

Strategic Stress Management Starts Here

**Science-Based Products and Programs for
Professional Golf Course Superintendents
and Sports Turf Managers**

looking for photo
replacement

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Ocean Organics Corporation Back Cover

OCEAN ORGANICS CORPORATION

Manufacturers of High-Performance, Science-Based Plant Strengthening and Fitness Materials for Growth, Protection, Stress Tolerance and Recovery

Ocean Organics began as a seaweed processor. The value of seaweed extracts as plant strengtheners was already clear to us from prior work with seaweed-based materials in horticultural, agricultural and biomedical applications in the 1970's. The seaweeds we harvest are in the brown family. They are "intertidal" species (predominantly *Ascophyllum nodosum*) that anchor themselves to rocks along craggy coastlines throughout the North Atlantic Ocean from Maine and the Maritime Provinces, through Iceland and around Scandinavia, Great Britain and the Western Coast of Ireland.

Strategic Stress Management Starts Here

These seaweeds are among the most stress tolerant plants on Earth. Every day they fluctuate between being completely submerged at high tide in water (3% saline) and being completely exposed at low tide to air temperatures well below 0° F in winter to nearly 100° F in summer.

The robust "root-like" organs that anchor *A. Nodosum* (also known as "North Atlantic Kelp" or "Rockweed") to the rocks are called "holdfasts" and they are aptly named. They tolerate constant wave action and withstand sustained violent storm surges. So it's not surprising – given that they have evolved and thrived in incredibly harsh environments – that they are prolific producers of naturally occurring stress tolerance and plant strengthening compounds. *A. nodosum* is also among the richest renewable sources of trace elements, yielding unique benefits for plant strengthening and stress tolerance.

Ocean Organics is the leader in a small group of research-driven companies that have legitimized fact-based nutritional, chemical and fertilizer manufacturers use to prove their product claims.

The Ocean Organics Mission

As the developers and manufacturers of high-performance, industry-leading stress management products and specialty fertilizers, our overarching research and development mission is to help golf course, agricultural and horticultural professionals maximize the performance and genetic potential of the plants and crops they grow, manage and protect... particularly under difficult, often stressful conditions. We prefer to work with renewable natural resources for economic as well as ecological reasons.

In recent years we have broadened our use of botanical extracts to create synergistic combinations with our proprietary seaweed extracts.

For more than 40 years, Ocean Organics products have been independently tested at more than 25 universities, a dozen private research labs, and in scores of field trials.

Independent research confirms:

- Better quality, color and vigor
- Better high temperature tolerance
- Better U.V. tolerance
- Better root development
- Better drought, salinity and sodicity tolerance
- Better cold temperature tolerance



More than 40 years ago, Professor James B. Beard, the preeminent turfgrass physiologist of his time, said in his opening remarks at a Turfgrass Stress Management Symposium:

*“Since almost all forms of predation that attack turfgrasses attack the weak first, it would seem that **building the strongest stand of turfgrass possible is job #1 for today’s professional turfgrass manager.**”*

He proceeded to point out that **managing stress from multiple sources – often simultaneously – is what makes turfgrasses among the most difficult plants to maintain.**

Helping golf course superintendents by developing sustainable, science-based, plant strengthening materials has been Ocean Organics mission for more than four decades. During that time, we’ve worked with leading scientists at more than two dozen

Research Driven
•
Independently Tested
•
Scientifically Proven

Our products have been producing results on thousands of golf courses and sports fields worldwide for over 40 years.

public universities and numerous private research organizations to develop **high-performance materials that increase stress tolerance and improve survival potential** for intensively-maintained turfgrasses.

Ocean Organics has emerged as a leader in science-based strategic stress management products and programs that are university tested, independently proven and sustainably produced in the USA. **In recent years we’ve made significant progress developing solutions to problems associated with abiotic sources of plant stress including summer stress decline in C3 cool season**

turfgrasses, salinity and sodicity alleviation in mixed stands of bentgrasses and poa annua as well as C-4’s such as bermuda grasses. In addition, we’ve developed drought stress solutions, innovative complexing systems to maximize nutrient uptake, and a state of the art surfactant product line .



Intensively-maintained Turfgrasses on Golf Course Greens...Perhaps the Most Highly-stressed Plants on Earth

Golf course superintendents face the same problems that challenge all growers — diseases, insects, increasingly unpredictable weather, high and low temperature extremes, drought, salinity, and steadily deteriorating water quality.

However, there are a host of unique stresses related to the cultural practices necessary to produce high quality, stress tolerant, and yet beautiful playing surfaces. Daily mowing at heights from 1/8th” to 1/10th” is commonplace today on upscale golf course greens throughout North America. That’s 35-40% lower than 40 years ago.

Greens are significantly truer, faster and more demanding than ever.

Ball roll and green speeds have increased by 35-40% because of frequent and lower mowing heights, but that comes at an agronomic cost.

- 35-40% less leaf surface area is available for photosynthesis – at a time when photosynthetic output and efficiency are vital.
- More frequent rolling, topdressing and aerifying significantly increases abiotic stress levels.

Research over many years at Rutgers, Virginia Tech, University of California, Michigan State and other leading research institutions have shown that turf grass plants treated with Ocean Organics products have **higher turf quality, canopy density, and color; lower stress index, higher chlorophyll content, increased membrane stability, and better photochemical efficiency** (more light energy converted to chemical energy) compared to untreated controls.

Ocean Organics... the leader in science-based, high performance strategic stress management products. Sustainably harvested and processed in the USA.

Strategic Stress Management Program

Our objective is to help you improve the physiological fitness of the turfgrasses you manage in order to maximize both performance and survival potential under the widest variety of stress conditions.

Strategic Stress Management for intensively maintained turfgrasses starts with building the strongest stand of turf possible. Ocean Organics products and programs help you:

- Build more stress tolerant turf with superior quality, plant density, and root growth
- Maximize your turf's physiological performance even under high heat and UV exposures
- Help your turf survive under a wider variety of predictable and unpredictable stress conditions, including salinity, sodicity and drought.

Science-based Summer Stress Protection... Independently Tested and Proven

Summer stress decline in cool season grasses is a major challenge for most superintendents most years. It almost always involves high temperatures and UV overexposure, and often includes drought, salinity and sodicity.

Count on our program for turf quality, root viability, and recovery from heat, prolonged UV exposure, drought, salinity and sodicity.

The Ocean Organics Strategic Stress Management Program showed superiority under high heat and prolonged UV exposure in trials at Virginia Tech, Rutgers and UC Riverside.

*"Ocean Organics treatments clearly offered the most notable results during both the spring and summer... products promoted significantly higher turf quality, green leaf biomass, and plant density compared to the control during most of the experimental periods."*¹


The Strategic Summer Stress Management Program

	Spring	Summer	Fall
Stress Rx® Foliar Fertilizer		3-6 oz. per 1000 sq. ft. every 2 weeks	
XP Extra Protection® Foliar Fertilizer		3-6 oz. per 1000 sq. ft. every 2 weeks	3-6 oz. per 1000 sq. ft. every 2 weeks
SeaBlend® Granular Greens Fertilizer	Two 1/2 lb. N apps per 1000 sq. ft. two weeks apart		Two 1/2 lb. N apps per 1000 sq. ft. two weeks apart
Guarantee® Seaweed Extract	3-6 oz. per 1000 sq. ft. every 2 weeks		3-6 oz. per 1000 sq. ft. every 2 weeks
NuRelease® Liquid Soil Additive		3/4 oz. per 1000 sq. ft. every 2 weeks	

For 6 years beginning in 2008, Ocean Organics developed, tested and refined a program using 5 products to produce significant improvements in tolerance to summer stress and other serious abiotic sources of stress. Research was conducted at Rutgers University; Virginia Tech; University of California, Riverside; and with independent researchers and consulting agronomists.



* Pitting PGRS and Biostimulants Against Summer Bentgrass Decline...Rutgers researchers Seek Practical Measures for Alleviating SBD on Creeping Bentgrass Greens. Foundation News, Tri-State Turf Research Foundation. Fall 2013. Vol 16. No 1. Research by Dr. Bingru Huang and David Jespersen).



The Ocean Organics Difference

Ocean Organics began as a seaweed processor. The value of seaweed extracts as plant strengtheners was already clear to us from prior work with seaweed-based materials in horticultural, agricultural and biomedical applications in the 1970's. The seaweeds we harvest are in the brown family. They are "intertidal" species (predominantly *Ascophyllum nodosum*) that anchor themselves to rocks along craggy coastlines throughout the North Atlantic Ocean from Maine and the Maritime Provinces, through Iceland and around Scandinavia, Great Britain and the Western Coast of Ireland.

These seaweeds are among the most stress tolerant plants on Earth. Every day they fluctuate between being completely submerged at high tide in water (3% saline) and being completely exposed at low tide to air temperatures well below 0° F in winter to nearly 100° F in summer.

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Ocean Organics is the leader in a small group of research-driven pioneers that have legitimized seaweed-based materials by subjecting them to the same kinds of scientific scrutiny and testing that conventional nutritional, chemical and fertilizer manufacturers use to prove their product claims.



GUARANTEE®/GUARANTEE NATURAL FOR TURF

(0-0-1) Guarantee® Seaweed Extract – made from fresh *Ascophyllum nodosum* – builds stronger root systems, strengthens plants, and improves plant stress tolerance.

The Ocean Organics Difference

We use proprietary processes and superior extraction technologies to make extracts that lead the industry in both performance and ease of use.

Our extracts are highly compatible with other liquid fertilizer components and are delivered smoothly through irrigation systems.

- We sustainably hand-harvest fresh *Ascophyllum* from the cold, clean waters of the N. Atlantic Ocean off the coast of Maine. The seaplants' high-stress growing environment yield plants with unique stress management benefits.
- Extracted using proprietary technology, the naturally occurring carbohydrates, polysaccharides, organic acids, amino acids, antioxidants, osmoprotectants, and macro and micro nutrients in *Ascophyllum* play a key role in boosting plant stress tolerance, survival, and better growth.

Our innovative, high-performance plant growth materials are widely used on golf courses and in agriculture and horticulture to deliver:

Highly Compatible;
Excellent for Foliar Use As
Well As Drip Irrigation

- Superior tolerance to heat, U.V. overexposure, drought, salinity and disease stresses
 - Increased yields / performance characteristics
 - Enhanced root development
 - Improved health and vigor
- Dr. Erik Ervin at Virginia Tech established over several years of research that our seaweed extracts offer additional stress tolerance benefits beyond those delivered by standard nutritional and plant protection programs.
- Ocean Organics is the only U.S.A.-based manufacturer of fertilizer products that is also a highly experienced, industry-leading seaweed processor.

Application Rates

For Intensively Maintained Turf: Apply 3–6 oz. (89–177 ml.) per 1000 ft² every 14 days. Rates will vary based on soil/tissue analysis and your agronomic needs.

Can be applied as a foliar spray or through fertigation.

Other Uses (Trees, Shrubs, Flowers, Flowering Plants, Stressed Plants)

Standard Mixture: 1- 2 oz. (30-60 ml) per gallon (3.78 L) of water

Sizes: 2 x 2.5 gal cases, 15 gal drums, 55 gal drums, 275 gal totes



STRESS RX

(6-0-2) Foliar fertilizer with osmoprotectants. Significantly increases turf's stress tolerance, survival potential and recuperative ability from heat, drought and salinity.

Continuing Research Shows Ocean Organics Leadership in Turf Stress Management

Stress management is a proactive process. But even when your turf is already under stress, Stress Rx can really help.

Seven Years of Research

University research (Rutgers, Virginia Tech) on Ocean Organics products showed improved turf quality, root viability, and recovery under a variety of stresses:

- Heat
- Prolonged UV exposure
- Drought
- Salinity
- Sodicity

Stress Rx®
from Ocean Organics significantly increases your turf's heat, UV, drought and salt stress tolerance, improves its survival potential, and promotes recovery.

Research shows Stress Rx improves turf quality, relative water content, membrane stability, and root health under stress.

Stress Rx contains Ocean Organics proprietary seaweed extract along with the most diverse and complete biorational compounds available in a single foliar-applied product:

- Unique osmoprotectants, such as exclusive glycinebetaines
- Powerful pigments that stabilize photosynthetic membranes and act as effective antioxidants.
- **PRO-AMINO®** Technology: To further enhance stress tolerance, osmotic balance and micronutrient chelation.

In other research, Dr. Bingru Huang evaluated a variety of products for their ability to alleviate summer bentgrass decline.

The treatments that had the most significant impact were Ocean Organics seaweed-based

formulas, which included Stress Rx. * Notable results were:

- Significantly higher turf quality
- More green leaf biomass
- Better plant density



Ocean Organics plots had better quality, color, density, chlorophyll content, and green leaf biomass than controls and competitive products in this Rutgers Trial.



The summer applications used a rate of 6 oz per 1,000 ft². Spring treatments also incorporated Ocean Organics **SeaBlend®** granular fertilizer 12-4-5 and **Guarantee®** Natural for Turf. (See pages...

Application Rates

Apply 6 oz per 1,000 ft² (2 gal/acre) every 10-14 days. Apply in the early morning or late afternoon for best results. Use a spray adjuvant for superior coverage. Allow foliar product to dry on plant prior to irrigation.

Sizes: 2x2.5 gal cases, 15 gal drums

* Ocean Organics: Effects of biostimulants on putting green summer performance, Final Report – November 2017, Stephanie Rossi and Bingru Huang, Ph.D., Rutgers, the State University of New Jersey

XP® EXTRA PROTECTION

(5-0-0) Foliar fertilizer with photoprotectants that significantly increase stress tolerance, protect against UV exposure in turf and plants.

XP Extra Protection Delivers a Powerful “1-2 Punch” of Protective Plant Ingredients and Micronutrients

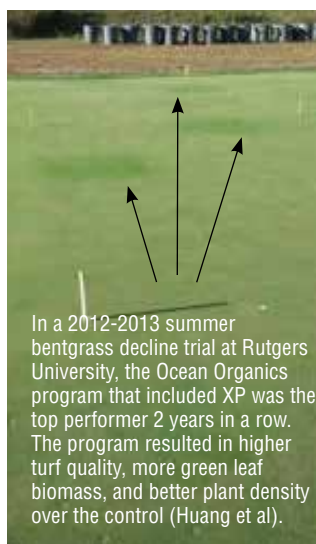
- 1) The unique plant-protective compounds in *ascophyllum nodosum* are boosted with high levels of other botanical extracts that protect plants under heat and UV stress.
- 2) XP provides the most effective micronutrients (Fe, Mn, Mg) to boost summer color. Its amino acid-chelated micronutrients are ideal for foliar uptake. Soil-directed iron provides superior extended color.

XP — Exceptional:

- Turf Quality
- Color
- Root Health
- Stress Tolerance Recovery

Backed by Research

Independent research over **five** years at **four** universities, and with several private researchers, has confirmed XP improved turf quality and recovery under heat stress, salinity, deficit irrigation, and prolonged UV radiation. XP also improved chlorophyll content and protective carotenoid pigment levels.



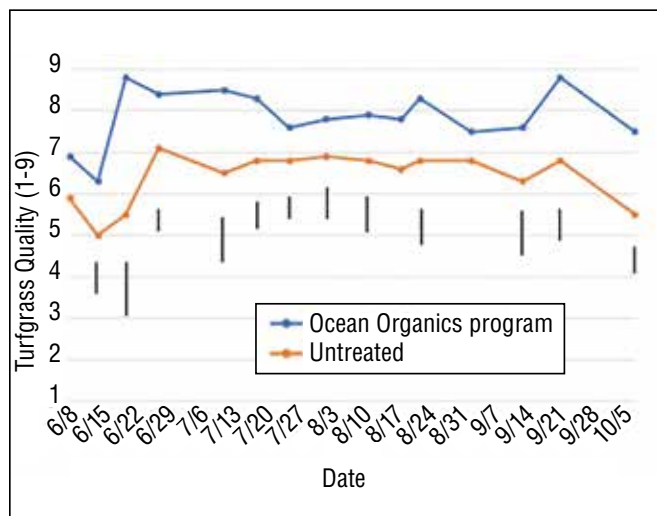
In a 2012-2013 summer bentgrass decline trial at Rutgers University, the Ocean Organics program that included XP was the top performer 2 years in a row. The program resulted in higher turf quality, more green leaf biomass, and better plant density over the control (Huang et al).



XP was part of Ocean Organics top winning program for three years at UC Riverside on bermuda grass greens under heat and salinity stress (Baird et al).



XP is further strengthened by our Pro-Amino® Technology.



Improved Turf Quality (TQ): Significant differences were found on 13 of 15 rating dated for visual turf quality, with the Ocean Organics program having greater turfgrass quality (compared to an untreated control).

For years, Ocean Organics has been researching the role of pigments in seaweed's ability to improve stress tolerance. In addition to the xanthophyll in our seaweed extract, we formulated XP with additional botanical pigment sources.

Application Rates

Apply 177 ml. per 93 meters² (6 oz. per 1,000 ft²) every 14 days during the growing season. For large areas, apply 7.6 liters per 4,047 meters² (2 gal. per acre).

Apply in the early morning or late afternoon for best results. Use a spray adjuvant for superior coverage.

Allow foliar product to dry on plant prior to irrigation.

Sizes: 2x2.5 gal cases, 15 gal drums

Plots treated with XP and Stress Rx consistently performed best overall throughout the summer stress period.

APPLYING XP AND STRESS RX® TOGETHER WAS MOST EFFECTIVE OVERALL...

In three years of trial work at Rutgers (2016-2019), Prof. Bingru Huang et al. found that **XP®** and **Stress Rx®** improved the **quality and performance of creeping bentgrass under heat stress during the summer months all three years.**

- The **Rutgers** studies show that applying XP and Stress Rx together was most effective overall in helping turf to maintain better physiological health, promoting:
 - higher turf quality
 - improved NDVI (indicating a larger density of green leaves and higher chlorophyll content) and LAI (larger leaf area)
 - increased shoot density and color
 - faster recovery
 - In 2018, Ocean Organics treatments statistically improved root growth – root length, surface area, volume, and diameter.
- Researchers at **Virginia Tech** showed that XP, alone and in combination with Stress Rx, triggered a statistical increase in carotenoid pigments that play a critical role in plants' protection mechanisms (2015).
- **Professional Turfgrass Solutions, LLC**, showed Stress Rx® and XP® statistically improved turf quality and enhanced recovery on creeping bentgrass putting greens under heat, salinity and drought stress on a course in Salt Lake City (2015).
- At **Michigan State**, the Ocean Organics program in Creeping Bentgrass (2016) statistically:
 - Improved turf quality during summer stress
 - Reduced Dollar Spot
 - Improved cold tolerance

Improved Turf Quality,
Chlorophyll, and Protective
Carotenoids during Heat
and UV Exposure

Additional Benefits Accrue with other Ocean Organics Industry Leading Products

SYNERGIES WITH SEABLEND®, NURELEASE® AND GUARANTEE®

All of our products are stand-alone materials that deliver significant plant-strengthening benefits on their own.

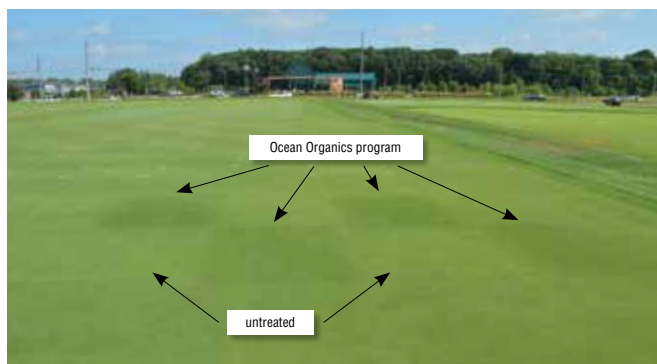
However, the research suggests that there are synergies when they are combined in programs. The program that MSU studied involved **Stress Rx®**, **XP®**, and two additional Ocean Organics products: **NuRelease®** and

SeaBlend®. See pages ____ and ____.

The #1 program for alleviating Summer Stress (during both years it was studied at Rutgers) used the four above-mentioned Ocean Organics products and included **Guarantee®** Seaweed Extract. See page ____.

OCEAN ORGANICS NAUTILUS® SURFACTANT

In 2018 at Rutgers, when Nautilus surfactant was added to the Stress Rx and XP program, turf maintained “significantly higher root length, surface area, and volume in the 0-10 cm root zone. Additionally...significantly higher root diameter in the 0-10 cm root zone following heat stress.”



Michigan State, 2016

Alleviating Salinity Stress

DESAL®

Managing Soil Health

DeSal® is a salinity and sodicity soil treatment that addresses the underlying problems in the soil, dramatically reducing sodium and total salts in the rootzone. It's the top performing product in this category. Our proprietary blend of natural compounds mimics the natural sequestering power of exudates produced by healthy roots and soil microbes.

Detox the Soil and Correct Nutrient Deficiencies

Using our proprietary NuRelease® technology, DeSal®:

- Dramatically reduces sodium and total salt concentrations in rootzones.
- Helps move sodium and total salts out of the rootzone.
- Releases calcium, critical to effective water and nutrient transport.
- Helps correct Ca, P, K, Mg, Mn, Fe, and Zn deficiencies.

Calcium released by DeSal® in the rootzone has two functions. It displaces sodium on soil particles allowing the sodium to be more easily and economically flushed out. It also helps to supply the plant roots with calcium, which is known to improve salinity tolerance and protect plant cells.

Improve Water Uptake

The net result of reducing sodium, improving calcium availability and correcting critical nutrient deficiencies is better water uptake.

Salinity Tolerance, Quality, Reduced Sodium

The Two-Pronged Approach for Salinity Management

Target the Soil with DeSal; Target the Plant with Stress Rx® and XP Extra Protection™.



Top Performing Product in Research

- In salinity stress field trials at **UC Riverside** on bermudagrass, Ocean Organics program using **Stress Rx** and **DeSal** was the top performer in improving turf quality.

"We tested 30 commercial and experimental products for their ability to alleviate salinity stress on bermudagrass irrigated with saline water...The highest quality was recorded in plots treated with DeSal + Stress Rx + XP Extra Protection. In fact, this was the only treatment that resulted in higher quality than the untreated control for both years..."



GCM Online, August 2019 | Marco Schiavon, Ph.D., and James Baird, Ph.D.

- DeSal® was the top performing salt management product out of 7 programs in a replicated field trial conducted by **Mark M. Mahady & Associates, Inc.** on the Poa annua chipping green at Corral de Tierra Country Club near Monterey, California.
- In a replicated field trial funded by the **Hi-Lo GCSA Research Committee** and conducted by Mark M. Mahady & Associates, Inc. on fairways at the Shadow Hills Golf Club (Indio, CA), of 9 programs tested, DeSal® exhibited the greatest change in the concentration of critical salt management components.

Application Rates

For saline and/or sodic soils: Apply 24 oz. per acre (0.5 oz. per 1000 ft²) every 21 days. Following treatment, apply adequate irrigation to wash product from leaf surfaces into the soil. Follow with a flushing irrigation appropriate for the soil type within 24 hours. DeSal may be applied with irrigation water or with fertigation.

To enhance movement of salts away from the root zone, tank mix with a wetting agent (penetrant).

Follow post-treatment irrigation recommendations.

Sizes: 2x2.5 gal cases, 15 gal drums

Research Conducted at Universities, Laboratories, and Field Sites

“Out of nine programs tested, the DeSal program “exhibited the greatest change in the concentration... of exchangeable sodium, soluble salts, extractable sodium, extractable chloride, bicarbonates and EC”

A Review of Products for Salinity Management in Overseeded Bermudagrass Fairways, The Hi-Lo GCSA Research Committee and Mark M. Mahady and Associates, Inc., 2008

“[DeSal] performed very well for salt management. Plots showed a sizeable reduction in EC, sodium and total soluble salts over the six-week trial.”

Evaluation of Products for Management of Salts and Localized Dry Spot on a Poa annua Putting Greens, Mark M. Mahady and Associates, Inc., 2005

“By applying these products together during periods of prolonged heat stress, it can be expected that putting greens will maintain better quality during the summer and recover more quickly...”

Prof . Bingru Huang Rutgers University, 2019

“We tested 30 commercial and experimental products for their ability to alleviate salinity stress on bermudagrass. The only program that had an effect on turfgrass quality and soil chemistry was DeSal + Stress Rx + XP Extra Protection.”

increased turf quality and Dark Green Color Index (DGCI)

decreased EC, SAR and Na content in the soil.

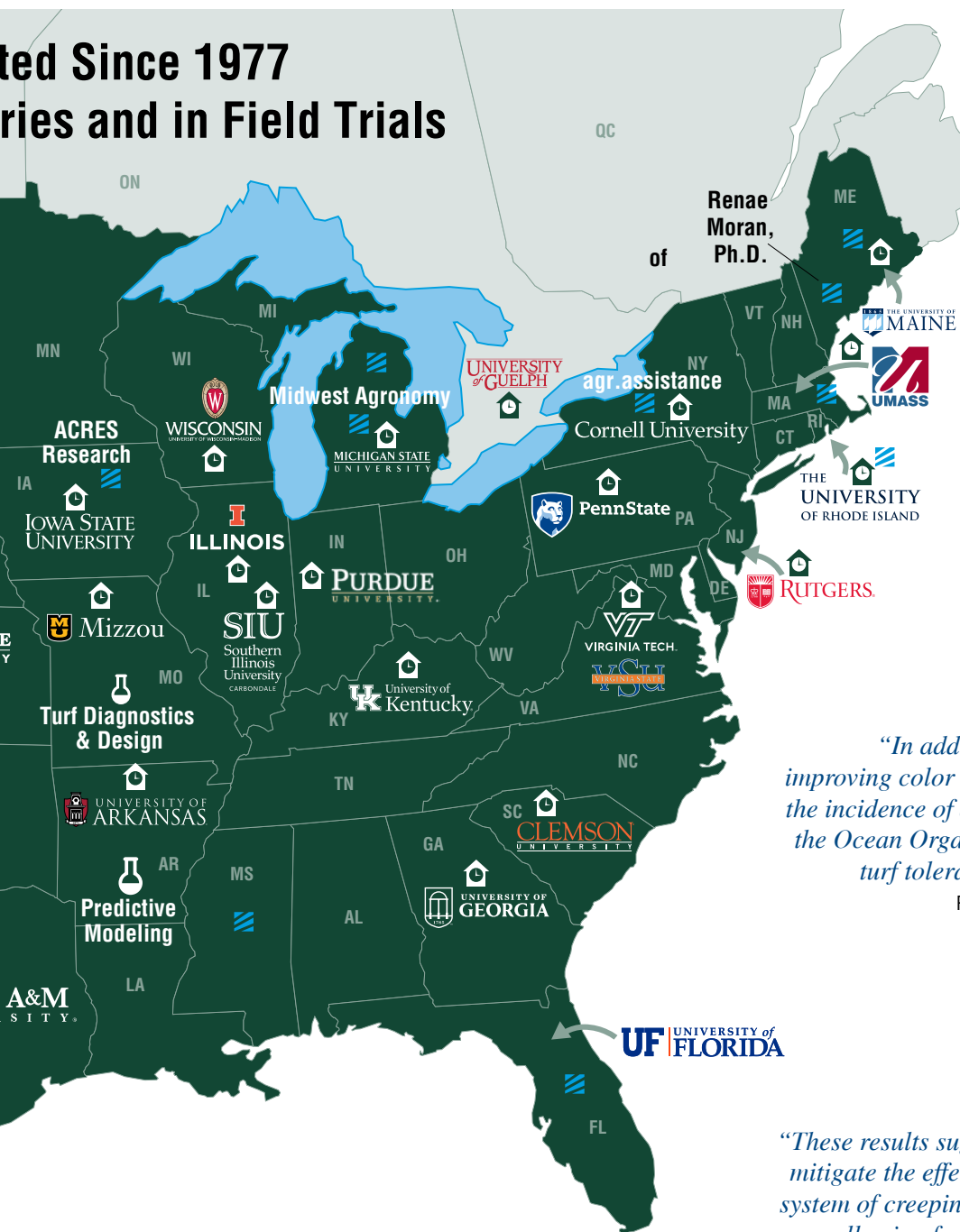
“the best combination of salinity alleviation and turf quality in both years of the study.”

U.C. Riverside, 2013-2014



-  University
-  Laboratory
-  Independent Field Research

ted Since 1977 ries and in Field Trials



"The commercial treatments provided by Ocean Organics had the most significant impact on alleviating summer bentgrass decline, with the most "notable results" during both spring and summer."

Tristate/Rutgers, 2013

"In addition to increasing turf quality, improving color and chlorophyll content while reducing the incidence of dollar spot during the summer of 2016, the Ocean Organics treatment program also improved turf tolerance to cold temperature stress."

Rutgers University, 2016 & 2017

"Treatment with Stress Rx statistically improved root length in both Trial 1 and Trial 2 during the heat/UV-B stress period."

With Stress Rx treatment, roots were between 35 to 87% longer than in controls.

Stress Rx treatments had 54% longer roots than controls even after 8 days of recovery.

Virginia Tech, 2012

"These results suggest that the products examined ... may mitigate the effects of high soil temperature on the root system of creeping bentgrass, improving root growth and allowing for better water and nutrient uptake."

Rutgers University, 2018

NuRelease®, a proprietary formulation of specific, naturally occurring organic acids, is an innovative nutrient release soil treatment liquid and also performance-enhancing fertilizer additive. NuRelease maximizes nutrient release, bioavailability and uptake efficiency in the root zone and facilitates plant nutrient uptake and absorption.

The Breakthrough Biocatalyst for Phosphorus... and Nitrogen, Potassium, Calcium, Magnesium, and Iron

Phosphorus is essential for energy transformation and conversion of carbohydrate starch to sugar. Phosphorus absorption through roots declines as root growth declines.

NuRelease® makes phosphorus and divalent cations, like Ca, Fe, Mg, Mn, and Zn, more available to the plant.

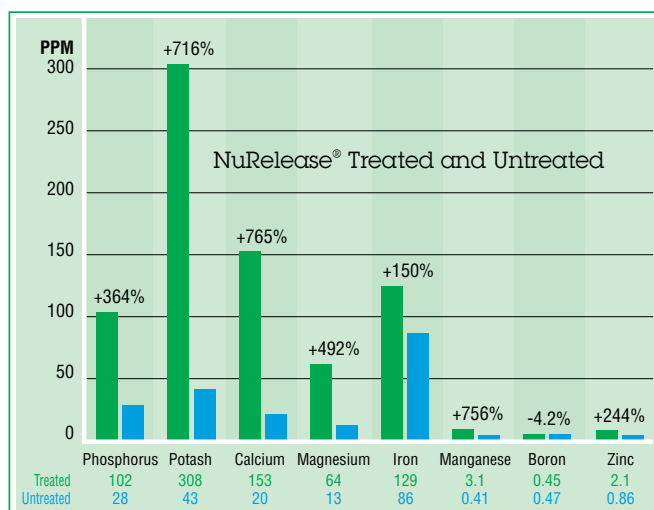
When added to fertilizers, NuRelease® maintains nutrient solubility, facilitates plant nutrient uptake and increases foliar absorption.

Excellent Results on Midwest Golf Courses

In field tests on several golf courses in summer 2011, application of NuRelease® made Nitrogen, Phosphate, Potassium, Calcium, Magnesium, and Iron more available to turf. At some sites, bio-available forms of Ca increased by as much as 59%; Mg by 65%; and K by 70%.

Top 10 Reasons to Use NuRelease®

1. It will help you do more with less. You can apply 20-40% less Phosphorus with no compromise in turf quality, color or density.
2. It will improve the performance of the rootzones, rhizospheres and soils you manage.
3. It will also release Phosphorus-bound divalent cations like Ca, Fe, Mg, Mn and Zn...making them more bioavailable. NuRelease® also releases bound Sodium.

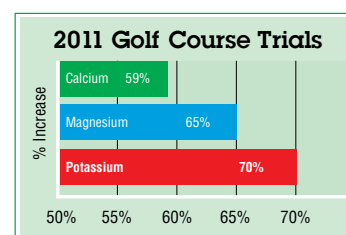


South Carolina Soil Sample

4. Great for repairing winter damage; and better spring seeding, sodding and sprigging.
5. **It will help you maximize your turf's photosynthetic capacity, respiratory efficiency and stress tolerance.**
6. It's extraordinarily versatile and effective across a broad range of soils and conditions... A complete biofertility toolbox.
7. **It works in cool soils so it will help desirable turfgrasses like bentgrasses out-compete poa annua in spring and fall.**
8. It's fast-acting, affordable, budget friendly and compatible with virtually everything you apply.
9. Use as a tank mix additive to improve stability as well as uptake of nutrients and other plant protection materials.
10. It's sustainable. You can lower phosphorus inputs and reduce risk of groundwater contamination while improving turf quality.

Independent Tests Confirm NuRelease's Efficacy

In other tests, 16 oz NuRelease®/acre outperformed 60 lbs/acre Triple Super Phosphate (TSP)



- **Adding 8 oz NuRelease® allowed P inputs to be reduced by 50%. Eight ounces of NuRelease® plus 30 lbs of TSP out-produced 60 lbs. of TSP alone.**

Application Rates

As a soil applied treatment: Apply 32 oz per acre (0.8 oz per 1,000 ft²) monthly and water into the root zone.

As a fertilizer TANK-mix additive:

U.S. Measure: For one acre: apply 16 oz monthly. For 1,000 ft²: apply 0.4 oz monthly.

If you are applying foliar fertilizers and nutrients more frequently than once per month, divide the NuRelease monthly rate by the number of applications per month, and apply that amount each time. For example, if you foliar feed golf course greens every two weeks, apply 0.2 oz (6 ml) of NuRelease per 1,000 ft² each time.

Sizes: 2x2.5 gal cases, 15 gal drums



Consider the Source

The SeaBlend® Line

The origin of life – the sea. Kelp, fish, shrimp, lobster, crab – renewable resources from the world's oceans. All are rich and diversified protein sources, delivering unique forms of Nitrogen. These marine organic meals and other renewable resources are the core constituents that make up SeaBlend's granular organic base.

It's not surprising when you think about it. Life on the planet originated in the oceans. North Atlantic sea plants are a rich source of trace elements, micronutrients and a wide variety of other beneficial constituents.

Understanding and using these unique constituents to enhance the performance of conventional materials sets Ocean Organics apart from other manufacturers and formulators. Our products perform well beyond the NPK numbers on the label. Ask anyone who uses SeaBlend.

**Superior Granular Fertilizer
for Color, Density and Quality
in All Seasons**

The SeaBlend Family of Premium, Natural and Organic-Based Granular Fertilizers produces outstanding color, density and quality; stimulates microbial activity and builds soil. It provides complete, balanced and diversified nutrition.

SeaBlend has a rich base of ingredients including: Kelp Meal, Fish Meal, Crab Meal, Blood Meal, Feather and Alfalfa Meal, Potassium Sulfate, Magnesium Sulfate, Manganese Sulfate, Ferrous Sulfate, Zinc Sulfate Urea, and Methylene Urea.

- SeaBlend® (12-4-5)
- SeaBlend® (12-0-12)
- Fairway SeaBlend® (12-4-5)
- SeaBlend® AS (14-2-4)
- SeaBlend® Super Starter (5-7-5) For Rapid Establishment and Growth



SeaBlend Produces Outstanding Color, Density and Quality; Stimulates Microbial Activity, and Builds Soil.

In the Fall, you can't predict when cold weather will begin. If it's late, SeaBlend fully releases all nutrients so your turf builds carbohydrate reserves. If cold weather starts early, the synthetic ingredients in SeaBlend will still build reserves, while the organic ingredients become a dormant feed releasing in Spring for early green-up.

SeaBlend produces outstanding color; it builds soil and stimulates microbial activity. Unlike most organics, SeaBlend won't gum up mower rollers. And with a homogenous micro particle size, it's perfect for closely mowed bents and Bermudas, including the newer denser varieties. SeaBlend contains no bone meals or biosolids. The marine organics are high in chitin and calcium. The benefits of calcium in the soil are well known. Chitin in the soil has been shown to be inhospitable to nematodes.

Application Rates

Established Turfgrass and Landscape: Use as a fertilizer for greens, tees, roughs, fairways and ornamentals, three to four times each season. For one pound of nitrogen, broadcast at a rate of 3.63 kg. per 93 sq. meters (8.33 lbs. per 1,000 sq ft.).

New Turfgrass and Landscape Planting and Seeding: Incorporate into top 2-4 inches of soil prior to seeding, sodding or sprigging and landscape planting.

Application Coverage Rates

For 1 lb. of N/1000 sq. ft. apply 8.33 lbs:

- 1 bag (50 lbs.) covers 6,000 sq. ft.
- 7.25 bags (363 lbs.) covers 1 acre
- 40 bags (1 ton) covers 5.5 acres.

Size: 50 lb bags

SEABLEND® SUPER STARTER FERTILIZER

A Performance Enhancing, Organic Based Starter Fertilizer

- Accelerates Establishment by 30-35%
- Let's You Do More with Less

SeaBlend® Super Starter enriches the rootzone with natural organics, high quality natural and synthetic fertilizers, and breakthrough biocatalysts. SeaBlend® Super Starter promotes quick growth and establishment for newly seeded, sodded or sprigged turfgrasses and also helps give established turf a jump start in spring's cool temperatures. SeaBlend® Super Starter is formulated with NuRelease™ Technology and biologically produced organic acids.

These compounds complex the nutrients present, but locked up in the soil, and make them available for root uptake – so you get more of the performance potential out of your rootzone. NuRelease Technology works in cool soils, so you can get off to a super start in spring.

- SeaBlend® Super Starter's nutrients are derived from a combination of select, natural organics and high-quality chemical fertilizers – the best of both worlds. The ingredients and their proportions are selected to produce even and sustained availability of the major and minor nutrients.
- Like the other members of the SeaBlend family, SeaBlend® Super Starter contains specific amino acids and microbes which work together to produce natural growth promoters in the root zone. This approach triggers the natural processes in the soil that have been part of plant growth for as long as there have been plants.
- SeaBlend® Super Starter contains a proprietary, naturally-derived wetting agent to ensure rapid movement of the soluble nutrients into the root zone.

- SeaBlend® Super Starter maximizes phosphorus utilization and minimizes nutrient runoff. It also releases phosphate-bound calcium, iron, magnesium, manganese and zinc in the soil and makes them more bioavailable for root uptake.

SeaBlend® Super Starter – More Than Just A Fertilizer – Truly Complete Nutrition.

Application Rates

For use as preplant fertilizer: For 1 lb of Nitrogen, 1.4 lbs of Phosphorus, and 1 lb of Potassium, apply 20 lbs of SeaBlend® Super Starter per 1,000 sq. ft. Use a rotary or drop spreader. Incorporate into the top 2-4 inches of the soil prior to seeding, sodding, sprigging and landscape planting. Irrigate after planting.

For established turf: To stimulate turf growth and winter recovery in spring, apply 10 lbs per 1,000 sq. ft.

Size: 50 lb bag





The Ocean Organics Surfactant Line

Turf Surfactants with a Difference

Nothing is more critical to managing intensively-maintained, highly stressed turfgrasses than controlling moisture and nutrient delivery. The Ocean Organics Surfactant Line optimizes both nutrient and water use efficiency.

Surfactants are increasingly critical in today's turfgrass management environment — and will only become more so.

The Ocean Organics Turf Surfactant Line is unique and proprietary

Of the more than 50 companies supplying surfactants to turf professionals in North America, less than 10% actually make the molecules that provide the basic molecular building blocks involved in surfactant technology. Instead of manufacturing chemicals, we focus our expertise on how to best apply these basic chemistries to the specific, unique performance requirements of intensively-maintained turf grasses — and we add value. Our products optimize both nutrient and water use efficiency and also provide unique ingredients that help boost plant fitness.

Each formulation contains a surfactant, an infiltration agent, and a biostimulant

- We include our industry-leading seaweed extract for its many benefits related to fitness and stress management. Because it has no Nitrogen, it never causes growth flushes.
- Penetrant agents help water and nutrients infiltrate through the mat layer and into the soil faster. They also keep the surface dryer.
- The Ocean Organics Surfactants are also phyto-safe — they are EO/PO Block Co-Polymer formulations.
- They are highly cost-efficient, having a lower end user cost per gallon and a lower cost per acre than competitive products.

The Ocean Organics Surfactants: Increase Nutrient Uptake, Plant Vigor and Stress Tolerance; Promote Faster and More Complete Root Development; Aid Water Conservation

NAUTILUS®

Nautilus® promotes drier and firmer playing surfaces; consistent, uniform root zone soil moisture; and a slower, more consistent dry down that reduces hand watering.

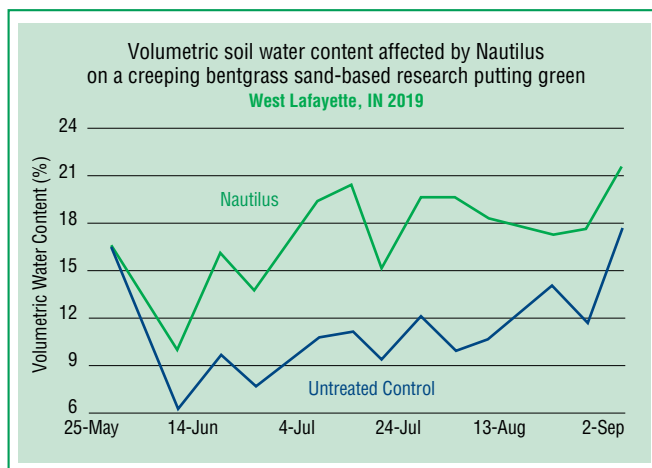
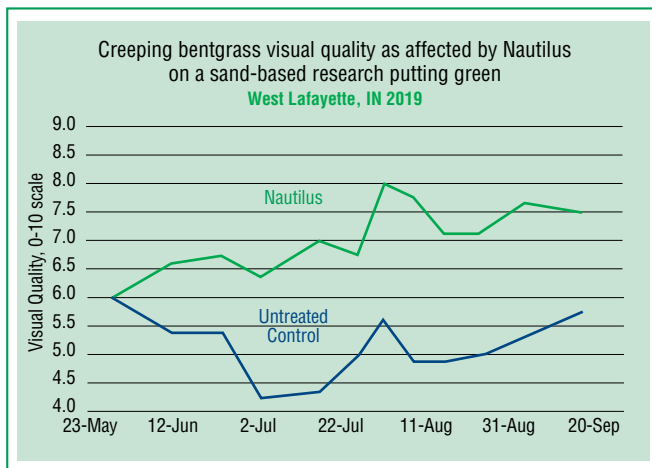
Nautilus employs our capped chemistry which is unique in how it attaches to hydrophobic soils to deliver lower soil moisture content while insuring a consistent dry down of the root zone.

Nautilus:

- Provides firm, dry, and fast playing surfaces.
- Enhances the efficacy and control of fertility and pesticide programs.
- Creates consistent uniform soil moisture in the root zone.
- Delivers a slower, consistent dry down that reduces hand watering.

STRESS RX, XP AND NAUTILUS® SURFACTANT

In 2018 at Rutgers, turf maintained significantly higher root length, surface area, and volume in the 0-10 cm root zone and significantly higher root diameter following heat stress with the addition of Nautilus to the Stress Rx and XP program.



Application Rates

Apply 6 fl oz per 1000 ft² in minimum of 2 gal of water every 28 days. After application, irrigate sufficiently to remove product from leaf surfaces.

For coarse soils/sand root zones: Use 1/3" irrigation water

For fine textured soils: Use 2/10"-1/4" irrigation water

Sizes: 2x2.5 gal cases, 30 gal drums, 275 gal totes

Mariner® promotes firmer and drier playing surfaces and improved root zone moisture uniformity when used in either a short or long term program

Mariner uses our straight block chemistry.

Mariner:

- Provides firm, dry, and fast playing surfaces.
- Improves the efficacy & control of fertility & pesticide programs.
- For both long (90 days) or short term (14-28 days) use.
- Delivers consistent uniform soil moisture in the root zone.

Application Rates

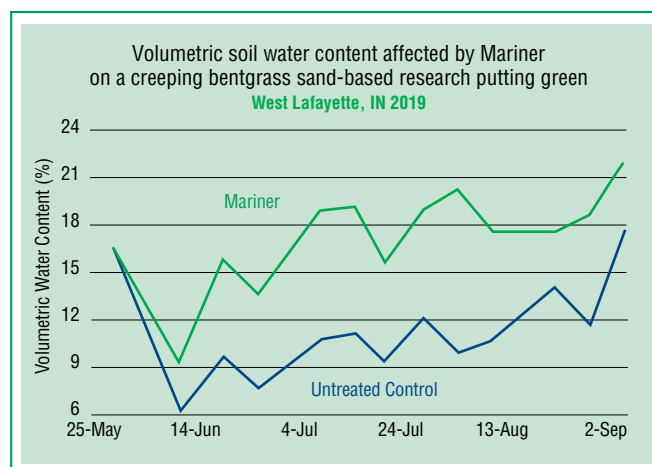
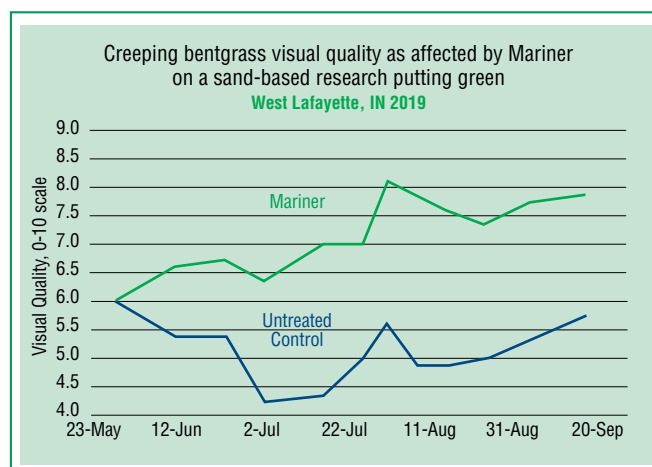
For Short-Term use: 4-6 fl oz/1000 ft² in minimum of 2 gal of water every 28 days.

For Long-Term use (90 days control): Apply product at 8 fl oz per 1000 ft² in minimum of 2 gal of water. Follow up with second application of 8 fl oz per 1000 ft² in minimum of 2 gal of water 7-10 days later. After application, irrigate sufficiently to remove product from leaf surfaces.

For coarse soils/sand root zones: Use 1/3" irrigation water

For fine textured soils: Use 2/10"-1/4" irrigation water

Sizes: 2x2.5 gal cases, 30 gal drums, 275 gal totes

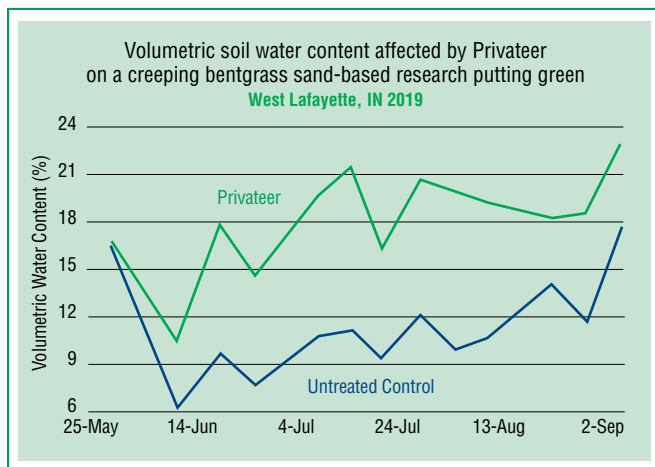
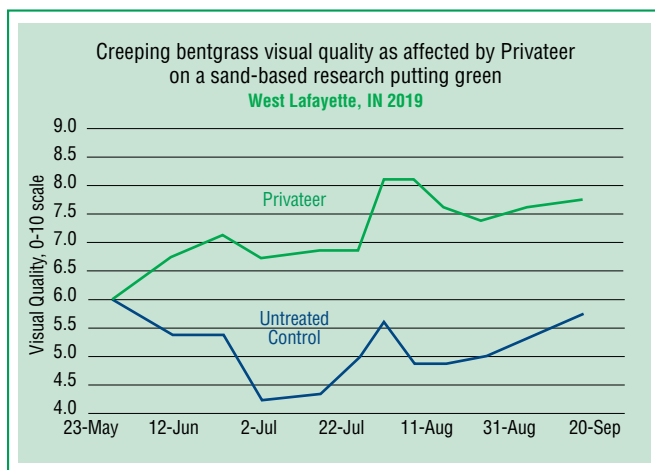


PRIVATEER®

Privateer® treats Localized Dry Spots (LDS) while increasing moisture uniformity in the root zone. Can be used as a curative or as a monthly program product.

Privateer:

- Treats and eliminates LDS.
- Can be used as a treatment for LDS or for its prevention.
- Maximizes water uniformity in the root zone.
- Assists in the rapid recovery of drought stressed turf.



Application Rates

Apply 4 fl oz per 1000 ft² in minimum of 2 gal of water every 28 days. After application, irrigate sufficiently to remove product from leaf surfaces.

For coarse soils/sand root zones: Use 1/3" irrigation water

For fine textured soils: Use 2/10"-1/4" irrigation water

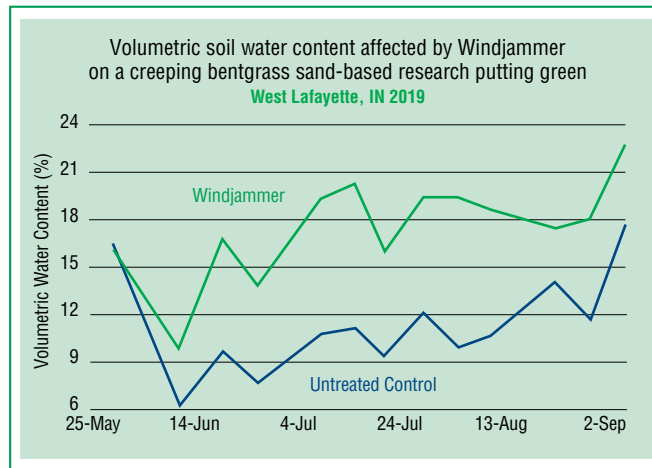
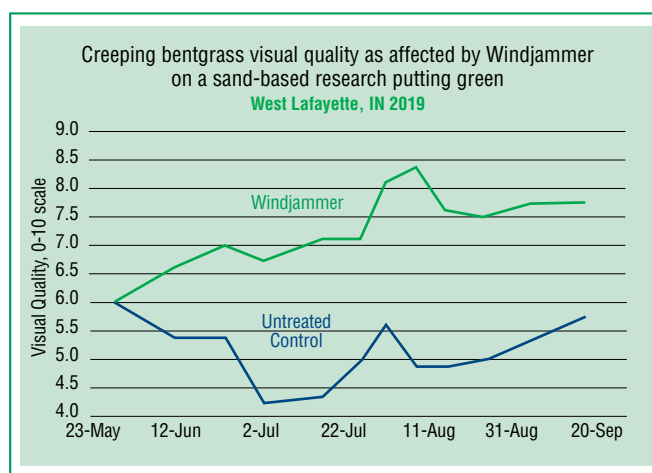
Sizes: 2x2.5 gal cases, 30 gal drums, 275 gal totes

WINDJAMMER

Windjammer™ treats Localized Dry Spots (LDS) while increasing moisture uniformity in the root zone. Can be used as a curative or as a monthly program product.

Windjammer:

- Reduced Wilt
- Superior Plant Moisture Availability
- 6 Times Faster Infiltration Rate vs. The Competition
- Drier Surfaces/Less Disease
- Superior Turf Quality vs. The Competition
- Phyto Safe
- Improved Efficacy of Fertility and Pesticide Programs



Application Rates

Apply 4-6 fl oz per 1000 ft² in minimum of 2 gal of water every 28 days. After application, irrigate sufficiently to remove product from leaf surfaces.

Sizes: 2x2.5 gal cases, 30 gal drums, 275 gal totes

HELMSMAN®

Helmsman® is a surfactant for use on fairways and fine soils. It increases the penetration of applied water and rainfall and improves irrigation efficiency. Helmsman addresses soil moisture problems on hillsides, mounds, and other difficult to access areas. It can be injected or sprayed.

Helmsman:

- Greatly increases penetration of applied water and rainfall.
- Improves irrigation efficiency.
- Enhances the efficacy & control of fertility & pesticide programs.
- Can be sprayed or injected.

Application Rates

Spray: 3 fl oz per 1000 ft² every 28 days. After application, irrigate sufficiently to remove product from leaf surfaces.

For coarse soils/sand root zones: Use 1/3" irrigation water

For fine textured soils: Use 2/10"-1/4" irrigation water

For Injection: Apply 12 oz per acre once a week.

Sizes: 2x2.5 gal cases, 30 gal drums, 275 gal totes

TOPSAIL®

TopSail™ is a surfactant for use on fairways and fine soils. It increases the penetration of applied water and rainfall and improves irrigation efficiency. TopSail addresses soil moisture problems on hillsides, mounds, and other difficult to access areas. It can be injected or sprayed.

TopSail:

- Low Rates For Big Results (32oz/acre per month)
- Can Be Sprayed Or Injected
- Superior Turf Quality vs. The Competition
- Great Delivery Agent For Individual Sprays (16oz/Acre)
- Economical
- 3 Times Faster Infiltration Rate vs. The Competition
- Drier Surfaces/Less Disease
- Reduces Leaching
- Phyto Safe

Application Rates

Spray: 32 fl oz per acre every 28 days. After application, irrigate sufficiently to remove product from leaf surfaces.

For coarse soils/sand root zones: Use 1/3" irrigation water

For fine textured soils: Use 2/10"-1/4" irrigation water

For Injection: Apply 4-8 oz per acre once a week.

Sizes: 2x2.5 gal cases, 30 gal drums, 275 gal totes



Soil Water Repellency

Soil Water Repellency: Soil water repellency is a reduction in the rate and retention of water in soil caused by the presence of hydrophobic coatings on soil particles. For crop production and the maintenance of fine turf, water repellency can stress plants resulting in poorer yield quality or turf playability.

Consequences of Water Repellency:

- Drainage and leaching of nutrients due to “preferential flow” or preferential pathways through the soil
- Runoff of both natural and applied water
- Uneven distribution of applied chemicals
- Localized Dry Spot (LDS)

What is a Surfactant/Wetting Agent? A Surfactant/Wetting Agent is a substance that when absorbed prevents a surface from being repellent to a wetting liquid. It is used especially in mixing solids with liquids or spreading liquids on surfaces.

How do they work? Surfactants/Wetting Agents are typically sprayed on a surface and then liberally watered into the soil profile. As the molecule makes its way through the soils, the hydrophobe will attach itself to any hydrophobic or water repellent surface. Once anchored, the hydrophyll will attract and hold water, therefore aiding in the hydration of the water repellent soils.

MARINER® SURFACTANT BIO-TABS

A cure for LDS in a handy tablet for hose-end applicators.

Mariner Surfactant Bio-Tabs:

- Product excellence — 100% Active Ingredients
- Tablets are not sticky, won't dissolve until in applicator
- Easy to handle
- Contains 5% Ocean Organics Seaweed Extract
- Contains highly-bioavailable Ocean Organics Humic Acid
- Treats LDS

Application Rates

Mariner Surfactant Bio-Tabs are specifically designed for spot treatment of severely affected areas using appropriate hose-end applicators.

Mariner Surfactant Bio-Tabs should be used as required. Repeat applications as necessary. Rate of dissolution will depend upon water pressure and temperature. One tablet will treat approximately one golf green (watering for 20-30 minutes) or alternatively, will spot-treat 6-7 golf course greens.

Mariner Surfactant Bio-Tabs do not require watering-in after application.

Size: Box of 6 - 8 oz. tablets



MARINER® and PRIVATEER® SWDG

Our unique formulation includes our industry-leading seaweed extract for its many benefits related to plant fitness and stress management.

Privateer and Mariner SWGD are also phyto-safe.

Privateer and Mariner SWGD:

- Provides consistent uniform soil moisture and controls soil/water repellency
- Improves the efficacy and control of fertility & pesticide programs
- Greatly improves penetration of applied water and rainfall
- Improves irrigation efficiency
- Assists in the rapid recovery of drought/stressed turf

For both long term (90 days) or short term (30 day) use.

Application Rates

For Short-Term (30 days control) use:

Apply 2.5 lbs./1000 sq. ft.

For Long-Term use (90 days control):

Apply 7 lbs./1000 sq. ft.

Following product application, irrigate with enough water to move active ingredients into the root zone. Apply 2/10 inch water for fine textured soils, 1/3 inch for sandy soils.

Size: 50 lb bag



The Science Behind Summer Stress Decline

Overcoming Summer Stress Decline in C3 (Cool Season) Turfgrasses Is Probably the Single Biggest Recurring Challenge Most Golf Course Superintendents in North America Face.

For many years conventional wisdom held that summer turfgrass decline was due to disease. It was treated with fungicides. In recent years, leading turfgrass physiologists concluded that the principle underlying cause of summer decline in C3 cool season turfgrasses is summer decline in carbohydrate reserves. Their reason is obvious in Chart 1. They theorized that the decline, including the onset of disease, was due to the plant responding to high temperatures and prolonged UV radiation exposure, which causes carbohydrate decline and depletion.

Chart 1 shows that carbohydrate reserves peak in spring, plummet in summer, and rebound in fall.

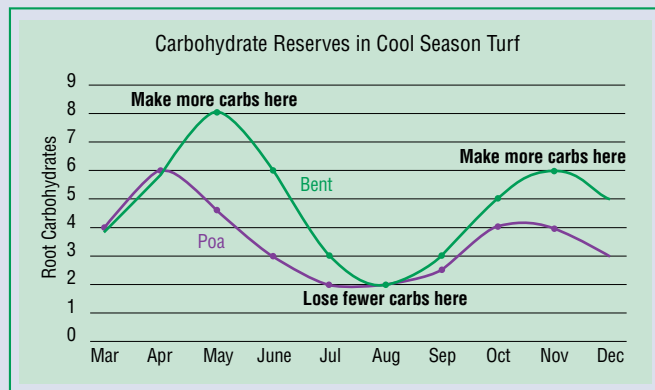


Chart 2 shows root and shoot growth...the two drivers of photosynthesis and carbohydrate production. Again, the peak is in early to late spring, with a steep decline (and roots ceasing growth altogether) in the hot months followed by a rebound in autumn. This is the phenomenon that caused Prof. Joe Vargas, plant pathologist from Michigan State, to quip: "God grows grass till the Fourth of July. After that it takes a professional."

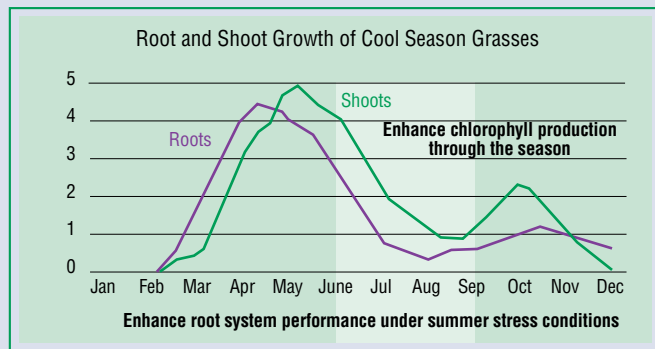
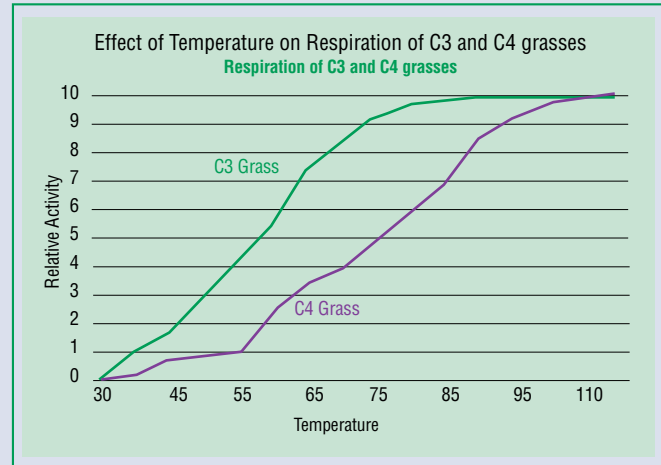
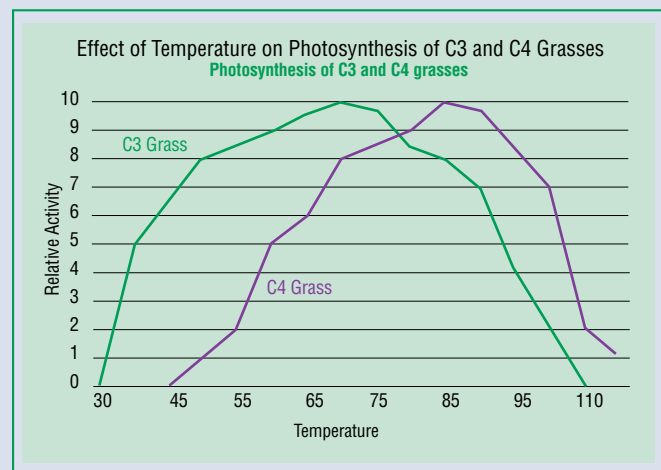


Chart 3 (Effect of Temperature on Respiration of C3 and C4 Grasses) shows that as temperatures rise, respiration increases, indicating that at a certain temperature, 100% of the plant activity is about respiration. In other words, all the carbohydrates produced are being consumed just to satisfy the plant's respiratory needs. In C3 grasses that temperature is 80° F. In C4 (warm season) grasses, it's about 95°.



Meanwhile, photosynthesis, which had been building in moderate summer temperatures, begins to decline (Chart 4). This means that the food-producing factory is shutting down, just as the plant needs more carbohydrates to fuel its immediate respiratory needs. As we saw in Chart 2, production is going down in these months. As temperatures approach 80°, 100% of the carbohydrates in C3 grasses are in the crown of the plant. For every degree over 80°, C3 plants have to withdraw from their "bank" of stored carbohydrates just to survive.



More carbohydrate reserves are the key to survival.

Make More Carbohydrates • Lose Less • Improve Photosynthetic Output • Improve Photosynthetic Efficiency
Increase Chlorophyll Production • Build and Maintain More Robust Root Systems
Increase root system performance under stress

Photosynthesis, Carbon Fixation, Photorespiration and UV Exposure

Photosynthesis—the conversion of light energy into chemical energy. The process by which green plants turn carbon dioxide and water into carbohydrates and oxygen using light energy trapped by chlorophyll. It's the process that makes life possible.

C3 Carbon Fixation—the majority of plants (85-95% of the earth's biomass by most scientific estimates) use a C3 carbon fixation strategy to "fix" CO₂ and create carbohydrate precursors (sugars). C3 plants thrive in areas where sunlight and temperatures are moderate, carbon dioxide concentrations are around 200 ppm or higher and ground water is plentiful. So, for C3 turfgrasses like bent and bluegrasses, "ideal" growing conditions in the continental U.S. would be in the "cool" growing zone.

Photorespiration—a counter-productive, energy-wasting pathway in photosynthesis in some plants (e.g., C3) in which oxygen is mistakenly absorbed and carbon dioxide released.

The "Achilles Heel" of plants that use the C3 carbon fixation pathway is photorespiration.

Instead of using the carbon in CO₂ to make carbohydrates and release oxygen into the atmosphere, C3 plants often absorb oxygen by mistake and release CO₂. The O they absorb by mistake releases free radicals which cause toxic stress and damage within the plant. The CO₂ released contributes to global warming.

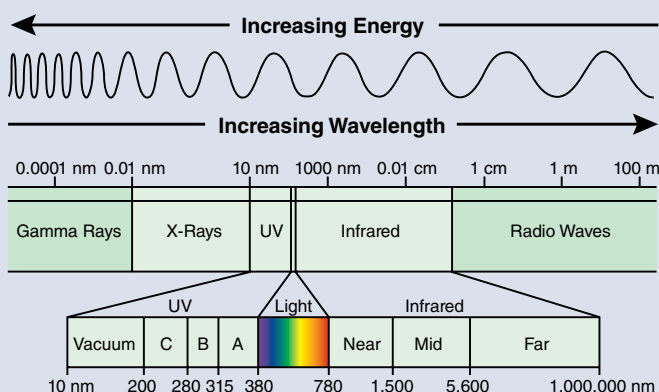
UV Exposure—another related but very different dimension of SSD is the impact of shorter wave radiation like ultraviolet light that accompanies the narrow band of visible light in the electromagnetic spectrum plants use for photosynthesis.

High temperature stress is straightforward and measurable. Superintendents use a variety of methods (e.g., syringing) to cool turfgrass plants during the "dog days." But to deal with prolonged UV exposure, superintendents need products that directly address the damage.



Summer Stress Decline (SSD) in C3 turfgrasses is a multifaceted problem. One dimension is high temperature stress.

The Electromagnetic Spectrum

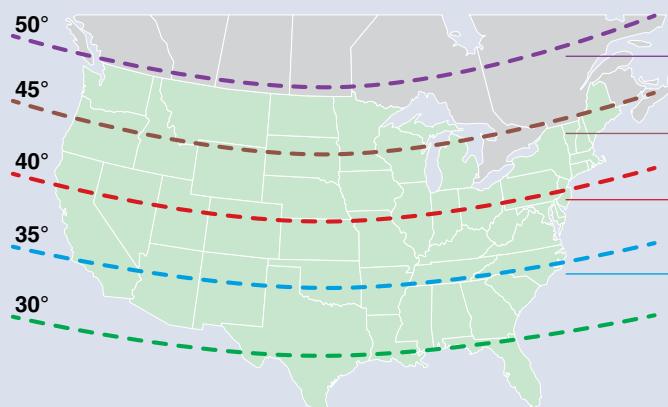


UV overexposure stress is different from high-temperature stress.

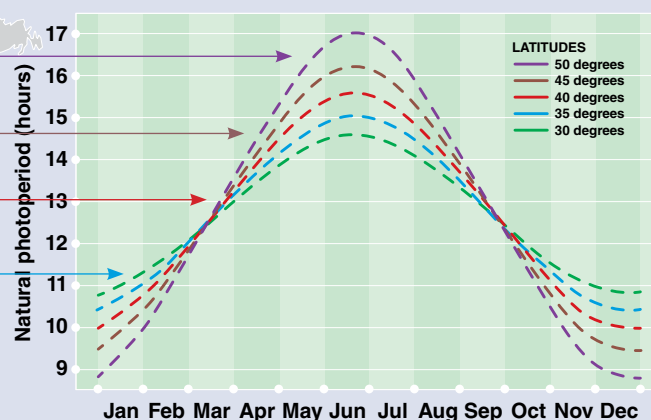
UV Stress: Different from Heat

On the Fourth of July, while superintendents managing C3s in the southern U.S. may be coping with excessive photo respiration with daytime temperatures 10-12° higher than their counterparts in the north, while superintendents in the north may be getting an hour or more daylight and potential photoinhibition from UV overexposure.

Latitude Map



Natural Photoperiods





As the developers and manufacturers of high-performance, industry-leading stress management products and specialty fertilizers, our overarching research and development mission is to help golf course, agricultural and horticultural professionals maximize the performance and genetic potential of the plants and crops they grow, manage and protect... particularly under difficult, often stressful conditions. We prefer to work with renewable natural resources for economic as well as ecological reasons.

For more than 40 years, Ocean Organics products have been independently tested at more than 25 universities, a dozen private research labs, and in scores of field trials.

Independent research confirms:

- Better quality, color and vigor
- Better high temperature tolerance
- Better U.V. tolerance
- Better root development
- Better drought, salinity and sodicity tolerance
- Better cold temperature tolerance

Our plant growth materials lead the industry in quality, effectiveness, and cost efficiency.



Ocean Organics®

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