

Ca⁺⁺Nhance™

For Environmentally Sustainable Remediation & Restoration of Brine Impacted Soils

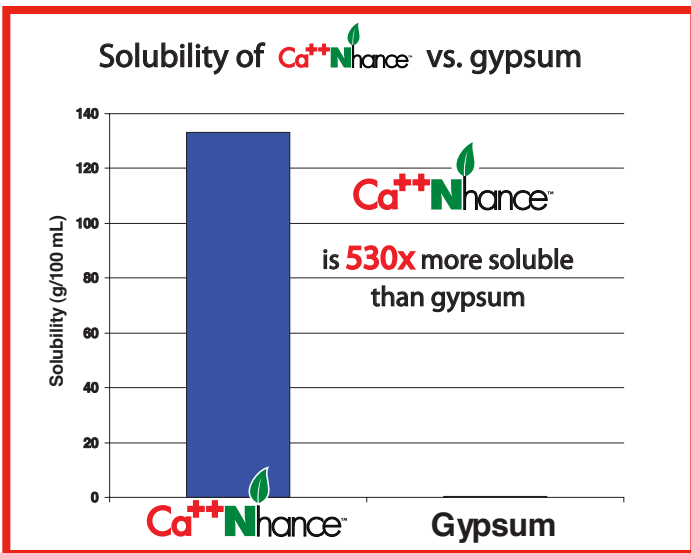


- ✓ **Too Much Water**
- ✓ **Ineffective at depth**
- ✓ **Causes leaching of key plant nutrients**

Did You Know?

- ✗ When you use gypsum (calcium sulfate) as a source of calcium for the remediation of the sodicity that can result from brine or saltwater spills, the gypsum must dissolve in water to be effective.
- ✗ Gypsum's low solubility (< 2.5 g/L) means that a large amount of precious water is needed to achieve the intended benefit of reducing sodicity.
- ✗ In addition to the problem of significant water usage, the low solubility of gypsum results in gypsum being effective **only** within the depth it is incorporated in the soil.
- ✗ Elevated concentrations of gypsum in soil have been shown to increase the mobility of key plant nutrients resulting in their leaching from the soil.

These characteristics of gypsum combine to make its use for brine spill remediation environmentally unsustainable.



There Is A Better Way

The remediation and restoration of brine-impacted soils, both old and new, is one of the most difficult remediation and restoration problems in the exploration and production of oil and gas. An environmentally sustainable solution is needed to reduce the requirements for fresh water, to be more effective at depth, and to improve prospects for effective revegetation.

The Solution is Ca⁺⁺Nhance!

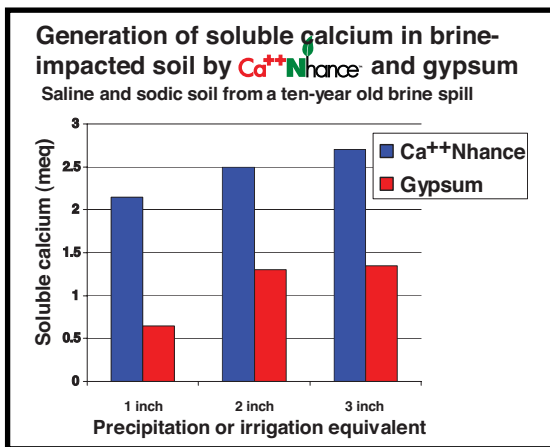


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Ca++Nhance consists of food-grade organic acids which chemically react with calcium carbonate (limestone) in soil to produce soluble calcium to fight sodicity using less water than required to produce an equivalent amount of soluble calcium from gypsum. Because **Ca++Nhance** is 530 times more water soluble than gypsum, **Ca++Nhance** penetrates deep into the soil profile to generate soluble calcium. Gypsum is typically effective only to the depth it is incorporated in the soil. The figure below shows the production of soluble calcium in soil from a 10-year old brine spill treated with **Ca++Nhance** + limestone or an equivalent amount of calcium in the form of gypsum. The result is greater production of soluble calcium per increment of water with **Ca++Nhance**!

Ca++Nhance does not interfere with nutrient availability like gypsum. In fact **Ca++Nhance** stimulates microbial growth in the soil which immobilizes nutrients preventing leaching and building soil nutrient pools.



How to Use **Ca++Nhance**™

Use **Ca++Nhance** as the key component in a sensible strategy for remediation of brine spills and ultimate restoration of the soil. Use organic matter to increase the permeability of the soil and **Ca++Nhance** (in combination with limestone if there is insufficient limestone already present in the soil) to treat sodicity. **Ca++Nhance** application rates are 50 lb/1250 ft². Fresh water is of course required to dilute and flush salts out of the root zone. How much water depends on the salinity of the soil. Leaching water is all that is needed to activate the **Ca++Nhance**. Remember to facilitate drainage from your site, the salt has to have somewhere to go!

RestorNhance™

For capturing and holding critical moisture during seed germination and root development

Did you know re-establishing desirable vegetation on any damaged site, like a remediated brine-impacted site, requires more water than required to maintain that vegetation when it becomes established? That's a problem, especially in arid and semi-arid regions of the country. How do we make the most out of the water we have and increase the probability of success and rates of revegetation? The solution is RestorNhance!

RestorNhance is a blend of two types of stable organic matter, both of which have been shown to stimulate plant growth, plus a water management system to make the most out of every drop of water. The water management system consist of environmentally benign hydrogels which absorb over 200 times their weight in water, capturing that water, and making it available to seeds and plants. These hydrogels have been used for years in the nursery and landscaping industries to maintain the high water potential required to establish new plant growth.

Hydrocarbon remediation

BioNhance+ is a source of high quality, stable organic matter, fast-acting and slow-release fertilizers, and a proprietary water management system to make the most out of available water while increasing the permeability of the soil to air. **BioNhance+** is available in a convenient 4# spill kit or a 50# bag for larger sites.

Brine remediation in Clay Soils

InfiltrationNhance™ maintains critical water infiltration during remediation of brine-impacted soils in the presence of swelling clays.



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Developed in collaboration with



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