WaterSOLV™ Solutions

Optimum Vegetation Vitality & Production
Through Soil
by Sustainable Water Treatment

HCT
SOLUTIONS TO WATER

Introduction

An in-depth educational tutorial
of HCT's WaterSOLV™ Program.

Founded on chemistry, science, physics and biology
Irrefutable - Empirically Reproducible across North America

HCT, LLC Introduces Water**SOLV**™

A prescription of up to three products
that "sustainably"
treats water and remediates soil
by chemical injection or topical application

No nutritional additives – Grade 0-0-0
We're liberating and sequestering elements of water and nutrition,
that are in your water, and that have accumulated in your soils

New chemical technology
Replacing the need for acid and gypsum

Safe
Perpetuates vegetation health, vitality and pest resistance
Lowers costs and improves production

Founded on

Chemistry

Science

Biology

Physics

Empirical, Reproducible Successes

5 years

USA, Mexico and Canada

Three Products

- WaterSOLV™ Curative
- WaterSOLV™ BC
- HCT WaterSOLV

Treating/Remediating

Elements of water, soil and biology

Element
Oxygen
Water
Nitrogen
Sodium
Chloride
Zinc
Sulfur
Manganese
Magnesium
Boron
Potassium
Phosphate
Calcium
Iron
Copper
Aluminum

+ Bacteria and their by-products

Accreditations & Academia

Chemically, Scientifically, Biologically, and Physically

CDFA Approved!

Perhaps the only one of its kind

Registered for use in offline cleaning of potable water systems.

We like rain because it is pure water and our vegetation responds.

Is it the rain, or the dissolved oxygen, or both?

What else becomes soluble, N is next?
Then what comes – Na, Cl, toxicity and tissue burn?

Did you think rain was about flushing salts and making nutrients available?

We did too until we did the study.

Even deionized water does not dissolve soi bound products
But it does readily dissolve N, sodium and zinc!

See the video at our YouTube Channel

How is Vegetation Vitality Accomplished

with 1/10th the amount of sulfurous acid

and only 70-80% of the water necessary

with less nutrition

no sulfurous acid
no additional gypsum

yields increased 20% on nuts - 50% on citrus

and soils readily taking in water?

"SOLV Problems"

Primary Problems

1. Getting water down / Infiltration / Confining Layer

2. Continuous available hydration, nutrition, oxygen and detoxification of sodium and chloride

3. Biology – Soils turn Cementous from sulfuric acid and gypsum. Soils then can turn anoxic from bacteria, black layer and root rot of from bio-films (iron slime) – both of which are caused by bacteria as well as the lack of sufficient oxygen in the soil, which is ALSO why our soils needs pore space (30-40%), measurable by water absorption rate.

Solutions: Convert soil cementation and nutrition to available nutrition
Manage biology to alleviate films and toxins
Detoxify sodium and chloride salts
Create adequate soil pore space
Reduce costs, increase revenues
Harvest soil nutrition, enhance yield volume and grade
15% less water, pumping costs and nutrition

The impact of available hydration and nutrition
(Same branch, without and with treatment, next leaf)
No change in nutrition additives, just making available what was there

Why would Nitrogen, Nitrates, Sodium, Zinc, Boron and Chloride
be complexed in our soils when they are so soluble?

In any form of water, good or bad, they should solubilize!
With good soil structure – CEC, SAR, Pore Space - they should flush!

But if the soils have restricting layers preventing flushing,
our most soluble salts are toxins
that accumulate and become the most
available solution for our plants to drink when hydrated.

What are Restricting Soil Layers?

They are reported in soil analyses as exchangeables;

- Carbonate bonds of calcium and magnesium
- Valence bonds, like calcium phosphate
- Chloride bonds like calcium, sodium, iron, zinc & boron

Most restricting layers are NOT – We said NOT identified by Exchangeable Soil Analyses

Total Digestion Soils Analysis is what is necessary
You must include Total Nitrogen, the minerals and metals

Analytical Chemistry – The Lab Work

The

Elements / Nutrients / Toxins

of

your water,
soil and fertilizers

Element
Oxygen
Water
Nitrogen
Sodium
Chloride
Zinc
Sulfur
Manganese
Magnesium
Boron
Potassium
Phosphate
Calcium
Iron
Copper
Aluminum

<<< Less **Solubility** More >>>

Are these not the elements you see in every water and soil analysis?

Then you also see the physical and transient indicators;

Physical like SAR and CEC

Transient like Ec and pH

But note the natural "Solubility" of each element over the other

As when it rains;
Oxygen - good
Water - good
Nitrogen - good
then Sodium - bad

When does the
Calcium and Iron come
Available – ever - how?

Water Types

Whether Rain, Creek, Stream, River, Snow Melt or 1-7 grades of Reclaim

We are still dealing with the same elements and their natural tendencies.

<< Less **Solubility** More >>

Element	Surplus Potential	
Oxygen		
Water		
Nitrogen	Suffocating	
Sodium	Toxic	
Chloride	Toxic	
Zinc		
Sulfur		Bio Toxicity
Manganese		Bio Toxicity/Films
Magnesium		
Boron	Toxic	
Potassium		
Phosphate	Hinder Flow	
Calcium	Hinder Flow	
Iron	Hinder Flow	Bio Films
Copper		
Aluminum	Hinder Flow	

Rain does not flush or liberate bonds of Bicarbonate, chlorides or valence, except for the Toxic salts (sodium, chloride and zinc)

How bad is your water, compared to water we already treat?
Likewise for soils - We have data!

HCT WaterSOLV™ Report

Reset | Share

188	teden@hctllc.com	todd eden	HCT, LLC	turf	215	180	395	232	112	155	1	50	2	3.14	1.02	0.5	0.17
189	teden@hctllc.com	todd eden	HCT, LLC	turf	25	12	37	53	13	13	0	3	0.3	0.45	0.15	0.07	0.02
190	teden@hctllc.com	todd eden	HCT, LLC	turf	70	20	90	144.5	132	108	10	42	2	1.17	0.38	0.5	0.17
191	eliteacid@hotmail.com	david rose	Elite Acid Inc	agriculture	240	75	315	394.5	215	101	14	0	0	3.55	1.16	0	0
192	eliteacid@hotmail.com	david rose	Elite Acid Inc	agriculture	367	200	568	233.5	82	60	41	0	0	4.01	1.31	0	0
193	eliteacid@hotmail.com	david rose	Elite Acid Inc	agriculture	366	262	628	678.51	229	248	19	123	0	6.53	2.13	0	0
194	eliteacid@hotmail.com	david rose	Elite Acid Inc	agriculture	115	102	218	200	33	57	15	13	0	2.09	0.68	0	0
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197	eliteacid@hotmail.com	david rose	Elite Acid Inc	agriculture	95	41	136	130	19	6	12	23	0	1.33	0.43	0	0
198	eliteacid@hotmail.com	david rose	Elite Acid Inc	agriculture	123	102	225	200	33	57	15	13	0	2.13	0.69	0	0
199	teden@hctllc.com	todd eden	HCT, LLC	agriculture	110	221	331	300	18	16	0	94	5	3.16	1.03	1.25	0.42
200	eliteacid@hotmail.com	david rose	Elite Acid Inc	agriculture	155	87	242	255	56	21	15	27	0	2.48	0.81	0	0
201	billg@basinfertilizer.com	bill gasser	Basin Fertilizer & Chemical Co., LLC	agriculture	98	189	286	157	81	12	0	0	4	2.22	0.72	1	0.33

126 - 150 / 321

Requirements

Ca (ppm) 0 – 17,370

Mg (ppm) 0 – 2,255

Total Hardness 0 – 3,932

HCO3 (ppm) 0 – 4,200

Notations

Na (mg/l) 0 – 1,692

Cl (mg/l) 0 – 7,213

NO3-N (mg/l) 0 – 953

SO4 (mg/l) 0 – 2,100

Type

Total Bacteria 0 – 7

Data Last Updated: 10/6/2021 10:09:02 AM | Privacy Policy

HCT's Methods of Analytical Chemistry

1. Water Quality

2. Water Bacteria – New to the industry

   Developed by HCT 6/2019
   Industry adopting

3. Soil - Available Nutrition – Improved Method 9/2021

4. Soil - Exchangeables – Improved Method 9/2021

Be that Trusted Advisor

Knowledge is Power!

Differentiation

1. **WATER - Irrigation Suitability Analysis – 1 of 3**

What's in my water, nutrients – how much too much, not enough, toxins, how much, what's going to get consumed, not consumed, plug up my greens, hinder infiltration, be toxic, promote biological issues?

"Test for all elements" Minerals and Metals and NO3-N.

Reasoning; to be able to check ratios of elements in soil compared to ratios from the water. What's accumulating in the soil and what do we need to do about it to maintain vegetation predictability.

Example 1: Sodium in soil 900 ppm, in water 900 ppm – Great!
Example 2: Sodium in soil 900 ppm, in water 100 ppm – Problem!

Other elements tell a story, Zn, Cu, Na especially, also Mn.

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Knowledge is Power!

Differentiation

2. **<u>SOIL – Available - Saturated Paste Extract – 2 of 3</u>**

"Reagent grade lab water to a soil sample, 1:1 ratio made into a paste, to indicate the nutrients that will be made available by watering."

PROBLEMS:

A. The most available forms of a product start at a gas, then a liquid, then a powder. If we could make our real soils a powder, then do the test, we'd get better data. But the room for improvement is significant – your treated water, 3:1 water to soil, 72 hours soak time before extracting the elements (good and bad, through the bad release right away (as in sodium and Zn.

B. The actuality of your real water, which is already saturated with minerals, and metals, and also biology, treated, with the improved methods, will give you the proper data to feed your vegetation while sustaining your soils physicality.

SOLUTION:

Inspect what you expect! Have this test done with your actual treated water. Supply the lab with your treated water. Also, designate the soil DETAILS – SEE HCT FOR WRITTEN GUIDELINES/FORMS.

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Knowledge is Power!

Differentiation

3. **<u>SOIL – Exchangeable – 3 of 3</u>**

Also reported as AA/DTPA, Ammonium Acetate and Mehlich III

"In place of using water to break down what's in the soil, labs use stronger acids to see what it shows and reports it as "exchangeable".

PROBLEMS:

A. We usually always see plenty of elements in the soil as "exchangeable", though not available, therein we put more on, without regards to soil conditions relating to pore space, infiltration, oxygen content, bio-films, getting water down!

B. We are consulted to acidify the water and soils attempting to dissolve the "exchangeables", and yet find the exchangeable levels even more year over year – having added acid, more sulfur, calcium (gypsum) and nitrogen, finding the accumulating even more.

SOLUTION:

Effectively and sustainably begin consuming the exchangeable to restore the soils pore space and operation. Vegetation become what we provide them to drink, on their demand resulting in optimum vitality and predictability due to soil conditions and soil uniformity.

Be that Trusted Advisor

Knowledge is Power!

Differentiation

3. **SOIL – TOTAL Exchangeable – 3 of 3**

OUT WITH THE OLD – IN WITH THE NEW

What if we told you the Exchangeable were must greater than the current analysis reported?

What if we told you your soils were toxic from one or all these conditions;

Mineral Cementation (Calcium)

Metal Encrustation (Iron and Aluminum)

Harboring Toxins (lack of infiltration hold rancid, bio, toxic water, sodium and chloride salts and potentially impenetrable bio films and or toxic gasses

SOLUTION:

EPA Method 200.7 – typically used for heavy metals – comprised of soil digestion using muriatic acid (HCl), Nitric Acid and Hydrogen Peroxide). Same cost as running "EXCHANGEABLE"

Method Comparison Results

Available

Table 1: Saturated paste extract:

Lab no.	pHc	Electrical conductivity mmho/cm	Nitrate mg/L NO3-N	Ammonium mg/L NH4-N
112480		2.28	<0.10	23.6

Water soluble cations

Phosphorus mg/L P	Potassium mg/L K	Sulfur mg/L S	Calcium mg/L Ca	Magnesium mg/L Mg	Sodium mg/L Na
1.2	114	187	205	56.7	123

Water soluble micronutrients

Zinc mg/L Zn	Iron mg/L Fe	Manganese mg/L Mn	Copper mg/L Cu	Boron mg/L B	Aluminum mg/L Al
0.09	0.51	6.42	0.09	0.08	0.22

Exchangeable Type 1 Method

Table 2: Conc. salt solution/chelate extract:

Lab no.	Soil pH 1:1 soil: water	Soluble salts mmho/cm	Organic matter % OM	--- --- ---
112480	7	0.7	2.5	

Ammonium acetate cations

Phosphorus ppm P	Potassium ppm K	Sulfur ppm S	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na
13	119	104	893	136	93

DTPA-sorbital micronutrients

Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B	Aluminum ppm Al
8.4	55	8.3	2.6	0.33	

Exchangeable Type 2 Method

Table 3: Strong acid extract:

Lab no.	Soil pH 1:1 soil: water	Soluble salts mmho/cm	Organic matter % OM	--- --- ---
112480	7	0.7	2.5	

Mehlich 3 cations

Phosphorus ppm P	Potassium ppm K	Sulfur ppm S	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na
138	122	116	1060	142	78

Mehlich 3 micronutrients

Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B	Aluminum ppm Al
11.8	416	91	3.4	0.7	98

NEW Total Digestable Method

Table 4: Very strong acid digest:

Lab no.	--- --- ---	--- --- ---	--- --- ---	--- --- ---
112480	---	---	---	---

Nitric acid/peroxide cations

Phosphorus ppm P	Potassium ppm K	Sulfur ppm S	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na
368	258	0.04	3260	1270	173

Nitric acid/peroxide metals

Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B	Aluminum ppm Al
31	3725	171	15	<2	1197

Available

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If you have vegetation problems; if water is not going down,
the only thing we don't know thus far is the biology.

We do know biology feeds on Sulfur, Sulfate, Iron and Manganese
We also know we need pore space and oxygen therein.

Nutritional Availability (with actual water & treatment)

Discontinue

Discontinue

Reality of soil conditions (Total Exchangeable)

Available

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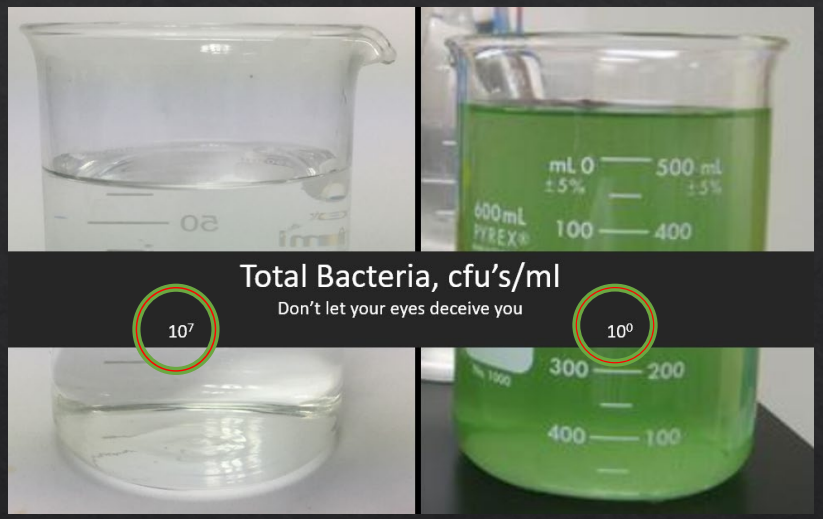
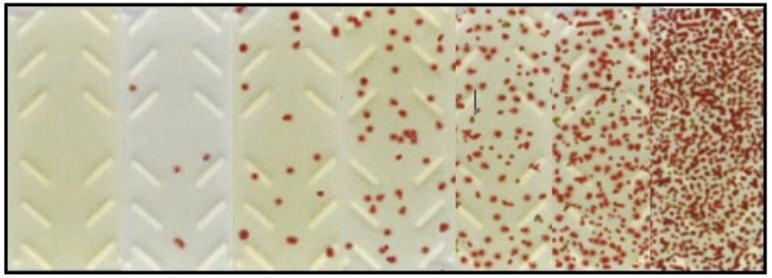
The Biology – Water Bacteria Into Soil Challenges

And what about the Bac T testing?

Which water contains the most bacteria and that would likely be detrimental to vegetation?





<100	10^2	10^3	10^4	10^5	10^6	10^7	**Exponents cfu/ml**
10	100	1,000	10,000	100,000	1,000,000	10,000,000	**cfu's/ml**

Do we assume this is black layer or might it be manganese bacteria, or ferric iron?
Perhaps it has been labeled organic matter?

Bacteria feeding on sulfate, produce acid and toxic gas (H2S)
Bacteria feeding on iron produce slimes – polysaccharides, resistant to just about everything including most acids, but not H2O2. How do we tame the acid(s) and the H2O2 to be vegetation friendly and soil sustainable?
HCT's proprietary - inhibiting and catalyzing chemistry.

Slight variations in chemistry can have significant consequences

Don't guess, test!

Peroxide + Glycolic/Amino Acid + Calcite

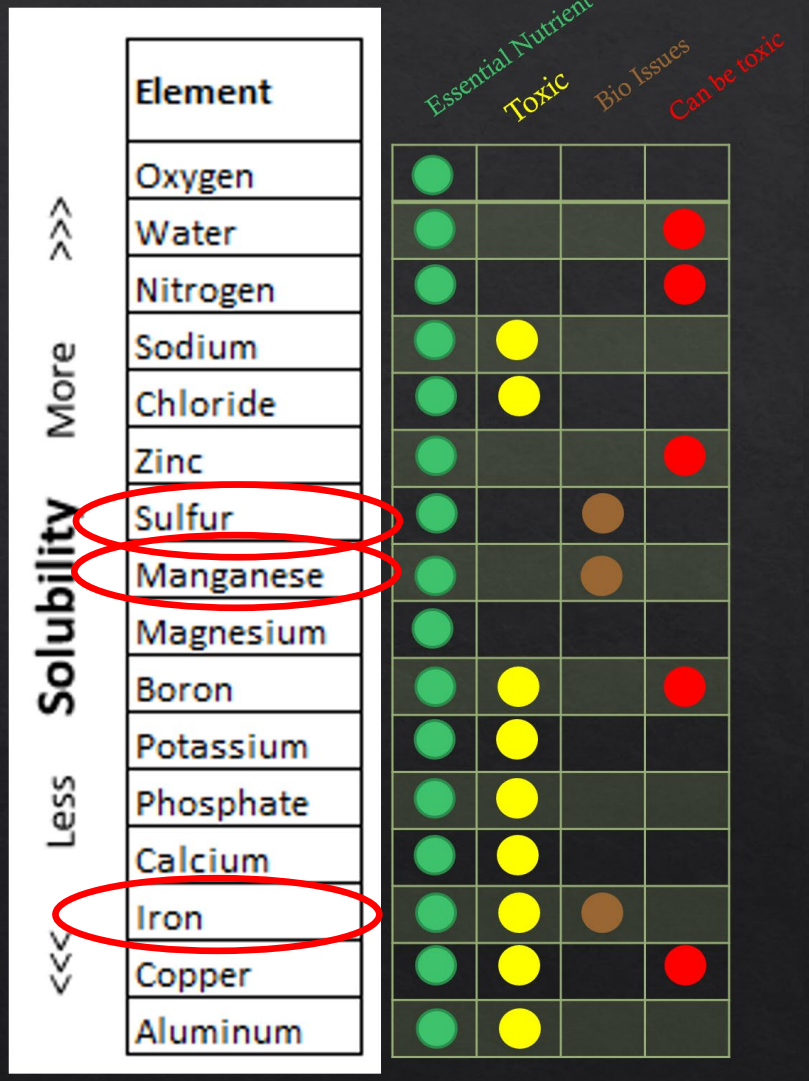
PROBLEM

Peroxide + Glycolic/Amino Acid + HCT's Solutions + Calcite

SOLUTION

WaterSOLV™ BC

Prescription without diagnosis is malpractice.



We Need to Know More About the Water and Soil!

Bacteria Analysis of our water!

If there is too much bacteria in the water
And sufficient bacteria food source

We'll have slime (Fe)
and possibly black layer and root rot (SO4-S, S and Mn)

Increasingly toxifying our soils and vegetation
Because bacteria can replicate exponentially

Our Agronomical Approaches

Conventional Versus HCT Technology

Solubility

<< Less	Element	>> More
	Oxygen	
	Water	
	Nitrogen	
	Sodium	
	Chloride	
	Zinc	
	Sulfur	
	Manganese	
	Magnesium	
	Boron	
	Potassium	
	Phosphate	
	Calcium	
	Iron	
	Copper	
	Aluminum	

Conventional	HCT
None	Add Dissolved Oxygen Chemically
None	A by-product of our chem. is pure H2O
Has to use with acid as inhibitor	Contains no N whatsoever
Flush, add Ca and or organic matter	Chemically detoxify
None	Chemically detoxify
Use chelants to make soluble	Liberate from Cl, sequester and consume
They keep adding more with Ca	Liberate from Ca, sequester and consume
Flush	Oxidize with BC and sequester for consumption
Keep 1:5 ratio with Ca	Liberate from HCO3, sequester and consume
Flush with water	Liberate from Cl & Na, sequester and consume
Add more	Liberate from valence bonds, sequester and consume
Add more	Liberate from valence bonds, sequester and consume
Acidify, add more gypsum	Liberate from bonds, sequester and consume
Acidify	Liberate from bonds, sequester and consume
Flush	Liberate from bonds, sequester and consume
None	Liberate from bonds, sequester and consume

Characteristics of Elements in Water and Soils

<< Less Solubility More >>>

Element	Beneficial	Solubility Issues	Traits
Oxygen	Yes		
Water	Yes		
Nitrogen	Yes - limited		Can hinder oxygen flow
Sodium	No		Toxic with water, bonds with calcium and still toxic
Chloride	No		Toxic with water
Zinc	Yes - limited		Can be toxic at elevated levels
Sulfur	Yes - limited		Can be food souce for bacteria
Manganese	Yes - limited		Can be food souce for bacteria
Magnesium	Yes - limited		
Boron	Yes - limited		Can be toxic with soidum and chloride
Potassium	Yes - if available		
Phosphate	Yes - if available	Yes	Tends to lock with potassium and calcium
Calcium	Yes - if available	Yes	Tends to lock with sodium and phosphate
Iron	Yes - if available	Yes	Can be food souce for bacteria
Copper	Yes - limited		Can be toxic at elevated levels. Beneficial for fungi.
Aluminum	Yes - limited	Yes	Highly insoluble

And still what is missing? Bacteria levels and oxygen content.

The WaterSOLV™ Guide

Solubility: >>> More — <<< Less

Element	Essential Nutrient	Toxic	Bio Issues	Can be toxic	BC	Curative
Oxygen	●				●	
Water	●			●	●	
Nitrogen	●			●	●	
Sodium	●	●			●	●
Chloride	●	●			●	●
Zinc	●			●	●	●
Sulfur	●		●		●	●
Manganese	●		●		●	●
Magnesium	●					●
Boron	●	●		●	●	●
Potassium	●	●				●
Phosphate	●	●				●
Calcium	●	●				●
Iron	●	●	●		●	●
Copper	●	●		●	●	●
Aluminum	●	●				●

Every Watering

On average;

Every ppm of these become lbs per acre if not consumed or flushed.

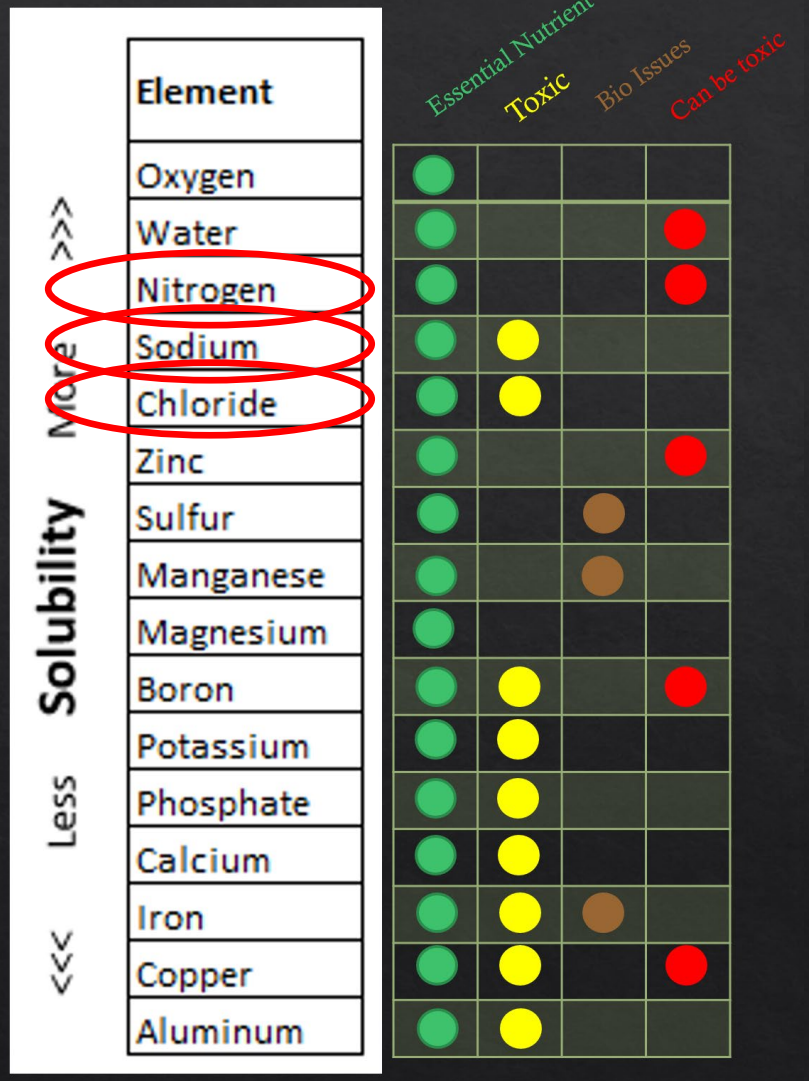
The accumulation in soils adds up to;

Cementation

Saturations of Metals

Harboring of toxins including bio-films, anoxic bacteria and their toxic gasses likely complexes of toxic chloride and sodium.

Initial Treatment Soil Toxins



Over treat and over water to get these treated with WaterSOLV™

But first
you must identify the confining layers through Tiered Soil Analysis, Moisture Analysis and Total Exchangeable Digestion

See your dealer for our "proprietary" soil recommendations

HCT Presents Analytical Data in Buckets

New School		
Traits	Elements: Water & Various Depths of Soil	Notations
Hypothetical Indicator	pH (measure Hydrogen)	Without pH, calculated use renders pH near or less than 8 units
	Hydrogen	When there is a lot they have likely added acid and are struggling
Toxic Culprit	Bicarbonate	Curative Treatment Rates, Bicrarbonate is the gas that releases when descaling carbonate bound salts.
Insoluble, Beneficial	Calcium	
Soluble, Beneficial	Magnesium	
Soluble, Beneficial	Potassium	
Insoluble, Beneficial	Phosphate	
Bacteria + Food = Issues	Total Bacteria	Excessive Bacteria + Food Sources equates to toxicity and slime
Soluble, Beneficial	Sulfur	
Insoluble, Beneficial	Manganese	
Insoluble, Beneficial	Iron	
Black layer - death	Sulfate Bacteria	
Black layer - death	Bacteria - Anaerobic	Toxic
Red Slime	Iron Bacteria	
Bio-films	Bacteria - Aerobic	Slime
Toxic Culprit	Chloride	Extremely soluble. If complexed and saturation layer, every watering will liberate toxic uptake of chloride and sodium salts
Soluble, Detrimental	Sodium	
Soluble, Detrimental	Boron	
Insoluble, Beneficial	Calcium	Can be locked up , infiltration barrier and unavailable as nutrition
Insoluble, Beneficial	Iron	
Soluble, Beneficial	Zinc	
Initial Treatment		The accummulation of these in soils have to be dealt with by extra treatmet and watering or they remain toxic to the vegetation as we liberate them and other elements. Initial treatments require extra product and water.
Soluble, excess toxic	NO3N	
Soluble, excess toxic	NH4	
Soluble, Toxic	Sodium	
Essential	Moisture Content	Get water down, make available nutrition, detoxify toxins
Essential	Water Infiltration Rate	The process begins by getting HCT water throughout the root zone.

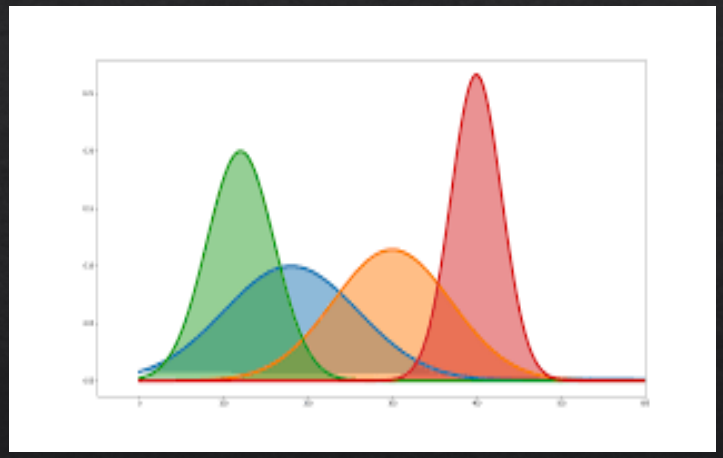
Know the Culprits of Water & Soil

Bicarbonate	The gasses you see liberated when dissolving scale. Mainly calcium and magnesium carbonate. Some call it a fizz test. Reacted elements don't fizz anymore when acidified, they just go back into solution. That's the chemical reaction of HCT and the pH is near neutral because the bicarbonate alkali is gone. pH is the measurement of Hydrogen, nothing else. Hydrogen temporarily disassociates the bicarbonate. We disassociate the same way but then we sequester it so we don't have to do the same cations over and over again. Hance, our soils always remain hydratable and penetrable.
Chloride & Valence	The accumulation of toxins in the soil; calcium chloride, zinc chloride, ferric (iron) chloride and sodium chloride, liberated and sequestered. Bonds of items like calcium phosphate, potassium phosphate, boron with chloride and sodium, calcium oxalates, iron oxides (paint pigment).
Biology	Trillions of species, but two categories for us; Iron Reducing, aerobic, slime formers Sulfate Reducing, anaerobic, acid producers, H2S toxic gas, black layer, root rot, fungi.

Soil Reactions over Time

As soils elements are liberated, their quantity increase from a cube (crystal/complex) to solution. We expect to see the exchangeable increase, the Total Exchangeables "decrease", as we liberate, sequester and create pore space. .

1. Soluble salts flush (sodium, zinc)
2. Other elements get consumed and removed by foliage/tissue



The rate of the reaction can be managed by the volume of chemical applied. The solubilization of the elements over time, depend on 2 primary factors; the solubility of the element (Na/Ca), & the infiltration capacity of the soil.

WaterSOLV™ Use Observations

- Water penetration (No. 1 objective)
- Applying sufficient treatment to get water down
  - and to liberate/detoxify sodium and chloride in confining layers
- Puddling and slosh diminish
- Some flushing of toxins within the vegetation
- pH suppression, moderate reduction (< 8.0)
- All vegetation improves
- Fertilizing and watering frequency decreases
- Yields
  - 20% plus on nuts - 50% on Citrus
- Reductions
  - 15-20% reduction in water demand
    - and related pumping costs
  - Lower costs, more revenue in the budget
- Predictability of outputs, conditions, sustainability
- See Offsets at www.hctllc.com

CURATIVE TRICKLE DOWN EFFECTS

Converts water and soil hardness to nutrition

↓

Renders chloride and sodium inert, non-toxic

↓

Gradually Restores CEC, SAR, Physical Pore Space

↓

Enhances vitality through available nutrition, detoxification and even physical pore space

↓

Restores infiltration and flushing capacity

↓

Cost offset by harvesting soul nutrients, 10-20% water efficiency, quality of play

↓

Impacts everything watered – trees, shrubs, emitter, piping, sprinklers, even shells

↓

Optimum Vegetation Vitality

BC TRICKLE DOWN EFFECTS

STOP anaerobic bacteria in the water before it forms colonies in the soil (black Layer)

↓

Converts water harness to nutrition

↓

Renders chloride and sodium inert, non-toxic

↓

Gradually reduces biofilms and anoxic soil conditions (black layer and iron bacteria)

↓

Restores infiltration and flushing capacity (and pigment removal)

↓

Enhances vitality with continuous “chemical” aerification

↓

Cost offset by 10-20% water efficiency, less resources and quality of play

↓

Impacts everything watered – trees, shrubs, emitter, piping, sprinklers

Optimum Vegetation Vitality

Out with the OLD and in with the NEW

Elements	Old School	New School
Calcium, Magnesium Potassium, Phosphate	Add more regardless of soil conditions	Liberate from bicarbonate and sequester
Sulfur, Sulfate Iron, Manganese	More calcium sulfate, nitrogen from urea and cementing of soils	Liberate from bonds and sequester
Chloride Sodium Boron	Add more Ca or organic matter Flush with water	Liberate, detoxify and sequester
Zinc, Copper	Add more	Add as needed
N	Add more, and more and more	Minimize to under 20 ppm
	What about Biology & Oxygen?	Incorporate WaterSOLV™ BC - Bacteria and Oxygen Mgmt.
	Unsustainable	Sustainable

Know the Essentials to Optimum Vegetation Vitality

1. On demand; available hydration, nutrition and oxygen, throughout the root zone.

2. Pore Space – CEC / SAR

3. Flushing of toxins: With pore space, infiltration and the flushing of toxins should
4. Be readily realized.

5. Aerobic soil profile (free of black layer/sulfate reducing bacteria)

6. Maintaining these conditions, ongoing, with water treatment – versus
7. Frequency of aerification and sanding.

8. Stop adding nutrition to soils when soil is saturated with the nutrient. Fix the soil
9. By topical or chemical injection, for the vegetation to consume the nutrient(s)

10. Accurate data, tracking and trending, including additives, by individual elements.

11. Maintaining the full range of micro and macro nutrients at prescribed levels, in the soil.

More Information . . .

Corrosion

BC is non-corrosive.

Curative, when applied and used as prescribed, is non-corrosive, less corrosive than chlorine, and it inhibits the corrosion of water. Curative fumes are NOT inhibited, and corrosive – the containers should be airtight, or fume scrubbed.

Chlorine is highly corrosive and toxic, not beneficial for soil sustainability.

Certified / Listed

CDFA Certifies. NSF and associated agencies, certify. OMRI lists based on ingredients compliance to the NOP Organic Program Requirements

Fate & Sustainability

Some growers are more fortunate than others, they get to sell the very dirt their plants are grown in, unlike turf, landscape and agriculture.

Vegetation drinks what we make available to it. It is imperative what we put in the soils, remains of value to vegetation when the soil is hydrated and that it perpetuates a healthy soils.

Our soils get aged without proper maintenance. Think of our soils as filters.

Items we Found Surprising

Gypsum (calcium sulfate)
Why add more to your soils if tons are there already?

Gypsum is a desiccant.
It competes for water.

Mono Ammonium Phosphate + Water + bicarbonate

In 7 days
Evaporation to Dryness
Crystals that are NOT soluble in water

Add WaterSOLV™ and water - they will dissolve.
Add WaterSOLV™ before growing, they will not grow.

Have your client take a glass beaker and evaporate his water to dryness in the sun.
Take another beaker, do the same, but add some WaterSOLV™
(pHix preferred – has both Curative and BC)
The WaterSOLV™ will allow water to re-hydrate the scale back into solution.

By making the salts rehydratable, by detoxifying the sodium salts, by dealing with the biology and providing sugars and oxygen, our soils remain the perfect medium to sustain vegetation vitality.

Detoxifying Sodium

Sodium 1,500 to 1,800 ppm
Chloride 2,860 to 4,700 ppm


WaterSOLV™ can Convert Shells to Nutrition at just 3 ppm

We are what we eat

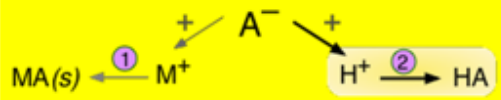
Plants are what we make available for them to drink

Fate and Sustainability of what we feed them
and the impact to our soils,
is essential!

Why Sulfuric has a Short Range Benefit

Salts of weak acids are soluble in strong acids

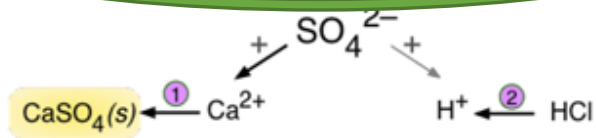
The solubility of a sparingly soluble salt of a weak acid or base will depend on the pH of the solution. To understand the reason for this, consider a hypothetical salt MA which dissolves to form a cation M^+ and an anion A^- which is also the conjugate base of a weak acid HA. The fact that the acid is weak means that hydrogen ions (always present in aqueous solutions) and M^+ cations will both be competing for the A^-:



The weaker the acid HA, the more readily will reaction 2 take place, thus gobbling up A^- ions. If an excess of H^+ is made available by addition of a strong acid [illegible] eventually reversing reaction 1, causing the salt to dissolve.

... but strong acids will *not* dissolve salts of strong acids

Neither will RO, DI or Rain Water



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

National Agronomy Manual

2011

There is a whole lot more there of value than what we exhibit here.

Section 504.07
Irrigation related agricultural salt problems

There are three principles regarding irrigation and salinity that are important to understand;

- all waters used for irrigation contain salts of some kind in some varying amount
- salinization of soil and water is inevitable to some extent
- irrigated agroecosystems cannot be sustained without drainage, either natural or artificial

Application of irrigation water

Application of irrigation water results in the addition of soluble salts. The primary soluble salt constituents of interest are sodium, calcium, magnesium, potassium, sulfate, and chloride dissolved from geologic materials with which the waters have been in contact and alkalinity, i.e. bicarbonate and carbonate, princi-

carbon dioxide. Therefore, water quality needs to be evaluated in terms of assessing the combined effects of salinity, infiltration/permeability (sodicity), and nutritional imbalance/toxicity.

HCT and WaterSOLV™ are Simply Unbelievable

We agree.

Try me, you'll see.

No water test, no soil test, no Bac T test necessary.

Assure you have adequate nutrition
Add WaterSOLV™ pHix between periodic watering's
Watch vegetation blow out of the ground, infiltration improve, everything gets better.

pHix is water, BC and Curative all in one. No concern over existing soil conditions which would normally be sodium levels and NO3-N levels.

The only caveat – if soils are extremely sodium, the treatment rate and watering volume has to be excessive the initial 4-8 watering's to get the chloride salts treated.

Our Customers are Your Customers
We’ve done this across the Country – we’re not rolling the dice
Predictable Outcomes with accurate data

- Over 5 years of success across the country
- Coast to Coast
- Industry to Industry
- Crop to Crop
- Soils, Waters, Environmental Conditions and Variables
- Agriculture, Nurseries, Landscape, Sports Facilities, Golf Courses

Getting Started

1. Short Survey
2. Their water analyses
3. Their Soil Analyses (maybe you run a AAO Total Digestion, also)

4. We run the Bac T analysis for them
5. Do the calculations, interpretations, recommendations & timing
6. Include Chemigation Equipment as well, if needed

7. You do the proposal

What's our Program?

Fix and maintain soil vitality though the treatment of water.

Chemically create viable water quality.

Do this chemically, analytically, scientifically and sustainably.

Who does the Interpretations & Recommendations

Client:	Water Analyses Soil Paste Extractions Total Soils Digestions
HCT or Dealer:	Water Bac T Analyses
Water Calculations:	HCT Mobile app or Excel Spreadsheet
Soil Interpretations:	HCT & HCT will train Dealer Caveats are client timing, N and Na conditions Physical traits to speed up the process HCT Interim evaluations on request ($$$)
Data Logging:	HCT Dealer
Annual Review:	HCT Dealer with HCT Oversite ($$$) or – Turf Dietitian ($$$)

HCT Support

Just about everything we know is on our website by market segment and by topic.

We respond to inquiries usually the same day.

We DON'T expect you to know the details of our technology and expertise so we are an agent for you. A technical sales person there for you even for client presentations where we can do conference calls and video conference.

Learn about the technology on our audio tapes forth coming. In the interim, use our website tile topics – available at www.hctllc.com

We are your support team – we'll never say we do, unless we know, and we'll always say we don't know if we don't know!

Please – Take a look at our website and also our YouTube Channel (from our website). Everything is there for you and your clients.

Prescription without diagnosis is mal-practice

Why didn't you tell me that?

Super Concentrates – means the acid fumes are strong, just like pool acid. The Curative has to remain sealed because the fumes are corrosive. Yet the liquid on you or the equipment is not damaging.

Typically the ratio of Curative to BC is 5 to 1 – 1 tote of Curative to 1 drum of BC – that's primarily in arid environments.

Curative is always injected properly in the pressure/discharge side of pumping stations. BC is injected into the pumping station as it keeps that system biologically and corrosion free.

You have to have spill, leak and PPE precautions put in place. See the safety data for details. You can never be too safe.

Can you topically spray? I would for evaluation, but not for treatment. Ask for details as to why or search "topical" on our website for the details.

Chemigation
Continuous Injection
Plants are what we make available to them to drink

Landscape and Turf

Switch Box

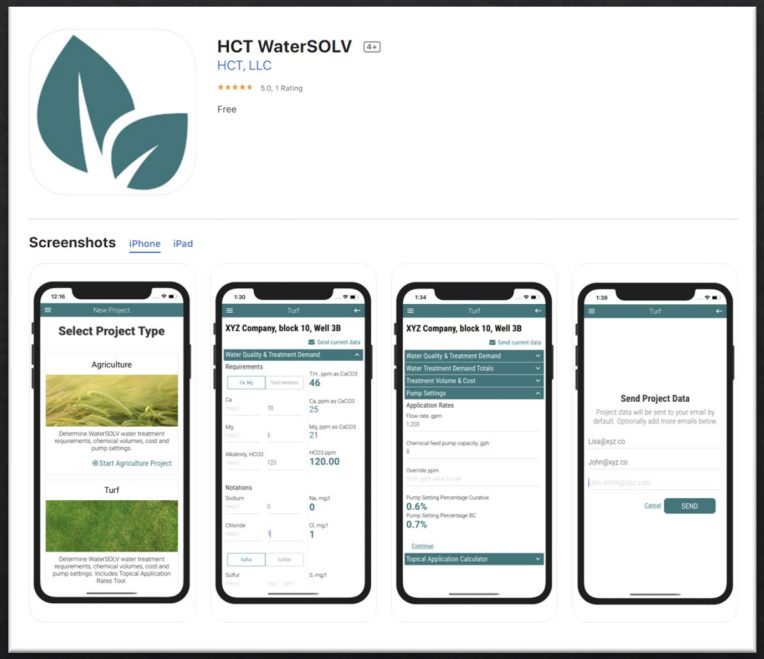
When there is flow, power the pumps. Signal the pumps with flow rates.

Operate up to three pumps

1. Curative Acid
2. BC for bio and oxygen
3. Nutrition

Documents, Forms, Tools
For Proposal and or Getting Started

1. Water Analysis Calculations (Mobile App)
2. Water Bac T Analysis
3. Soils Analyses, Available & Total
4. Chemigation Equip. Check-list



Download the mobile App for Water Calculations
Search HCT WaterSOLV™ at your mobile app store,
iPhone and Android, available throughout North America,
Mexico Included

Download on the App Store
Get it on Google play

Documents, Forms, Tools
For Proposal and or Getting Started

1. Water Analysis
2. Water Bac T Analysis
3. Soils Analyses
4. Chemigation Check-list
5. Proposals
6. We’re here to create the tools to assist you to secure and retain the clients

Proposals

1. How much Curative and BC is necessary to treat the water

2. What are the needs for remediating the soil
   A. Getting water down with Curative, BC or both

   B. How quickly does this need to occur from the clients perspective?
   The more product applied, the more expense, however, increased yields and saved vegetation can far outweigh the cost of remediation.

   C. Usually, the harvesting is existing soil nutrition, water demand reduction and pumping costs will usually offset the total program cost.

3. Now it's just a matter of calculations; however, cost year 1 should include the treatment, soil remediation, and offsets (fertilizer, water, power, aerification, sand, sod, …)

4. Cost year 2 and will be substantially different, as should the revenue income as well by the quality of play.

A list of reported offsets is available inline at our web pages

Calculations

The conversion of meq/l to ppm (also mg//) is challenging. Each element has its own multiplier. It is best to use the mobile app, where you can easily convert the meg/l to ppm.

Knowing the quantity of the product ppm needed for treatment and remediation is simplified For calculating and presenting use cost;

After using the mobile app and entering the water and soil remediation data, you can also enter product cost, water use and or acreage, and obtain total use cost.

You can also use HCT's downloadable Excel Spreadsheet

The math is pretty straight forward looking at it this way:

Each 1 ppm = 1 gl. per million gallon of water. For example, 2.5 ppm = 2.5 gl, per million gallons of water. If the product is $40/gl. the use cost would be $40 x 2.5 = $100 per million gallons of water. Let's reduce that by 15% for the water use reduction ($100 * .85 = $85.00 per million gallons of water. If they prefer to see the cost by acre ft. of water, (1 million gallons is 3.07 acre ft. of water, where in this Scenario - $85.00 divided by 3.07 = $27.69 per acre ft. of water. 1 acre ft. of water is 325,851 gallons.

Download the mobile app from your phone – Search the app store for HCT WaterSOLV™ - Download the Excel spreadsheet for our website

Most drip systems combat

water elements that evaporate to scale

Biology that grows
Exponentially
Reproducing up to every 15 minutes
In ideal conditions
Of nutrients and temperatures (warmth)

WaterSOLV™ Curative
+
WaterSOLV™ BC

Chemically the most effective
Remediation solution
Treatment Solution
Soil Sustainable Solution
Available in todays marketplace

Better than PAA

WaterSOLV™ Solutions

Drip Line, Emitter Cleaning

WATER + WaterSOLV™ Curative + WaterSOLV™ BC = LineOut™ Drip Line, Emitter Cleaning

- The reaction products are perhaps the greatest cleaner available in the marketplace.
- Very powerful acid, peroxide, and by-product called peracetic acid.
- In turn you clean scale and bio matter faster and better than any alternative, even better than chlorine dioxide.
- Inject one product, however you'll need to prepare the product on site, at the point of injection.
- Bio-degradation products: water and bound soil scale and fertilizer to nutrition. Sodium detoxification, Dissolved oxygen and water into the soil profile. Anticipate growth spurts and visual vitality.
- Increases the solubility and availability of most fertilizers in water and soils.

Supplies
275 gl. Tote filled 60% with water (165 gallons)
82.5 gl. WaterSOLV™ Curative (30%)
27.5 gl. WaterSOLV™ BC (10%)

Application Rates
Aggressive Cleaning 15 ppm
Maintenance dosages (perform HCT specific water analysis, contact HCT)

Calculations
(GPM, Flow Rate x PPM Application Rate) x 0.0006 = GPH
Injection Rate (typically 1 to 2 ppm – dependent on water quality – 0.14 to 0.33 GPH)

Procedures
Always add products, individually into water
Always observe personal protection equipment
Always have an eye wash station per person within 6 seconds or less unobstructed access
Always have a safety shower – 55 gl. water per person exposed to chemistry

Inject material at instructed or prescribed rates
Allow contact time 30 minutes minimum (or more)
Repeat process until the lines are clear (pressure minimized)
36 hours is the maximum feasible time for cleaning activity

Discharge/effluent is beneficial for most soils and crops. Ideally flush inline through emitters.
Ideally water 1 to 2 cycles after discharging the effluent to enhance sodium flushing form soils.
Overhead Spray Equipment: Apply at 1/2 strength values
Metal Tubing - After use, rinse system/surfaces with soda water (sodium bicarbonate and water) to passivate the surface, minimizing oxidation and rust.

Injection Point - As close to the system you are trying to clean as possible, perhaps after the pump station backwash.

Component Compatibility - Must use components compatible with water treated like a swimming pool.

HCT
SOLUTIONS TO WATER

Taking Soil Samples

The purpose of soil samples is to track the elements;

The elements added from water and nutrition

The consumption or loss of elements from plant uptake

The loss of elements from possible flushing

What's moving, what's not – relating to toxins, macro and micro elements.

And what about biology? What role do bio films and toxins play in the quantity of elements in the soil? The collection if iron and iron slime in a restricting layer – the presence of sulfate reducing bacteria – collection of chloride salts and toxins and varying restricting layers from different soil types, elevations and grades – the accumulation of insolubles and toxins in collection areas, the evaporative salts of slopes or collection of salts where infiltration has been compromised – and for what period of time?

What's there and what can we do and not do to create a viable medium?

Topical Application
Vegetation, Turf or Soil

They way WaterSOLV™ Works is converting the source elements and biology to a favorable product that will remain favorable by fate as well as sustainably.

This is how 1 (one) gallon of Curative is equal to 10 gallons of 93% sulfuric. The reaction is permanent, and favorable to vegetation but also to soil.

With water being the number one input, and trouble maker – with bacteria having the ability to replicate exponentially, every 15 minutes – with the chemical treatment reactions occurring in the water and on the soil – it only makes sense to treat all the water and get it onto the soil, as quickly and efficiently as possible.

This will also contribute to uniformity, all soils receive the same amount of chemistry.

HCT's topical calculator is available online

We are a proponent of spoon-feeding vegetation nutrients and hydration regularly, providing them what they need on a continuous basis when "they" need it. That is an hourly shift based on environmental conditions.
Regarding the amount of water, you want to fill what pore space you have with the treated water. Look at HCT's topical calculator. If you have the desired 40% pore space, the total water is noted. What if you tine, or only have 1 inch of infiltration, how much water should you use?
From our perspective, how do you flush the greens if they aren't flushing?
I need the treated water into the total soil profile, hence a very distinct fact presented here that topical is mediocre at best. The soils holding X% of moisture of untreated water, how do I replace that by topical application? The answer is continuous treated water – chemigation.

The Needs are Pretty Straight Forward

1. What's in the water

2. What's the water's Total Bac T

3. What is the treated water liberating out of the soil (1:5 soil/water paste extraction)

4. Total Exchangeable – minerals, metals, N and Cl.

Qualifying and Quantifying

A. Total Chemical Used

B. Total Water Applied

C. Tracking / documenting the of the elements
(Available nutrients, added nutrients, Total Exchangeable)

Soil Sample Label

1. Grower
2. PCA/CCA
3. Agronomist
4. Crop and Age
5. Source Water ID
6. Block Id
7. Slope
    1. Collection
    2. Runoff
    3. Plateau
    4. Other
8. Sample depth range
    1. Overall Moisture Level
9. Depth Range Description – be specific?
10. At what level is the constraining layer?
11. What do you expect to receive from this soil analysis
12. Sample Method Requested
    1. Saturated Paste Extract (Available) (ESSENTIAL)
    2. Exchangeable (NOT RECOMMENDED)
    3. Total Digestible (ESSENTIAL)
13. Technician
14. Date
15. Contact
16. Phone
17. Email

Products

1. The Engager

WaterSOLV™ pHix

No matter what soils, pHix contains both the Curative acid and the BC peroxide, so the impact of positive results are assured. How much pHix and for how long is the variable. Time for results can safely be achieved as pHix has been tested to rates as high as 500 ppm every other day.

And in just 11 days . . .

Products

2. The Program

WaterSOLV™ Curative & WaterSOLV™ BC
Continuous Chemical Injection

Perfection, predictability, efficiency of water and nutritional inputs, better product for less money and less resources. Surrounding vegetation vitality, sprinkler heads, emitters. Member satisfaction.

Say goodbye to shells, scale and corrosion piping issues.

Plug and Play Chemistry

Curative
265 gl. Tote, 55 gl drum, 5 gl pails
Connects at bottom to chemical feed line
265 gl. of Curative displaces more than
2,000 gl. of 93% sulfuric acid
Safe – non-corrosive liquid, corrosive fumes
Keep container openings closed and sealed
<u>1 to 3 gallons treats 1 million gallons of water</u>*

BC
55 gl drum, 5 gl. pail
Pump sets on top.
It's not just hydrogen peroxide! It's inhibited, catalyzed, reactive with Curative, and detoxifies Sodium and chloride. Non-corrosive, non-fuming
Keep container out of sunlight.
<u>1 to 7 quarts treats 1 million gallons of water</u>*

Does not replace nutrition. Liberates saturations of nutrition from soils, in a controlled manner by application rates.
** Treatment rates are linear to the culprits. The harder or softer the water, sodium, chloride and biological conditions – for both water and soil conditions*

Products – see details online at www.hctllc.com

HCT
SOLUTIONS TO WATER

WaterSOLV™ CURATIVE

WaterSOLV™ BC

WaterSOLV™ PHix