

Hoover was one of the more than 300 manufacturers and distributors exhibiting landscape supplies and equipment at the 1985 Landscape Industry Show which took place in March at the Long Beach (California) Convention Center.

Produced by the California Landscape Contractors Association, the sixth annual trade show attracted more than 5,000 professional contractors, architects and turf managers, according to Greg Meyer, show chairman.

"There is no other show in the West as diverse as this one," says Meyers, who is vice president of Valley Crest Tree Co.

"We have everything here from A to Z for the landscaper."



Greg Meyer, *vice president of Valley Crest Tree Co.*

Irrigation components dominated the show floor.

More than 35 companies were exhibiting irrigation products like backflow preventors, fittings, PVC pipe, drains, drip emitters, filters, pumps, sprinklers, controllers, valves and meters.

Water is lifeblood

Such displays of irrigation parts are not unusual at the yearly Landscape Industry Show, for in the arid West, water is the lifeblood of landscaping.

"Everything is irrigated here," says Mark Pedicone, a sales representative for the turf division of Rain Bird. "For a built landscape, water is essential."

With a construction boom and a strong economy in key Western cities, there is plenty of business for the irrigation industry," Pedicone says.

"There is a demand for more "localized" irrigation products. Landscape architects are designing smaller parcels of property and are specifying that zone watering and low volume irrigation be implemented. Products marketed for this style of irrigation include bubblers, drip emitters and micro spray heads.

The "water manager" is beginning to appear as a viable member of the landscaping work force. Such a specialist will typically approach a homeowner's association or a city planner and propose a water savings plan. The water manager is compensated according to how much he can reduce the water bill. "This is a big trend," Pedicone says.

New to the market is a line of valves and nozzles that makes irrigation "more efficient," says Chuck Turmell of Champion Sprinkler Co.

Champion's new In-line Y Valve, for example, reduces pressure loss and improves the flow of water, Turmell says.

"We have a line of pop-up sprinklers with matched precipitation-rate nozzles," he points out. "Even though the nozzle sizes are different, the lawn still gets the same amount of water."

Joe Silva of Hunter Industries says the landscape manager wants to simplify his sprinkler inventory and find one sprinkler "that can do it all."

Hunter's new Professional Series sprinklers can apply water from a 15-foot radius to a 52-foot radius, and from one-half gallon per minute to 11 ½ gallons per minute, thanks to interchangeable nozzles.

"The contractor can get 12 sprinklers in one, Silva says.

Hunter is planning to market a fully adjustable head with one nozzle for a multiplicity of uses, he indicates.

Solid-state controllers, zone watering, irrigation management and versatile nozzles are not the only trends to catch the fancy of the Western landscaping industry.

Larger trees

Greg Meyer of Valley Crest Tree Co. says architects are now regularly specifying larger trees for commercial sites.

"Budgets are now calling for 15-gallon and 24-gallon trees, rather than the popular five gallon trees of yesterday," he says.

At Belcourt, a swanky residential development in Newport Beach, CA, "contractors were putting in 48-inch box specimen trees like they were as inexpensive as groundcover," Meyer

remembers. The trees cost about $800 each, he says.

Sophistication

Pointing to other trends, Meyer believes there is a direct relationship between landscaping and real estate marketing.

"Landscaping is worth the initial investment because it will pay off handsomely once the building or house is sold," he says.

Many landscape architects and contractors are working closely with developers in building corporate office parks where landscaping is used to lure clients, Meyer confirms.

In short, Meyer says, the industry is becoming more sophisticated, "even down to the homeowner level." He says homeowners are demanding quality workmanship and this in turn breeds higher standards for the industry."

He says the West will continue to be "a haven for architects and landscape contractors" as long as the climate, economy and the outdoor-oriented lifestyles of the people remain unchanged. **WT&T**

Jack Schember is the former editor of *Western Landscape News*.