SUCCESS STORY

There are numerous benefits to using products containing SumaGrow. While most of our success stories focus on increasing yield, and reducing or eliminating fertilizer, the attached before and after soil analyses demonstrated significant improvements in the soil's water efficiency and the nutrients measured in the soil increased from 8% to 91%.

The soil samples are from the Jack R. Hammett Sports Complex, owned by the city of Costa Mesa, California, and were treated with Natura Soil Enhancer, SumaGrow inside. Since the sports fields use recycled water, it makes high pH and chlorides constant concerns. Despite these added issues, in less than three months, the pH in the treated fields went down slightly and the chloride and salinity levels dropped 26% and 34%, while the soil moisture (field capacity) increased from 63% to 69%.

	12/8/11	2/28/2012	**Percentage**
Description	average	average	**Change**
pH	7.68	7.59	**-1.17%**
Salinity	1.52	1.12	**-26.32%**
Chloride	210	137	**-34.76%**
Soil Moisture	63%	69%	**+9.52%**
SAR	7.0	5.8	**-17.14%**

Soil ***salinity*** is the salt content in the soil. Salt-affected soils are caused by excess accumulation of salts from high salinity irrigation water, the use of potassium as a fertilizer, which can form a naturally occurring salt, in saltwater coastal areas where atmospheric deposition naturally occurs, or salts can be transported to the soil surface by capillary transport from a salt laden water table and then accumulate due to evaporation. As soil salinity increases, salt effects can result in degradation of soils and vegetation.

Accumulation of soluble salts (brine, salt, and chloride may be used interchangeably for our purposes) is not normally a hazard to human health; however, it can cause adverse and long lasting environmental impacts to soil and ground water resources because chloride is highly soluble, does not adsorb onto soil particles, does not degrade, and generally inhibits biological processes.

Releases of salt onto the ground can damage soils by destroying the soil structure and permeability. The presence of high concentrations of soluble salts can inhibit seed germination and a plant's ability to uptake water. Salt-contaminated soil in the near surface can lose its ability to support agricultural crops, native grasses, or other vegetation if salt levels are high enough, potentially contributing to surface erosion.

Chloride is the most recent addition to the list of essential elements and is essential for many plant functions; however, too much chloride in plants results in symptoms that are similar to typical cases of salt damage. As shown in the attached reports, the chloride target is <150 and Natura Soil Enhancer, SumaGrow inside, brought the chloride from an average of 210, outside the target range, down to an average of 137, within the target range.

Soil Moisture (or Field Capacity) is typically defined as the quantity of water, or moisture, contained in the soil 2-3 days after rain or irrigation. Natura Soil Enhancer, SumaGrow inside increased the ability of these fields to hold water.

Sodium Adsorption Ratio (SAR) is a measure of the suitability of water for use in agricultural irrigation, as determined by the concentrations of solids dissolved in the water. Although SAR is only one factor in determining the suitability of water for irrigation, in general, the higher the sodium adsorption ratio, the less suitable the water is for irrigation. Irrigation using water with a high sodium adsorption ratio may require soil amendments to prevent long-term damage to the soil.

If irrigation water with a high SAR is applied to a soil for years, the sodium in the water can displace the calcium and magnesium in the soil. This will cause a decrease in the ability of the soil to form stable aggregates and a loss of soil structure and tilth. This will also lead to a decrease in infiltration and permeability of the soil to water leading to problems with crop production.

These laboratory reports clearly show the soil's water efficiency being improved. There is more water in the soil, as evidenced by the higher soil moisture percentage, the water in the soil is more available to the plant life since the lower amount of salts in the soil allow more soil moisture to be used by the grass being grown, and the SAR indicates the water in the soil is a higher quality water than before treatment started. These results were achieved without any significant rainfall.

The nutrient levels increased across the board with every element measured showing increases, some very significant. This is especially significant when considering the short period of time between the soil tests, and accepting that Natura Soil Enhancer, SumaGrow inside is primarily a microbial product which takes more time than fertilizer to show initial results.

The city of Costa Mesa did continue its fertilization program (slow release 32-0-0) during the field trial, however, this would only have affected the increase in soil available nutrients for nitrates, and even then, not to the degree shown. Further, other field trials using products containing SumaGrow show even better results if fertilizer is dramatically reduced.

The microbial formulation of Natura Soil Enhancer, SumaGrow inside, would have to be given the credit for the 48% to 91% increases in manganese, zinc, copper, boron and magnesium, all essential nutrients for optimal growth.

	12/8/2011		2/28/2012		**Percentage**
Description	average		average		**Increase**
Nitrate	13		19		**46.15%**
Phosphorus	42.2		65.4		**54.98%**
Potassium	475		532		**12.00%**
Iron	29.1		38.66		**32.85%**
Manganese	0.93		1.78		**91.40%**
Zinc	11.39		17.64		**54.87%**
Copper	3.57		5.29		**48.18%**
Boron	0.39		0.58		**48.72%**
Magnesium	351		384		**9.40%**
Sodium	552		627		**13.59%**
Sulfur	57		62		**8.77%**

WALLACE LABS	SOILS REPORT	Print Date	Dec 7, 2011	Receive Date	12/6/11
365 Coral Circle	Location	City of Costa Mesa, Reference Number 26584			
El Segundo, CA 90245	Requester	Will Harrison, Target Specialty Products			
(310) 615-0116	graphic interpretation: * very low, ** low, *** moderate				

ammonium bicarbonate/DTPA — * * * * high, * * * * * very high

extractable - mg/kg soil	Sample ID Number	11-341-02		11-341-03		11-341-04		11-341-05	
Interpretation of data	Sample Description	1 and 2		3 and 4		4		5 and 6	
low medium high	elements		graphic		graphic		graphic		graphic
0 - 7 8-15 over 15	phosphorus	39.62	*****	45.13	*****	36.84	*****	47.24	*****
0-60 60 -120 121-180	potassium	515.86	*****	513.78	*****	498.46	*****	370.62	*****
0 - 4 4 - 10 over 10	iron	27.79	*****	26.26	*****	22.44	*****	39.89	*****
0- 0.5 0.6- 1 over 1	manganese	0.97	***	0.89	***	0.96	***	0.90	***
0 - 1 1 - 1.5 over 1.5	zinc	12.12	*****	12.11	*****	10.73	*****	10.60	*****
0- 0.2 0.3- 0.5 over 0.5	copper	3.31	*****	3.71	*****	3.59	*****	3.65	*****
0- 0.2 0.2- 0.5 over 1	boron	0.37	***	0.39	***	0.42	***	0.37	***
	calcium	477.77	****	498.21	****	440.89	****	671.39	*****
	magnesium	315.02	*****	366.74	*****	394.12	*****	329.33	*****
	sodium	494.93	*****	541.20	*****	608.40	*****	562.54	*****
	sulfur	45.32	**	59.59	**	74.67	**	47.49	**
	molybdenum	0.10	***	0.05	***	0.06	***	0.19	****
	nickel	0.73	*	0.73	*	0.68	*	0.61	*
The following trace	aluminum	n d	*	0.69	**	n d	*	n d	*
elements may be toxic	arsenic	0.15	*	0.14	*	0.19	*	0.17	*
The degree of toxicity	barium	0.45	*	0.40	*	0.40	*	0.35	*
depends upon the pH of	cadmium	0.11	*	0.11	*	0.11	*	0.02	*
the soil, soil texture,	chromium	0.03	*	n d	*	n d	*	n d	*
organic matter, and the	cobalt	0.07	*	0.05	*	0.05	*	0.21	*
concentrations of the	lead	1.60	**	0.75	*	1.38	**	0.21	*
individual elements as well	lithium	0.32	*	0.32	*	0.30	*	0.49	*
as to their interactions	mercury	n d	*	n d	*	n d	*	n d	*
	selenium	0.24	*	0.32	*	0.21	*	n d	*
The pH optimum depends	silver	n d	*	n d	*	n d	*	0.02	*
upon soil organic	strontium	2.78	*	3.12	*	3.00	*	4.85	*
matter and clay content-	tin	n d	*	n d	*	n d	*	n d	*
for clay and loam soils:	vanadium	0.73	*	0.73	*	0.77	*	0.63	*
under 5.2 is too acidic									
6.5 to 7 is ideal	Saturation Extract								
over 8.0 is too alkaline	pH value	7.60	****	7.51	****	7.80	****	7.80	****
The ECe is a measure of	ECe (milli-	1.47	***	1.59	***	1.54	***	1.49	***
the soil salinity:	mho/cm)		millieq/l		millieq/l		millieq/l		millieq/l
1-2 affects a few plants	calcium	42.7	2.1	51.0	2.6	49.5	2.5	47.7	2.4
2-4 affects some plants,	magnesium	16.2	1.3	18.6	1.5	18.6	1.5	17.8	1.5
> 4 affects many plants.	sodium	201.4	8.8	232.4	10.1	233.2	10.1	222.4	9.7
	potassium	32.7	0.8	32.1	0.8	24.8	0.6	29.9	0.8
	cation sum		13.1		15.0		14.8		14.3
problems over 150 ppm	chloride	210	5.9	203	5.7	216	6.1	210	5.9
good 20 - 30 ppm	nitrate as N	17	1.2	19	1.3	8	0.6	10	0.7
	phosphorus as P	2.9	0.1	3.7	0.1	1.9	0.1	2.8	0.1
toxic over 800	sulfate as S	64.1	4.0	67.2	4.2	79.3	5.0	70.2	4.4
	anion sum		11.2		11.4		11.7		11.1
toxic over 1 for many plants	boron as B	0.36	**	0.43	***	0.47	***	0.42	***
increasing problems start at 3	SAR	6.7	****	7.1	****	7.2	****	7.0	****
est. gypsum requirement-lbs./1000 sq. ft.		106		131		151		122	
	relative infiltration rate	slow		slow		slow		slow	
	estimated soil texture	clay loam		clay loam		clay loam		clay loam	
	lime (calcium carbonate)	low		low		low		low	
	organic matter	low/fair		low/fair		low/fair		low/fair	
	moisture content of soil	30.3%		29.0%		28.5%		34.9%	
	half saturation percentage	44.3%		44.9%		49.9%		55.6%	

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
pH and ECe are measured in a saturation paste extract. nd means not detected.
Analytical data determined on soil fraction passing a 2 mm sieve.

WALLACE LABORATORIES, LLC
365 Coral Circle
El Segundo, CA 90245
phone (310) 615-0116 fax (310) 640-6863

December 8, 2011

Will Harrison, will.harrison@target-specialty.com
Target Specialty Products
15415 Marquardt Avenue
Santa Fe Springs, CA 90670

RE: City of Costa Mesa, Reference Number 26584

Dear Will,

Summary Data

description	1 and 2	3 and 4	4	5 and 6	average	target
pH	7.60	7.51	7.80	7.80	7.68	6.5-7.9
salinity	1.47	1.59	1.54	1.49	1.52	0.5-3
chloride	210	203	216	210	210	<150
nitrate	17	19	8	10	13	20-30
phosphorus	39.6	45.1	36.8	47.2	42.2	8-20
potassium	516	514	498	371	475	60-180
iron	27.8	26.3	22.4	39.9	29.1	4-15
manganese	0.97	0.89	0.96	0.90	0.93	0.6-3
zinc	12.12	12.11	10.73	10.60	11.39	1-3
copper	3.31	3.71	3.59	3.65	3.57	0.2-3
boron	0.37	0.39	0.42	0.37	0.39	0.2-0.5
magnesium	315	367	394	329	351	25-100
sodium	495	541	608	563	552	<200
sulfur	45	60	75	47	57	25-100
SAR	6.7	7.1	7.2	7.0	7.0	<4
moisture	68%	65%	57%	63%	63%	65% - 80%

The average pH is moderately alkaline at 7.68. The pH values range from 7.51 to 7.80. Salinity is moderate at 1.52 millimho/cm on average. The salinity ranges from 1.49 to 1.59 millimho/cm. Chloride is slightly elevated at 210 parts per million in the saturation extract, on average. Sodium is the predominate soluble cation in the saturation extract. Soluble calcium is low. High sodium causes soils to disperse, slake and compact. The average SAR (sodium adsorption ratio) value is 7.0. It ranges from 6.7 to 7.2. SAR should be less than about 3 for ornamentals. Sodium can be lowered with the use of gypsum and leaching.

Nitrogen is low in samples 4 and 5+6. Phosphorus and potassium are high. The micronutrients are high except for moderate manganese. Total available sodium is high at

563 parts per million on average. Non-essential trace metals are not excessive. Soil moisture is modest on average at about 63% of field capacity.

Recommendations

Lower the sodium and SAR values. Excess sodium impairs the physical soil properties and is a competitive inhibitor of potassium. If compaction is high and restricts the rate of drainage, enhance the rate of drainage.

Apply gypsum at 15 pounds per 1,000 square feet quarterly for about 1 year. After each application, irrigate deeply and lower the sodicity and salinity which results from the addition of gypsum. Normally irrigate deeply but not frequently. Balance soil moisture with soil aeration.

Apply ammonium sulfate (21-0-0) at 5 pounds per 1,000 square feet about 4 times a year. Ammonium sulfate (21-0-0) helps to lower the alkalinity.

Continue to monitor the site with periodic testing.

Sincerely,

Garn A. Wallace, Ph. D.
GAW:n

WALLACE LABS	SOILS REPORT	Print Date	Feb 27, 2012	Receive Date	2/24/12
365 Coral Circle	Location	62951- Costa Mesa			
El Segundo, CA 90245	Requester	Will Harrison, Target Specialty Products			
(310) 615-0116	graphic interpretation: * very low, ** low, *** moderate				
ammonium bicarbonate/DTPA	**** high, ***** very high				

extractable - mg/kg soil Interpretation of data low medium high	Sample ID Number Sample Description elements	12-58-04 1+2	graphic	12-58-05 3+4	graphic	12-58-06 4	graphic	12-58-07 5+6	graphic
0 - 7 8-15 over 15	phosphorus	70.53	*****	75.79	*****	73.60	*****	41.61	*****
0-60 60 -120 121-180	potassium	631.45	*****	451.14	*****	539.38	*****	507.60	*****
0 - 4 4 - 10 over 10	iron	51.03	*****	30.74	*****	42.46	*****	30.38	*****
0- 0.5 0.6- 1 over 1	manganese	2.05	****	1.52	****	1.65	****	1.91	****
0 - 1 1 - 1.5 over 1.5	zinc	23.26	*****	14.65	*****	19.47	*****	13.17	*****
0- 0.2 0.3- 0.5 over 0.5	copper	5.51	*****	3.87	*****	6.03	*****	5.75	*****
0- 0.2 0.2- 0.5 over 1	boron	0.50	****	0.63	****	0.62	****	0.57	****
	calcium	620.63	*****	552.47	****	585.70	****	595.00	****
	magnesium	386.29	*****	302.69	*****	382.08	*****	464.83	*****
	sodium	530.03	*****	558.22	*****	569.29	*****	850.26	*****
	sulfur	43.44	**	60.93	**	65.55	**	76.62	**
	molybdenum	0.11	****	0.07	***	0.09	***	0.10	****
	nickel	0.98	*	0.78	*	0.93	*	1.19	**
The following trace	aluminum	n d	*	n d	*	n d	*	n d	*
elements may be toxic	arsenic	0.18	*	0.18	*	0.20	*	0.27	*
The degree of toxicity	barium	0.56	*	0.37	*	0.47	*	0.50	*
depends upon the pH of	cadmium	0.18	*	0.13	*	0.17	*	0.14	*
the soil, soil texture,	chromium	0.03	*	0.02	*	n d	*	n d	*
organic matter, and the	cobalt	0.02	*	n d	*	0.02	*	0.06	*
concentrations of the	lead	2.27	**	1.28	**	2.47	**	1.89	**
individual elements as well	lithium	0.41	*	0.33	*	0.38	*	0.38	*
as to their interactions	mercury	n d	*	n d	*	n d	*	n d	*
	selenium	n d	*	0.02	*	0.25	*	0.13	*
The pH optimum depends	silver	n d	*	n d	*	n d	*	n d	*
upon soil organic	strontium	3.60	*	2.79	*	3.31	*	3.80	*
matter and clay content-	tin	n d	*	n d	*	n d	*	n d	*
for clay and loam soils:	vanadium	0.85	*	0.67	*	0.85	*	0.85	*
under 5.2 is too acidic									
6.5 to 7 is ideal	Saturation Extract								
over 8.0 is too alkaline	pH value	7.50	****	7.52	****	7.63	****	7.69	****
The ECe is a measure of	ECe (milli-	0.98	***	0.99	***	1.14	***	1.38	***
the soil salinity:	mho/cm)		millieq/l		millieq/l		millieq/l		millieq/l
1-2 affects a few plants	calcium	35.3	1.8	35.9	1.8	40.3	2.0	42.6	2.1
2-4 affects some plants,	magnesium	14.1	1.2	14.1	1.2	14.1	1.2	15.7	1.3
> 4 affects many plants.	sodium	136.9	6.0	142.4	6.2	169.6	7.4	218.7	9.5
	potassium	30.5	0.8	27.3	0.7	24.5	0.6	19.1	0.5
	cation sum		9.7		9.9		11.2		13.4
problems over 150 ppm	chloride	110	3.1	110	3.1	133	3.8	193	5.4
good 20 - 30 ppm	nitrate as N	19	1.4	22	1.6	18	1.3	15	1.1
	phosphorus as P	4.7	0.2	5.5	0.2	4.8	0.2	2.3	0.1
toxic over 800	sulfate as S	34.0	2.1	33.7	2.1	48.6	3.0	57.5	3.6
	anion sum		6.7		7.0		8.3		10.2
toxic over 1 for many plants	boron as B	0.38	**	0.43	***	0.35	**	0.42	***
increasing problems start at 3	SAR	4.9	***	5.1	***	5.9	***	7.3	****
est. gypsum requirement-lbs./1000 sq. ft.		135		112		140		215	
	relative infiltration rate	slow		slow/fair		very slow		very slow	
	estimated soil texture	loam		loam		loam		loam	
	lime (calcium carbonate)	no		slight		slight		slight	
	organic matter	fair/low		fair/low		fair/low		fair/low	
	moisture content of soil	41.6%		36.2%		34.0%		40.9%	
	half saturation percentage	57.6%		57.3%		51.4%		55.9%	

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
pH and ECe are measured in a saturation paste extract. nd means not detected.
Analytical data determined on soil fraction passing a 2 mm sieve.

WALLACE LABORATORIES, LLC
365 Coral Circle
El Segundo, CA 90245
phone (310) 615-0116 fax (310) 640-6863

February 28, 2012

Will Harrison, will.harrison@target-specialty.com
Target Specialty Products
15415 Marquardt Avenue
Santa Fe Springs, CA 90670

RE: 62951 Costa Mesa

Dear Will,

Summary Data

description	1+2	3+4	4	5+6	average	target
pH	7.50	7.52	7.63	7.69	7.59	6.5-7.9
salinity	0.98	0.99	1.14	1.38	1.12	0.5-3
chloride	110	110	133	193	137	<150
nitrate	19	22	18	15	19	20-30
phosphorus	70.5	75.8	73.6	41.6	65.4	8-20
potassium	631	451	539	508	532	60-180
iron	51.03	30.74	42.46	30.38	38.66	4-15
manganese	2.05	1.52	1.65	1.91	1.78	0.6-3
zinc	23.26	14.65	19.47	13.17	17.64	1-3
copper	5.51	3.87	6.03	5.75	5.29	0.2-3
boron	0.50	0.63	0.62	0.57	0.58	0.2-0.5
magnesium	386	303	382	465	384	25-100
sodium	530	558	569	850	627	<200
sulfur	43	61	66	77	62	25-100
SAR	4.9	5.1	5.9	7.3	5.8	<4
field capacity	72%	63%	66%	73%	69%	65% - 75%

The average pH is moderately alkaline at 7.59. The pH values range from 7.50 to 7.69. Salinity is moderate at 1.12 millimho/cm on average. The salinity ranges from 0.98 to 1.38 millimho/cm. Sodium is the predominate soluble cation in the saturation extract. Soluble calcium is low. High sodium causes soils to disperse, slake and compact which reduces the porosity and percolation rate. The average SAR (sodium adsorption ratio) value is 5.8. It ranges from 4.9 to 7.3. SAR should be less than about 3 for ornamentals. Sodium can be lowered with the use of gypsum and leaching.

Nitrogen is moderate. Phosphorus and potassium are high. The micronutrients are high. Sulfur is modest. Total available sodium is high at 627 parts per million on average. Non-essential trace metals are not excessive. Soil moisture is modest on average at about 71% of field capacity.

Soil moisture is moderate on average at about 69% of field capacity.

Recommendations

Lower the sodium and SAR values. Excess sodium impairs the physical soil properties and is a competitive inhibitor of the uptake of potassium. If compaction is high and restricts the rate of drainage, enhance the rate of drainage.

Apply gypsum at 15 pounds per 1,000 square feet quarterly for about 1 year. After each application, irrigate deeply and lower the sodicity and salinity which results from the addition of gypsum. Normally irrigate deeply but not frequently. Balance soil moisture with soil aeration.

Apply ammonium sulfate (21-0-0) at 5 pounds per 1,000 square feet about 4 times a year. Ammonium sulfate (21-0-0) helps to lower the alkalinity.

Continue to monitor the site with periodic testing.

Sincerely,

Garn A. Wallace, Ph. D.
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