



To replace larger areas, strip the top two inches of topsoil in April.

"The extent of damage depends on the amount of salt and the type of grass. Tall fescue tolerates high saline levels the best, followed by perennial ryegrass, fine fescue and Kentucky bluegrass," says Pound.

If an entire strip dies, replace the dead turf and top two inches of topsoil in April in Midwestern climates, says Pound. But if you're dealing with a Kentucky bluegrass lawn and only parts have turned yellow, green grass will eventually fill in the damaged areas.

Ryegrass won't fill in, so reseed in early

spring.

"The need for topsoil replacement is only there if you want to replace the turf immediately," Pound points out, noting that many landscape managers use a sod cutter for this task. It's best to get a handle on the situation by doing some checks in the dead of winter. "I encourage people to take some soil samples." With a test for soluble salts, a reading above 150 indicates a saline level capable of killing grass.

—The author is a freelance writer specializing in the green industry. He maintains his office in South Euclid, Ohio.



Tall fescue tolerates salt better than other turf.

Wildflower seeding: pick best method for *your* site

■ The goal of wildflower seeding is simple—an even distribution of seed with good seed-to-soil contact.

That's not always easy to do, however, because of the great variation in the size of wildflower seed. Some species produce seed smaller than a pinhead while others may be several times larger and of a different shape.

Even so, a landscape manager can seed many sites with either a manual or tractor-pulled cyclone spreader, spreading them with a blending agent like sand or vermiculite. Also, some suppliers coat their seeds to make them easier to distribute, with at least one supplier using multi-colored coating so that appli-



Soil on this site has been loosened and is relatively weed-free, a good start for wildflower establishment. (Photo courtesy American Seed Trade Association)

The same site weeks later shows the results of good soil preparation and effective seeding. (Photo courtesy American Seed Trade Association)



cators can, at a glance, see how effectively they're dispersing seed.

Larger seeding projects call for different seeding strategies. Craig Steffens with the Texas Highway Department says his department uses three methods to broadcast wildflower seeds:

1) The most effective and expensive method is with a drill-type seeder where a rip shank forms a groove in the soil, seeds are dropped, and then a culti-packer comes back over to assure good seed-to-soil contact.

2) Another method used by the Texas DOT is a piece of chainlink fence weighted down (with rocks or a railroad tie) and dragged
continued on page 34

Plan for winter in the summer

■ The best way to avoid getting plowed under by winter snow and ice removal is to think winter in summer. Consider the snow when planning the landscape.

In snowy climates, any landscape plan has to be checked to make sure it leaves places to pile snow. Failure to ponder this point can leave you with a mountain of problems come the following spring: dead ornamentals, damaged lawns and irate customers.

Dr. Bill Pound, Ohio State University: "Be careful about what you plant and where you plant it." A strip of mulch around landscaped edges can reduce costs if snowblower damage is a recurring problem among your customers.

Joseph Hudak, a Westwood, Mass. landscape architect: "Avoid brittle plants whenever possible. Day lilies are one of the least sensitive plants for abuse. They're used a great deal in Canada along highways where they salt things to death."

Trees alongside driveways need special attention. Plan or prune so that you avoid low-hanging horizontal branches when the plow comes.

"The more snow they have the more they will hang down. If you have branches that won't clear the cab, you won't have any branches."

If you or your clients use a snowblower, look out for those tight hedges. "You've got that barrier staring you and your snowblower right in the kisser." Snowplows, snowblowers and salt can bring damage to any type of plantings along driveways and sidewalks. A misguided plow blade can easily strip away big chunks of grass and anything else in its way.

John M. Bass, Lawn Master, Midvale, Utah: Pounding in stakes in the fall, and maintaining fallen ones throughout the winter, can also help reduce lawn and bed damage. "We'll go out and mark the curbs so when we're pushing snow we'll know where to push it to."

Phil Jorgenson, Tuff Turf, Merriam, Kansas: "The main thing is taking corners." It's great customer relations to repair any plow damage free of charge. It can be an excellent advantage to you when compared to other plowers, such as off-season construction contractors and the like, who are unable or unwilling to guarantee that the proper repairs will be made.

—J.E.G.

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behind a tractor or pick-up truck over the area to be planted. This is usually done over existing vegetation, roughing up the area enough to allow seeds to get into the soil.

3) The least expensive, but also the least productive, of the three methods is the collection of wildflower hay from existing plantings. This is then re-distributed over the area to be planted. The germination rate of the wildflowers is generally low.

Wildflowers can also be planted with a hydroseeder or hydromulcher. Hydro-machines can seed slopes where it is impossible to use tractor-drawn seeders. Organic glues (tackifiers), when sprayed with the hay or straw mulch, help hold the seeds in place.

Some contractors have had trouble with small wildflower seed getting hung up in the machines or in the mulch itself. Consider doing the seeding and mulching in two steps, seeding first and mulching second, or increase the seeding rate for the wildflowers.

The combination of seed, water and mulch may allow you to extend the wildflower planting season. The mulch moder-

ates temperature variations, and protects new seedlings from summer's high temperatures.

There is no "right" or "wrong" method of establishing wildflowers. Each site will

be different and each situation will present its own challenge.

— Laura Martin, Wildflower Group, American Seed Trade Association.

Seeders just for wildflowers



J-Thom 42 Wildseeder: for large-scale wildflower seedlings.

■ The growing popularity of wildflowers spurs the development of specialized new seeding equipment.

The J-Thom 42 Wildseeder is a no-till drill seeder that can plant up to 14 varieties of wildflower seed in one pass and 100 seed

varieties at different applications, says its manufacturer. It's particularly suited for highway departments, commercial growers and research centers.

Contact: Wildseed, Incorporated, 1101 Campo Rosa Road, P.O. Box 308, Eagle Lake, Texas 77434. 409-234-7353.

The Truax Wildflower Seed Planters can be transported in the back of a pickup, and can be pulled onto a site with an ATV or garden tractor. Features on the two models (WF-24 and WF-32) include vertical row dividers to prevent sliding of seed when seeding on slopes, and both auger agitators and seed metering picker wheels in the fluffy box.

Contact: Truax, 3609 Vera Cruz Ave., No., Minneapolis, Minn. 55422. 612-537-6639.

Albright Seed Company
1482 Unit A Francis St.
Ontario, CA 91761

Applewood Seed Company
5380 Vivian St.
Arvada, CO 80002

Baldwin Seed Co. of Alaska
Box 3127
Kenai, AL 99611-3127

Bitterroot Native Growers
P.O. Box 566
Hamilton, MT (zip code?)
406/961-4702

Daehnfeldt
1100 Southeast Jackson St.
Albany, OR 97321
503-928-5868

Environmental Seed Producers
P.O. Box 2709
Lompoc, CA 93438
805/735-8888

Great Western Seed Co.
810 Jackson Street SE, PO Box
387
Albany, OR 97321
503-928-3100

LESCO, Inc.
20005 Lake Road
Rocky River, Ohio 44116
216/333-9250

Lofts Seed Inc.
Chimney Rock Road
PO Box 146
Boundbrook, NJ 08805
908/356-8700

McLaughlin's Seeds
Buttercup's Acre
Mead, WA 99021-0550
509/466-0230

Medalist America
1490 Industrial Way, SW,
Albany, OR 97321
503/926-0126

Northplan/Mountain Seed
PO Box 9107
Moscow, ID 83843
208/882-8040

Northrup-King
7500 Olson Memorial Highway
Golden Valley, MN 55427
800/445-0956

Pennington Seed
PO Box 290
Madison, GA 30650
404/342-1234

Turf-Seed, Inc.
PO Box 250
Hubbard, OR 97032
503-651-2130

SSS Seeds
PO Box 1275
Carpinteria, CA 93010
805/684-0436

Sharp Bros. Seed Co.
PO Box 140
Healy, KS 67850
316/398-2231

Stock Seed Farm
R.R. 1, Box 112
Murdock, NE 68450
402-867-3771

Vermont Wildflower Farm
Dept. BK, Route 7
Charlotte, VT 05445-0005
802/425-3500

Wildflower Carpet
1325 South Colorado Blvd.,
Suite 404, Denver, Colorado
80222
303/756-7943

Wildseed Farms, Inc.
PO Box 308
Eagle Lake, TX 77434
409/234-7353

Willamette Seed Co.
PO Box 791
Albany, OR 97321-0277
503/926-8883

Wind River Seed
Route 1, Box 97
Manderson, WY 82432
307/568-3325

Wildflower seed suppliers

Cactus Seed Company
50505 E. County First Street
Roll, AZ 85347
602/785-9605

Cenex Seed
PO Box 608, 951 Rundell Road
Gering, NE 69341
605-336-0623

Clyde Robin Seed Co.
3670 Enterprise Ave.
Hayward, CA 94545
415/785-9425

Jacklin Seed Co.
W 5300 Riverbend Ave.
Post Falls, ID 83854

Johnny's Selected Seeds
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How and where to use geotextiles

■ Geotextiles control soil erosion in a variety of landscape settings:

- ✓ditches ✓slopes, ponds
- ✓acid slopes ✓storm channels
- ✓embankments ✓shorelines

Golf course applications include:

- ✓embankments ✓cart paths
- ✓bridges ✓fences
- ✓bunkers ✓greens

The primary purpose of geotextiles is to prevent soil erosion. They also save labor by requiring less repair to eroded land.

Most geotextile manufacturers tout the lightweight quality of their product. Weight is important. Most repair projects require multiple rolls of material.

Root reinforcement is another quality of the best geotextiles. The purpose here is to permit root growth, and provide an anchor for secure rooting.

Texture of erosion control products varies, from mesh-like to perforated polymers.

Unlike weed control fabrics, which allow no air or sunlight through, erosion control products allow seed germination. The materials' ability to retain or allow moisture to penetrate is the key to early establishment of grasses and the subsequent permanent control of erosion of newly-graded slopes and ditchlines. Post-winter seeding, if needed, can be applied through the matting.

Akzo Industrial Systems Company of Asheville, N.C., offers the following step-by-step instruction when using its Enkamat for lining a typical 8-foot side slope ditch:

1) Shape and compact the ditch to specifications and dress the site so it is free of rocks, soil clumps or large vehicle tracks. Cut side slope shelves and check slots.

2) Starting downstream, cut terminal



Phillips Fibers' Supac geotextile fabric separates sand from subsoil in bunkers, helps filtration and drainage, and provides structural stability.

slot and align the initial roll along the ditch center line. Stake into slot, then backfill. Roll the mat upstream over refilled terminal and stake. Progress upstream with peaked side down, working across the check slots and pinning with temporary stakes to maintain tension and alignment.

Tuck mat into slots and stake. Stretch mat about five percent before staking.

3) Side rolls should follow in staggered sequence behind the initial roll. Working outward from the ditch center line, overlap the first roll by four feet with another roll and lay it upslope onto the side slope shelf.

4) Proceeding upstream, stake overlaps and mat edges on side slope shelves at three-foot intervals.

5) Repeat steps 3 and 4 with the

remaining side slope roll.

6) If splicing a new roll is necessary, use three-foot overlaps and shingle downstream.

7) Secure the upstream roll ends in a terminal slot.

8) Back-fill and tamp soil into check slots and both upper and lower terminal slots.

9) Seed area.

The most important installation tip is that the material should be securely anchored to dry ground before seeding. Overlap should be approximately four feet, at three- to five-foot intervals.

Mats are usually secured by wooden stakes or metal or plastic staples that penetrate the soil about six inches.

—Terry McIver

WHERE TO FIND GEOTEXTILES

✓ **Advanced Drainage Systems, Inc.**, 3300 Riverside Dr., Columbus, OH 43221.
Circle No. 300 on Reader Inquiry Card

✓ **Akzo Industrial Systems Co.**, P.O. Box 7249, Asheville, NC 28802; (704) 258-5050.
Circle No. 301 on Reader Inquiry Card

✓ **Contech Construction Products, Inc.**, P.O. Box 800, Middletown, OH 45042; (513) 425-5896; makers of Eromat, a clean, weed-free, knitted straw blanket.
Circle No. 302 on Reader Inquiry Card

✓ **Environmental Protection, Inc.**, P.O. Box 333 Mancelona, MI 49659.
Circle No. 303 on Reader Inquiry Card

✓ **Greensia International, Inc.**, 3807 Wilshire Blvd., Suite 1118, Los Angeles, CA 90010; (213) 382-7070; makers of Greensia seeded fabric.
Circle No. 304 on Reader Inquiry Card

✓ **Phillips Fibers Corp.**, P.O. Box 66, Greenville, SC 29602-0066; (502) 583-6591.
Circle No. 305 on Reader Inquiry Card

✓ **Reemay, Inc.**, 70 Old Hickory Blvd., Old Hickory, TN 37214.
Circle No. 306 on Reader Inquiry Card

✓ **Research Products Corp.**, P.O. Box 1467, Madison, WI 53701; (800) 334-6011; Earth-Gard temporary erosion control blankets.
Circle No. 307 on Reader Inquiry Card

✓ **Synthetic Industries, Inc.**, Construction Products; 4019 Industry Dr., Chattanooga TN 37416; (800) 621-0444; Landlok erosion mats.
Circle No. 308 on Reader Inquiry Card

BIOTURF NEWS

'Total System' for turf based on balance between organics and cultural practices

Canadian company shows clients that results of organic turf care programs are worth the wait.

■ It's got to make the skeptics sit up and take notice.

A 25-year-old company reduces chemical pesticide and synthetic fertilizer use by 80 percent for a majority of its 4000 customers using a fish-based fertilizer.

Is it because John Edmonds' company is in Halifax, Nova Scotia? Is the turf that much different up there?

Nope. Edmonds Landscape and Construction Services, Ltd.—run by John and his brother Roger—says it has made a success of organics by way of thorough education, patient customers and an effective fertilizer.

Edmonds' conversion to organic turf care began in 1989 when it developed its "Organic Pro Lawn, Earth, Tree and Shrub Care" programs. Employee training came first, followed by customer initiation.

"After demonstrating that organic soil management practices were more advantageous to the landscape in the long term," says Edmonds, "clients gradually began realizing that synthetic pesticides

and fertilizers were an unnecessary step in the landscape management process."

The secret: build up a healthy topsoil and let the natural soil biology do its thing. Some properties are now in the third year of the organic program, and, according to Edmonds, none of the properties is showing any strain. There's less chemical leaching, less thatch buildup, and better disease/insect/drought resistance.

John Edmonds, left, and biology professor David Patriquin are studying the fertility and soil-building properties of different compost materials.



Find the right formula—The next major step was to hit on a product that worked. Edmonds collaborated with National Sea Products, Ltd., to produce SeaGreen 7-7-7 fish-based fertilizer. NSP

now sells SeaGreen across the country. The company also continues to research the efficacy of various other organic fertilizers. Organics expert, Dr. David Patriquin, and the Edmonds staff are also researching the viability of using spent brewery grain as an organic soil amendment.

Current experiments involve the use of white clover seed in lawn mixes to fix atmospheric nitrogen into usable plant nutrients. (see sidebar).

An Integrated Pest Management system relies on pest identification and population monitoring to best determine the proper control method to use, and when. Proper soil conditions such as drainage, fertility, pH and soil structure are all key components.



The grounds around Summer Gardens, a Halifax condominium complex, show the results of the SeaGreen program.

IN THIS ISSUE

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TOTAL SYSTEM RESEARCH

■ John Edmonds' "Total System Organic Management" focuses on turf care in the urban/suburban environment by using "specific management strategies and products to create ecologically healthy environments at relatively low costs."

One part of the company's research is taking place on turf plots established on the grounds of "The Oaks" at St. Mary's University in May of 1992. Laboratory, greenhouse, growth chamber and outdoor lysimeter experiments are also being conducted at Dalhousie University. The Oaks plots were established on two soil types, one a newly-imported topsoil and others on severely degraded soil.

Locally available waste products are being compared with synthetic NPK fertilizer treatments and control plots using no soil amendments. The waste products tested include:

- an agricultural compost;
- unprocessed brewery waste;
- SeaGreen fish byproducts;
- three grass mixes, including a custom "Ecomix"; an off-the-shelf mix; and a mix of two tall fescues, one with clover, and one without clover;
- rock-phosphate in the "no-clover" mixes.

Greenness was assessed visually, and by chlorophyll measurements using a Minolta chlorophyll meter.

Greenness was found to be roughly proportional to the total nutrient applications. In July and August, the control plots were darkest green on the better field, and the brewery waste and Seagreen plots were darkest on the field of degraded soil.

According to the Edmonds report, results showed that it is possible to achieve sustained high quality of turfs with organic management, and that it is important not to over- or under-fertilize, and to select mixes for organic use.

Similar intensive tests have been conducted for chinch bug control and weed control. To obtain a copy of the company's Greenfacts Special Research Edition, contact Edmonds Landscape and Construction Services, 2675 Clifton St., Halifax, N.S. B3K 4V4; or fax your request to (902) 455-9956.

"Some of our high-profile properties haven't had any chemicals applied on them for two years," says Edmonds, "and chinch bugs are not a problem. That's not the case for chemically-treated lawns." A

\$5 million company, Edmonds Landscape and Construction Services was awarded the Canada Award for Business Excellence in 1991 for what was viewed as a valuable, death-defying—and apparently success-

ful—business feat.

A composting program began last year. Backyard composters are given free to regular landscape maintenance clients.

—Terry McIver

Healthy soil the key to turf care science

Biological soil management may be the 'missing link' in making IPM programs work.

by Joel Simmons,
EarthWorks, Inc.

■ Man's survival has always depended on his ability to work the land.

As man became more civilized, so did his skills at agriculture and horticulture and his understanding of the importance

of proper soil management. Today, many farmers, fruit growers and turf managers are re-evaluating the importance of the soil and gaining an understanding for the concepts of biological soil management.

Rediscover the basics—Biological soil management is based on solid agronomic principles that date back decades, if not centuries. Dr. William Albrecht, the former head of agronomy at the University of Missouri, wrote in the late 50s and early 60s of the importance of maintaining a healthy soil. Today, the agriculture industry is making major changes in its outlook toward the importance of soils, as farmers continue to lose

topsoil at alarming rates.

The practice of eco-agriculture is being led by government and universities in the U.S. and the world over.

Many in the turf industry are starting to realize the advantages of natural programming. An effective program depends on an understanding of the agronomic principles behind biological soil management.

For years now, we have been focusing on plant growth, and have ignored the soil. We must build a healthy soil first, which allows for ample nutrition, and a healthier plant.

The principles—There are four basic agronomic principles that have to be considered to build a healthy soil. Those are, in descending order of importance:

- air management;
- water management;
- decay management; and
- nutrient management.



**Simmons:
use
synthetics
after soil
biology
problems are
solved.**

characteristics.

Water: easy to waste—Water management addresses the problems of too much or too little water availability. Too much water creates an anaerobic environment, which depletes oxygen from the soil, and affects microbial activity and nutrient release. Too little water can produce the same results: poor microbial viability and limited nutrient uptake. Again, soil structure will have a significant effect on water mobility. A richly organic soil will provide both the pore space to allow water to drain through, and the sponging properties that will hold water.

From decay comes life—Decay management is a concept that few of us understand, but it is here that more of our focus should be placed, because it is here that biological soil management has its greatest impact.

The soil's micro-organisms decompose the organic compounds which release plant available nutrients. Humus is the final phase of decomposition that includes the use of organic matter, synthetic and natural plant foods and the remains of soil organisms themselves. It provides a significant buffering effect for excess moisture, temperature, acidity, alkalinity and salts. This reduces plant stress and increases insect, disease and weed tolerance.

Air and water mobility must be available for sustainable microbial activity. Soil micro-organisms need very much the same kind of environment that we need: air, water and nourishment. Nourishment

for soil microbes is supplied by organic matter: carbohydrates, sugars, proteins, vitamins and minerals, just to name a few.

Plant foods vary—Without proper microbial activity, synthetic nutrients are not mobilized and assimilated to plants.

As one example of microbial involvement in plant food availability, the urea molecule is transformed to nitrate, one of the forms that plants can utilize, due to the urease enzymes that are produced by these organisms. To generate these enzymes, energy from soil-available carbohydrates is necessary (humus).

Lime—which is simply calcium and/or magnesium carbonates—is often ignored as an important element.

Adjusting pH is critical because most soil organisms thrive in a limited range of acidi-

ty or alkalinity. Perhaps even more important is the need to provide calcium—and a smaller percentage of magnesium—as primary plant foods for soil microbes and landscape material. Calcium/magnesium content and ratios in the soil are also essential for building soil structure because of the valence or electrical attraction that exists between soil colloids and these two nutrients.

The over-use of synthetic fertilizers eventually destroys soil aggregates due to excessive salt accumulation. Simple and complex carbohydrates found in humus are oxidized or broken down, and used as an energy source in order to accommodate overloads of non-protein nitrogen. As the soils die, air space or granulation is reduced, creating compaction.

Compacted, low oxygen soil no longer retain moisture or support adequate life forms to stimulate digestion. The interdependent cycle has been ruptured, plant stress leading to insect and disease pressure has begun and subsequent "rescue chemistry," in the form of pesticides, is needed. The soil and the plants become dependent on chemicals, like plant in a hydroponic medium.

Formula for success—"Biologically friendly," turf care programs improve the soil structure with organic matter: compost, natural organic fertilizers or even grass clippings.

When synthetic products are used, proper IPM practices should be followed. Biological soil management will greatly enhance IPM and may be the "missing link" in truly making IPM work. Use those synthetic fertilizers that have the least harmful effect on the soil.

For example,

- use fertilizers with lower salt indexes. Chlorine, found in some plant foods, is very detrimental to microbial life;

- increase the amount of organic matter allows for a reduction in total nitrogen for the year;

- consider natural organic-based bridge products;

- use less reactive sources of phosphorus such as colloidal/rock phosphates.

With these four agronomic principles in mind, you'll get the most out of the soil. There will be more available nutrients, less plant stress and less dependence on pesticides.

—Joel Simmons is president of Earth Works Natural Lawn & Garden Care, Inc., Martins Creek, Pa.

The relationship between these four principles is significant. Without good air management, the other three cannot produce healthy soil. If water management is not up to par, proper air, decay and nutrient management is difficult. Most of us in the business of growing plants have over-emphasized the focus of nutrient management (i.e. fertilization) without considering the interdependence that exists among air, moisture, decay and fertility.

A program that keeps all four of these principles in mind assures you of good results; lessens plant stress; and reduces the need for pesticides. This may sound simplistic, but it works.

Unfortunately, our industry is focused on products that are designed to manage nutrients, often at the expense of air, water and decay management.

The breathing soil—Air management insures that there is ample oxygen in the soil. Soil compaction strangles air movement and depletes oxygen availability. A well-balanced turf program must first address compaction. Too often, this is done by aeration or top-dressing, short term treatments which ignore the fundamental causes of the problem.

Usually, the soil needs to be physically changed by adding composts, natural /organic fertilizers or other organic materials.

These can be worked in over time, or in combination with aeration. Managing oxygen in the soil also requires the proper ratios of cations (positively-charged nutrients) and anions (negatively-charged nutrients).

Measurable imbalances, due to either excesses or deficits of particular plant foods, will cause the soil to take on adhesive

Build up a healthy soil to allow for ample nutrition and a healthier plant.

Organic program mix shows results on Idaho golf course

The organic turf care program at Stoneridge Golf Club started slowly, but positive results were soon evident.

by Dan Eskelson,
Clearwater Landscapes, Inc.

■ In an effort to achieve a high level of environmental compliance and responsibility, Stoneridge Golf Club, Priest River, Ida., began utilizing integrated pest management (IPM) strategies 1988.

The season of 1991 brought to fruition some of our endeavors at Stoneridge, when three distinct disease occurrences were successfully controlled without the use of synthetic fungicides.

The following definition of IPM, selected from several we have seen, best exemplifies our approach:

"...a decision-making process for determining *if* you need pest suppression treatments, when you need them, where you need them and what strategy and mix of tactics to use. In IPM, treatments are not made according to a predetermined calendar. They are made only when and where

monitoring has indicated that the pest will cause unacceptable economic, medical or aesthetic damage. Treatments are chosen and timed to be most effective and least disruptive to natural mortality factors."

Stoneridge Golf Club:

- Lies in a Northern Idaho mountain valley at an elevation of 2500 feet;
- Native trees include red and white firs, western larch, ponderosa pine and hawthorne.
- Soils range from coarse sand and gravel to heavy silt loams.
- The greens mix is a shallow hodgepodge of different sands and silt, with plenty of fist-sized rocks.
- Penncross creeping bentgrass predominates the greens at about 95 percent.
- Symptoms of take-all patch, Ophiobolus patch, leaf spot and Fusarium blight are some common diseases in our area. The existence of those pathogens and possibly others resulted in the regular, preventive use of various contact and systemic fungicides until late in the 1988 season.

At this time, during my first year at Stoneridge, I began to investigate the underlying causes of seemingly endless disease problems. Soils were found to be distinctly layered at a depth of three inches. An anaerobic black layer was present on two of the greens.

IPM in practice— The following season a cultural program was implemented on four putting greens. This involved the use of natural organic fertilizers and a biostimulant (made by a cold temperature extraction process from 15 different sea plants.) The greens chosen varied from being traditionally healthy to highly disease prone.

The slow process of improving soil microbial activity and increasing plant vigor involved considerable faith and patience on everyone's part, but well before the end of the season, noticeably positive results were obtained:

- Disease incidence remained about the same, severity was definitely reduced;
- Recovery from disease damage after curative fungicide application was more rapid than it had been on control greens.
- Color was acceptable, but not as verdant as on those that were still on the traditional fertilizer program.
- Clipping yield was markedly reduced, with no loss of shoot density.

All greens were placed on this program in 1990 with one variation. Due to extreme cool spring soil temperatures and resultant lack of microbial activity, one application of a synthetic organic greens fertilizer at 0.5 lb. N/1000 sq. ft. was applied to initiate early growth and color.

Our natural nitrogen was supplied from a commercial natural organic, composts and fish emulsion at 3.0 lb. N/1000 sq. ft./year.

Potassium was supplied by the previous materials, sea plant extract and biannual application of sulfur-coated sulfate of potash to approximate a 1:1 NK ratio. Phosphorus was supplied by bone meal, applied at .75 lbs./1000 sq. ft., well in advance of any reseeding efforts.

Balanced top growth—with no surges—has produced reliable and predictable putting surfaces. Reduced clipping yield has saved greensmowing time. With regular foliar sprays of liquid compost and fish emulsion, color has equaled or surpassed that produced by synthetic fertilizers.

Suppressing disease naturally—Our first experiments with natural disease suppressants were promising but not totally effective. Fairly high rates of sea plant extract (7 oz./M) and a natural enzyme product were applied to control take-all patch at seven-day intervals. The disease was arrested but recovery was slow.

The addition of "compost soup" (see sidebar) increased the program's effective-



A diseased section of the first green at Stoneridge was aerated with 3/8-inch solid tines, and the holes filled with screened compost. Symptoms were gone in a week.

ness immensely. I had learned about it through research at the University of Bonn's Institute of Plant Diseases in Germany. A compost soup mixture was being used there to control non-turf-grass diseases such as Phytophthora, Botrytis and other fungal diseases. Apparently, active ingredients in the compost do not actually kill fungi but prevent them from colonizing plants.

Thatch reduction— I believe that regular use of sea plant extract and natural organics has helped us maintain the bentgrass thatch layer at one-quarter inch or less, without regular sand topdressing.

Although sand topdressing has been a time-tested, effective method of thatch control for many, we found that we could invariably count on disease stress soon after the completion of this process at

Stoneridge.

We decided to try using screened compost as a topdressing. It involves just slightly more brushing and clean-up time than with sand. To counter graining, we regularly brush with a home-built tool just prior to mowing.

Costs a bit more— In terms of the cost effectiveness of our IPM program, we have had to consider several factors. First, commercial natural organics are slightly higher in cost than high-quality synthetics.

The slow, even release of the natural organics, however, has allowed us to reduce our synthetic fertilizer program by almost 50 percent.

The large savings here are only partially offset by the purchase of biostimulants. Fish emulsion costs less than \$50 per year for regular foliar application to greens.

For topdressing after green aeration, cost was more than one-third greater

than it would have been with local sands. This extra cost was offset by the fact that we did not use fungicides during the 1992 season.

—Reprinted in part with permission of Golf Course Management magazine.
Ed. note: Ken Eskelson is now owner of Clearwater Landscapes, Inc., Priest River, Idaho.

"Please understand I am not 'anti-chemical' (whatever that means)," wrote Eskelson to Bioturf News. "I do believe, and have learned from experience, that a healthy soil will produce healthy plants, requiring few, if any, curative inputs. This is not always possible (i.e. putting greens stressed by mowing heights of 1/8-inch.) I feel it important to work for cultural systems with as few synthetic inputs as possible."

Specific products used by Eskelson at Stoneridge included Ringer Greens Restore fertilizer; Emerald Isle Pana Sea and Pana Sea Plus sea plant extracts; Safer's insecticidal soap; and Dipel Bacillus thuringiensis for webworms, cutworms, tent caterpillars, etc.

The 10,000 annuals at the course receive fish emulsion and sea plant extract in the beginning in the seedling stage.

RECIPE FOR COMPOST SOUP

■ Here's Dan Eskelson's recipe for the compost soup used for disease prevention. The base is produced in Missoula, Mont., from digested sewage sludge and wood wastes (sawdust, wood chips and finely shredded bark.).

The aerated piles must first reach temperatures of 170° F and higher, to destroy any harmful bacteria or weed seeds that may be present.

- 1) Fill burlap sacks and suspend them in large plastic trash barrels filled with water.
- 2) Brew for 10 to 14 days
- 3) Strain directly into spray tank. Use a nylon stocking as a strainer to prevent clogged spray nozzles.
- 4) A 40:60 soup-to-water ratio worked at Stoneridge. In the event of increased disease severity, experiment with a stronger mix.
- 5) Mix about 40 gallons of soup with 60 gallons of water in a 100-gallon spray tank.
- 6) Sea plant extract and fish emulsion are usually added.

Yield: 100 gallons covers 50,000 square feet of golf greens.

Cost: one man hour/week plus \$45 per year for the commercial product. The compost is purchased in bulk and is relatively inexpensive. Still, it is the program's costliest IPM-related item.

Ecogen moves forward on nematode research

■ Ecogen Australia Pty. Ltd. has established a cross-licensing agreement with the Commonwealth Scientific and Industrial Research Organization of Australia (CSIRO). CSIRO's Division of Entomology is a worldwide leader insecticidal research.

Under terms of the agreement, Ecogen gets co-exclusive rights to patents which CSIRO holds in insecticidal nematode fermentation, formulation and production

processes. CSIRO receives co-exclusive rights to Ecogen Australia nematode formulation patents.

Insecticidal nematodes are microscopic roundworms that seek out and attack insect larvae either in the ground or in plant stems.

Since 90 percent of all insects live in soil during some part of their lifecycle, there is a substantial opportunity in the nematode-based biopesticide market for Ecogen's products.

Ecogen has been involved in nematode

research since March of 1992, when it acquired the bio-insecticide business of Bioenterprises Pty Ltd. of Australia and created Ecogen Australia.

The newly-formed company develops and commercializes biopesticides using nematodes.

In addition to the cross-licensing agreement, Ecogen and CSIRO are entering into discussions to identify areas of potential cooperation in research and development, including insecticidal nematodes and insect attractants and pheromones.

PRODUCTS

THE BIORATIONAL ARSENAL

■ *The following is a list of those biorational pesticides available to the landscape, golf and lawn care industries. Some, it should be remembered, are harmful to beneficial and non-target organisms. Use those products with caution.*

Bacillus thuringiensis is a bacterial pathogen for the control of many worms and caterpillars. The bacteria has no effect on humans, other vertebrates plants or other insects other than the larval stage of moths and butterflies.

Soaps can be effective on spider mites and soft-bodied insects such as aphids, mealybugs and whiteflies.

Potassium soap sprays, such as insecticidal soap are more effective than household soaps when three tablespoons are mixed in one gallon of water. Some plants may be susceptible to soaps. Test spray a few leaves and wait three to five days to spot burn.

Horticultural oils are effective controls for a few difficult pests like scales. The oil simply coats the insect and suffocates it. Oils can burn plants if applied during unfavorable temperatures

Some of the new highly-refined oils show less burn potential. Vegetable oils have been reported to control some insects.

The **Neem** tree is the source of Azadirachtin. It is a growth regulator, anti-feedant and repellent. It is not labeled for edible crops. It controls many insects, but may be hazardous to fish and aquatic organisms.

Nicotine is an alkaloid found in the

leaves of many species of plants, but is usually obtained commercially from tobacco. Relatively non-toxic to beneficial organisms, birds and bees. It is toxic to humans and should be handled with care. It biodegrades rapidly with little residual affect. Trade name: Black Leaf 40.

Cosma lacustac is a biological grasshopper control agent. A naturally-occurring disease protozoa formulate on a bran bait. consumption drops within 10 days, but grasshoppers live for more than 22 days. Effective against the American grasshopper, and most others, but no the Lubber grasshoppers.

Diatomaceous earth is a talc-like powder made from the silica remains of a class of marine algae.

Will also kill beneficial insects, such as bees and parasitic wasps. Not effective in humid weather.

Quassia is made from the bark of a Latin American tree; it kills aphids, sawflies and caterpillars.

Rotenone is a botanical insecticide which controls many species of insects including external parasites of animals like fleas and ticks. It is harmless to warm-blooded animals, but will kill beneficial insects and fish. Short lived, so repeat applications are needed.

Ryania is derived from the ryania shrub of South America. Reportedly safe to humans and other warm-blooded animals. Effective against worms, but is short lived. Is usually combined with rotenone and pyrethrum; sold as Triple Plus and R-50.

Sabadilla is made from the ground seeds of the sabadilla lily. It's reported to control a broad range of insect pests. It too is short lived, as are most botanical insecticides. Sabadilla dust and seed irritates the mucous membranes of humans and is toxic to honeybees.

Pyrethrum is made from the pyrethrum flower. It will control a vast array of insects pests. It is described as relatively non-toxic to ladybeetle larvae and honeybees. It is readily metabolized by warm-blooded organisms without lasting ill-effects. Some commercial products also contain non-natural ingredients. Pyrethroids are synthetic pyrethrins, which have longer lasting residues.

Beneficial nematodes attack cutworms, mole crickets, beetle larvae, wireworms and sod webworms, as well as other soil dwelling insects. A symbiotic bacteria inside the nematode parasitizes and kills pests within 48 hours. Beneficial nematodes are labeled for lawns, gardens and houseplants.

Commercially available nematodes include BioSafe, Scanmask and some improved strains.

Sticky traps, such as Tanglefoot and Stickem, are found at garden centers. A home made trap can be made with a shallow tray filled with beer and flour.

Apply at the trunk of plants. It can also be applied to yellow poster-board squares which are hung or placed near plants. Insect in the sticky trap.

Source: Newsletter of the Florida Landscape Maintenance Association, January 1993.

PRODUCTS

Product converts thatch to nourishing humus

Thatch Biodigest from Springfield, Virg.-based Envirogenesis, is described as a powerful collection of bacteria strains that aggressively break down thatch and convert it to humus.

The objective of biological thatch control is to accelerate the process of thatch decomposition. In a test conducted by the University of California at Edgewood Tahoe Golf Course, 300 Kentucky bluegrass and creeping bentgrass plugs were pulled and measured. Thatch levels extended three inches below the surface.

Six weekly treatments of Thatch Biodigest resulted in a 53 percent thatch reduction six months later. According to the company, its biotechnology concentrates naturally-occurring microorganisms to a level thousands of times greater than that normally found in nature. This results in a super-accelerated breakdown of thatch into humus.

Envirogenesis says Thatch Biodigest increases turf disease resistance and restores turf to a balanced ecosystem.

Circle No. 221 on Reader Inquiry Card

Biostimulants made to enhance plant growth

Damaged or stressed turf and landscape plants, or establishing turf and ornamentals can now be treated with applications of CytoGro and CytoFe, two new biostimulants from Plant BioTech, Inc., of Corrales, NM.

CytoGro is an EPA-registered hormone biostimulant designed to enhance the natural growth of grasses. CytoFe is a mix of CytoGro and 5 percent chelated iron, to promote root growth and green up.

PBT says that an early spring application will promote tiller, rhizome or stolon growth, and help develop a deep root system to give the turf a rapid start after winter. Newly-emerged seedlings sprayed with CytoGro will speed establishment and increase canopy development.

Research by Dr. Dick Schmitt of Virginia Polytechnic Institute has shown that CytoGro applied to bluegrass and other turf will relieve stress from irrigating with saline water by stimulating new root development and root system saline tolerance.

Circle No. 222 on Reader Inquiry Card

Grace, PJ Margo open neem processing plant

W.R. Grace & Co and PJ Margo Privat Limited of Karnataka, India, recently began what is being called the world's first commercial-scale facility to produce neem-based biopesticides.

Initial capacity of the plant is 20 tons of neem seed per day, according to Grace, which has provided the process technology for the project and will purchase product from the plant.

Extracts from the Indian neem tree include the biopesticide azadirachtin, which attacks and controls more than 200 types of insect pests as well as some species of mites and nematodes.

The neem-based extracts are harmless to birds, mammals and beneficial insects such as bees.

Grace-Sierra its neem-based biopesticides to horticulturists under the trademark Margosan-O. The biopesticide is also marketed under license from Grace through the Minneapolis-based Ringer Corp. to consumers under the trademark BioNeem.

Circle No. 223 on Reader Inquiry Card

LETTERS

■ Thank you for this added service! We want to keep an open mind about all products on the market, but at this time we see no need to make any changes.

We offer a non-pesticide program for both turf and ornamentals, but of over 1000 customers, only 15 or so want it; of those 15 there is a heavy turnover since the average time they can stand weeds or insects is the time it takes their neighbor's lawn to look better than theirs! Thanks for keeping us informed.

—Jon Hart, Greenturf, Gaithersburg, Md

■ How nice to find someone who thinks biologicals are for real.

I have controlled algae in my lakes for the past three years with microbes.

We have also applied microbes to our greens for disease control. And yes, it did take a very long time to show results. I have not applied a fungicide to our greens since July 20, 1992. The sad fact is that we can not prove that the microbes are reduc-

ing disease incidence. Good luck!

—Don Parsons, Old Ranch C.C., Seal Beach, Calif.

■ I have been in the lawn care business for eight years. The handwriting is definitely on the wall. If the industry is going to survive and grow, more natural products must be used, and applications will have to be "risk free," or nearly so.

I'm very pleased you're doing your part by providing more information.

—Jim Tiller, DeYoung Landscape Services, Grand Junction, Mich.

■ Thank you for "Bioturf News." Presently, I don't offer any "environmentally friendly" pest control. I've investigated some products and found they just wouldn't fit into my service line. I am interested in bio-control products and hope I can use them in the future. Please put me on your subscribers list.

—Steve Candelori, Specialized Landscape Services, Pittsboro, NC.

BIOTURF NEWS

For the professional landscaper, lawn care operator and golf course superintendent interested in learning more about how organic turf care can supplement existing chemical control.

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BIOTURF NEWS



For the Latest Developments in Biological, Organic and Natural Turf Care!

With our October premier publication of *Bioturf News*, we at *LANDSCAPE MANAGEMENT* magazine continued our commitment to give you the best possible coverage of green industry happenings.

Bioturf News is our new, bi-monthly review of current research and development in "biological, organic and natural" turf care. In 1993, it will exist independently of *LANDSCAPE MANAGEMENT*.

Some alternative turf care products can't be ignored.

Independent University research has determined them to be viable forms of insect, weed and disease control.

Many of our readers have also formed opinions of biological and

organic products.

Some say biological and organic products are too expensive and take too long to show results.

Others believe customers should have a choice. And still others are probably wondering what all the excitement's about.

Our job, as an industry information source, is not to tell you what to think, but to simply relay the information to you—as soon as we can and in the best way possible—and let you take it from there.

There are two sides to every story. Your opinions count, and we want to know what you think of these products. Have you tried alternative turf care products? If so, what were the results?

To make *Bioturf News* the most useful green industry news source it can be, we will always welcome your questions and comments.



Jon Miducki
Publisher



Terry McIver
Editor



Bioturf News will be a bi-monthly newsletter reporting on biological, organic and natural products for the specialty turf market. But you have to subscribe in order to receive it. To receive your free, one-year subscription, please return the coupon below to:

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'Least management' methods for neighborhood fields

Small towns, high schools or community colleges may need a little help from their friends.



by Leif Dickinson

■ Many turf managers are finding that limited budgets simply won't stretch beyond least-management practices. Funding barely covers the absolute minimum in materials and labor to keep an athletic field playable.

Because there's a growing awareness of injury liability, turf supervisors are trying new plans and practices. Still, fields used for unsupervised play receive little attention. Care beyond basic mowing and occasional fertilization depends entirely on what funds are budgeted and how much volunteer help can be recruited.

Personnel—Team players and other volunteers can perform much pre-game preparation work with proper supervision like normal maintenance crews, or even savvy coaches.

On the high school and community college level, coaching staffs and players can establish playing standards by the amount of their cooperation. Often, an unwritten agreement can be made where the team is expected to handle the day-to-day and pre-game tasks, while the maintenance staff handles the more technical procedures and those involving power equipment.

At the other end of the scale, it's not uncommon to have as few as two people in charge of an entire 40-acre park, including baseball, softball, soccer and football facilities. Even when staffs are larger, these people have little time for fine-tuning playing fields. Little League

and senior league supporters pitch in to bring the quality of the fields up.

Frequently, the spearhead of a volunteer-assisted municipal program is a local business person with a love of sports but little turf experience. By working closely with such willing volunteers, turf managers have been able to achieve results far better than least-management budgets would allow.

Infields—It's important on low-maintenance fields to find a workable infield mix. In southern California, most such fields use 60 percent clay and 40 percent brick dust for the mound and home plate. The rest of the infield is a mix of 60 percent brick dust and 40 percent clay.

The infield may be composed of 100 percent skinned area in little-used and low-budget fields. Warning tracks also may be skinned surfaces.

Scarifiers are frequently low budget, ranging from nail drag on up. For example, the excellent program put together by Jeff Barnes at Red Hill Field in Rancho Cucamonga, Calif., uses a scarifier with a straight blade and weights, set up with a double-bar pull chain. Lug bolts can be

set from ½-inch to 2½ inches deep to scarify or rip up the field as needed. Weights are added to adjust the depth. Lug bolts are used for ripping two or three times per year because of heavy use.

At most lower-budget fields, scarifying is done on an as-needed basis. The brick dust mix is worked to a depth of ¼ to ½-inch before a game or series.

If mechanical equipment is available for infield preparation, crews start in the center and work to the perimeter, avoiding the mound, bases and batter's box. These sections are raked by hand.

Landscape rakes are used to level the surface after scarification, and the area is watered lightly.

The field can then be marked as the budget permits. In most cases, chalk is used to denote the batter's box and baselines. The outfield is painted only if funds allow. Often, special chalking and painting is budgeted only for special tournaments or major games.

Cultural practices—Many fields are heavily scheduled. To manage wet weather situations, a portion of the budget may be invested in products such as

Scarifiers, like the kinds used at Red Hill Field in Rancho Cucamonga, Calif., are frequently low budget.