Remineralize the Earth

The climate change solution right under our feet

Mounting a Campaign to Remineralize Forests on a Vast Scale

Global Repair Conference, May 3-5, 2019
Port Townsend, Washington

Remineralize the Earth
Facilitates a Grassroots Movement

Remineralization utilizes finely ground rock dust and sea-based minerals to restore soils and forests, produce higher yields and more nutritious food, and store carbon in soils to stabilize the climate.

RTE facilitates a worldwide movement that brings together gardeners and farmers, scientists and policymakers and the public to create better soils, better food and a better planet.

RTE – Brief History 1980s-1990s

European Forestry Studies

Long term experiments released in 1986 in Europe showed that in a forest where pine seedlings were remineralized, **after 24 years the wood volume was four times higher** than in the untreated area. One application lasted for 60 years.

Source: Von u. Sauter and K. Foerst. The Bavarian Research and Experimental Institute for Forestry, Munich, Germany, 1986.

Remineralizing a forest in Austria during the filming of a documentary in 1986.

Spruce branches without rock dust taken for mineral analysis (just outside the range of emissions)

Spruce branches with rock dust taken for mineral analysis

Source: *The Effects of Basalt Rock Dust Emissions on Spruce Trees at the Albert Basalt Quarry in Huhnerberg, Germany 1983,* Fritz Leipold

EarthDance Institute Volunteers Remineralize Mt. Mitchell and Grandfather Mountain in Asheville, North Carolina (1991)

Acid Rain Destruction of Temperate Forests

These rock dust applications ...{will replace} many of the micronutrients that have been leached out of the soil due to the persistent acid deposition in high elevations over the passed 50 years.

… [Rock dust] will revitalize soil microorganism populations, which will tend to stabilize and rejuvenate detrimental effects on these high altitude mountains.

If our results turn out to be similar than those reserved in Central Europe, we may have a short-term "magic bullet" for the rejuvenation of these devastated high altitude forest communities.

-Dr. Robert Bruck, North Carolina State University

Members of Earthdance planting tree seedlings with the addition of rockdust on Grandfather Mountain.

Grassroots Activists Remineralize a Devastated Forest Ecosystem

EarthDance volunteers sprinkle rock dust on seedlings on Mt. Mitchell

Mark Fields, founder of the EarthDance Institute in Asheville, NC instructing a group of parents, teachers and students on the emineralization project that they were about to begin on Grandfather Mountain. May 4, 1991.

In 1990, EarthDance Institute in Asheville, NC, asked Dr. Bruck to participate in their plan to plant 5000 seedlings on Mt. Mitchell and Grandfather Mountain. Each was fertilized with a megadose of micronutrients in the form of Planters II rock dust. In April 1991, 5,000 seedlings were dug in by adolescents, college students and a few adult volunteers. This was the largest controlled study of forest remineralization currently underway in North America.

Results of Trials with Rock Dust on Grandfather Mountain near Asheville, NC

500 five-year-old red spruce and fraser fir trees were treated with Planters II rock dust applied at the following rates: 50-gram/pot, 25 g/pot, 10 g/pot, and 0 g/pot. After a 6-month period, observations were made on root color, diameters, height-growth, and survival.

Survival rate of all rock-dusted trees was 100%, versus 87% of fraser fir and 77% of spruce of the controls.

Growth rate increases:

- Red spruce were 37%, 18%, and 5%
- Fraser fir were 39%, 21% and 14%

Field experiments, 1991

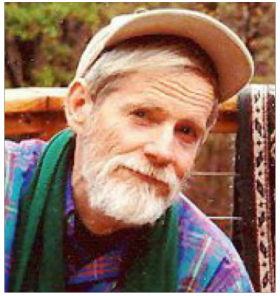
Results after 12 weeks in study on Grandfather Mountain near Asheville, North Carolina, where 6,000 red spruce and fraser fir seedlings were planted at 5,500-ft. elevation. The plots were split in half, and 175lb. per acre of Planters II broadcast on each split-plot of fraser fir and red spruce, respectively; the other split-plot received no treatment.

- Height growth of red spruce was increased by 27% over non-treated controls.
- Height growth of fraser fir was 19% greater than untreated controls.

Remineralization Pioneers

John D. Hamaker and Donald A. Weaver, *The Survival of Civilization*

Don Weaver
Earth Health Regeneration



David Yarrow
TERRA, Carbon Negative

Moira and Cameron Thomson
Seer Centre, Scotland

Joanna Campe, 1980s
Remineralize the Earth

Keynote, II Brazilian “Rochagem” Conference , 2013

Greg Watson Former
MA Commissioner of Agriculture

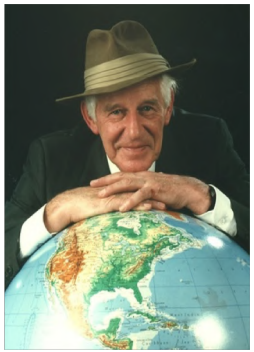
Bill Holmberg
American Council on Renewable Energy

Tom Vanacore
Rock Dust Local

Steve Diver, ATTRA

Agrogeology Pioneers

Canada



Bill Fyfe, Pres. IUGS

Ward Chesworth
University of Guelph

Peter van Straaten, University of Guelph and Brazil

Brazil

Othon Leonardos, University of Brasilia

Suzi Huff Theodoro, University of Brasilia

Eder Martins, Embrapa

Team from Brazilian Agricultural Research Corp/Temperate Agriculture United and Geological Survey of Brazil with co-researchers from Cameroon and Uganda (Jean Pierre Tchouankoue and Vincent Kato)

Remineralize the Earth

The Science

Local to Global Projects

Forestry & Agroforestry

Research Projects

Research Database



The Science

The only online research database dedicated solely to remineralization

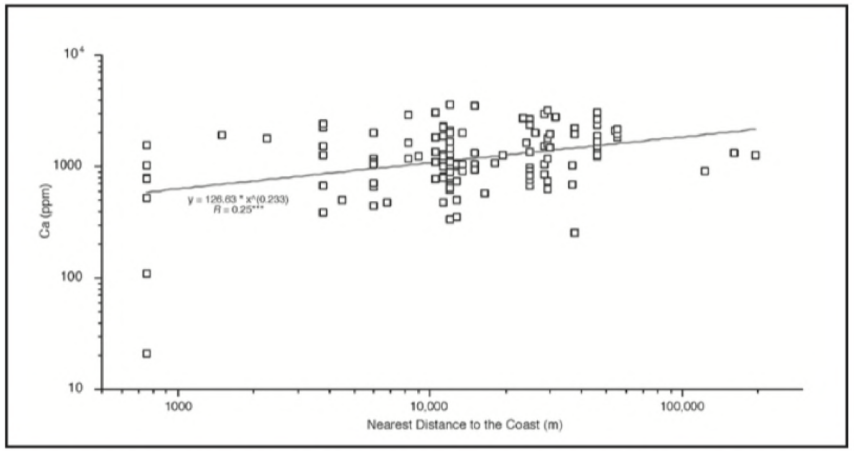


Figure 5. Calcium content of soils in this study as a log-log function of nearest distance to the coast in the sudden oak death-affected regions of California. Best-fit line of the data is a power law function (see equation). R is the regression coefficient; probability (p) ≤ .001 (***).

Table 1. Summary statistics of the chemical constituents in soil samples from sites of unhealthy trees in California.

Variable	Mean	Median	Std Dev	Units	N
Al	24.3	5.3	41.7	(ppm)	70
B	0.6	0.4	0.4	(ppm)	119
Ca	1389.0	1201.5	758.7	(ppm)	136
CEC	14.4	12.4	6.6	(meq/100g)	120
Cu	1.6	1.2	1.7	(ppm)	123
Fe	75.4	68.5	78.6	(ppm)	123
K	207.1	180.6	125.0	(ppm)	124
Mg	451.9	363.6	321.9	(ppm)	124
Mn	14.8	11.5	12.9	(ppm)	123
Na	56.3	34.7	86.3	(ppm)	124
NO_3-N	11.0	5.7	21.2	(ppm)	120
Org. Matter	4.8	4.2	3.4	(%)	120
P	28.4	13.5	34.0	(ppm)	132
pH	5.8	5.7	0.6		136
SO_4-S	21.6	7.0	66.8	(ppm)	117
Sol. Salts	0.6	0.4	0.9	(mmhos/cm)	117
Zn	6.5	2.7	9.4	(ppm)	123

Bryophytes and soil acidification effects on trees: the case of sudden oak death

Lee F. Klinger,

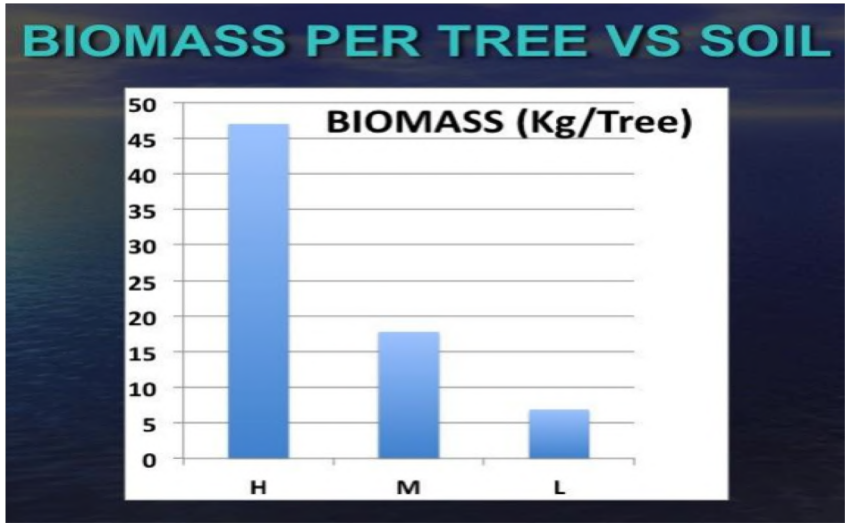
PhD

Combined Proceedings International Plant Propagators' Society, Volume 55, 2005

The Science in Practice – Panama

Dr. Tom Goreau
RTE Board of Directors

Basalt Powder Restores Soil Fertility and Accelerates Tree Growth in Impoverished Panamanian Tropical Soils



H (basalt quarry rock powder), M (transition zone), L (local soil)

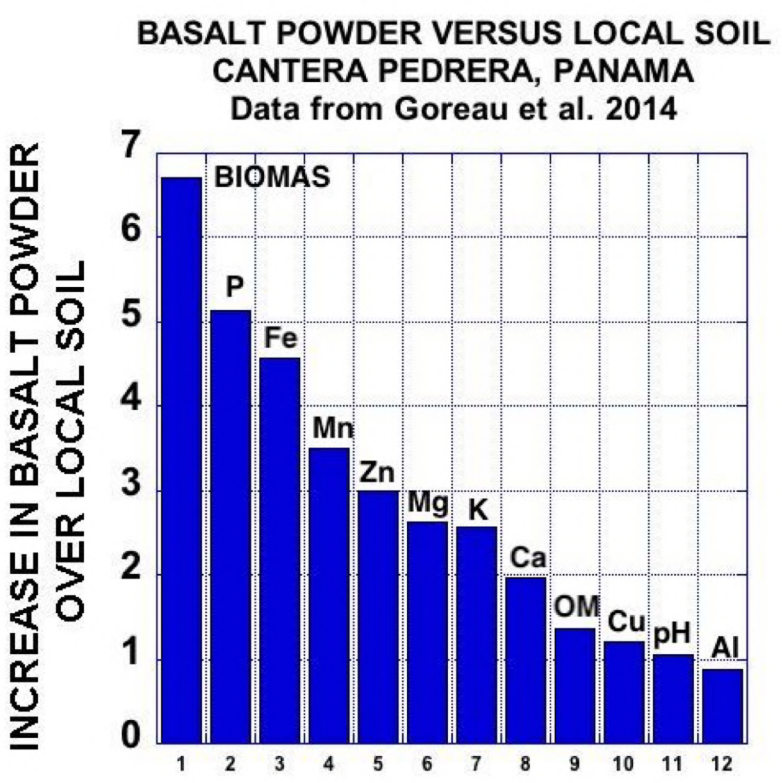
Seedlings of *Acacia Mangium* were planted in September 1997

Results of 5 year study

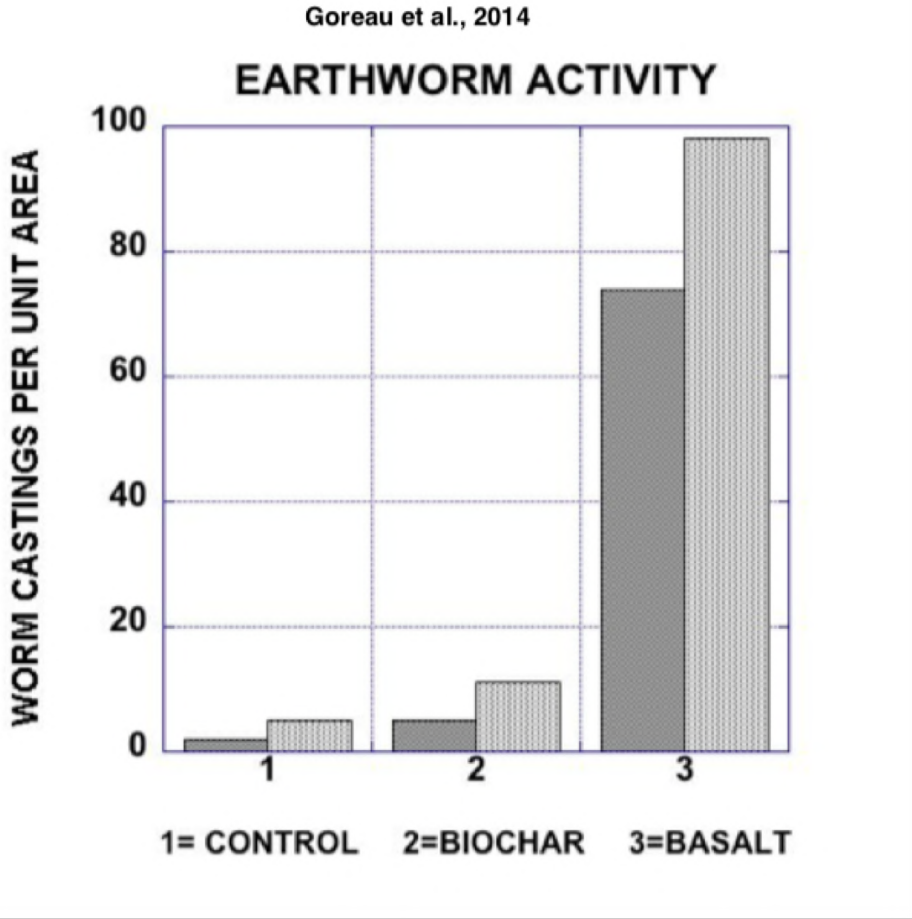
- 8-fold increase in biomass
- 2.17 increase in the height of the trees
- 4 times the survivability from the trees on basalt
- The trees on the local soil did not survive

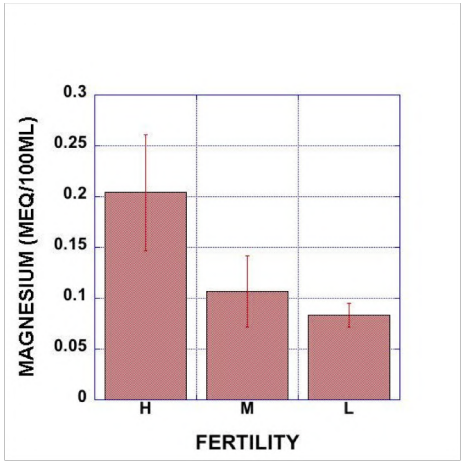
Thomas J. Goreau, Marina Goreau, Felix Lufkin, Carlos A. Arango,Gabriel Despaigne-Matchett, Gabriel Despaigne-Ceballos, Roque Solis, & Joanna Campe

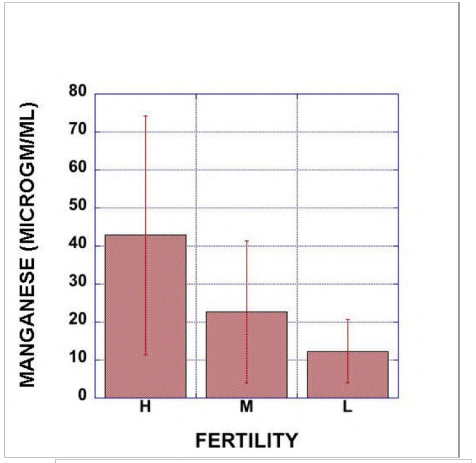
Chapter 17, *Geotherapy Innovative Methods of Soil Restoration Carbon Sequestration, and Reversing CO2 Increase*, 2015, Taylor and Francis Group, LLC

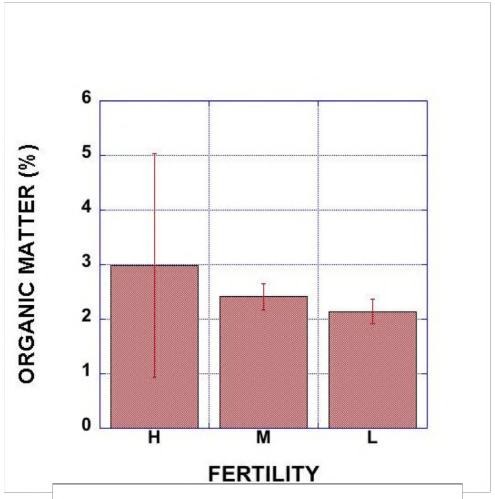


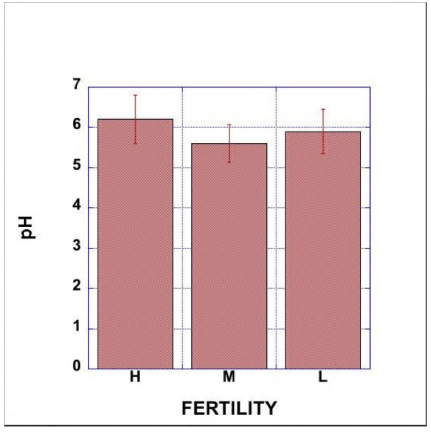
The value of that parameter in basalt powder (growth rate, concentration) divided by the value in local soil.

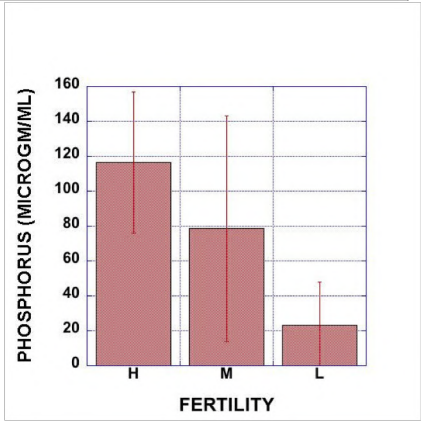


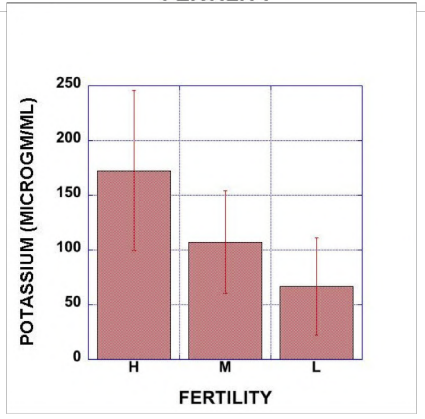






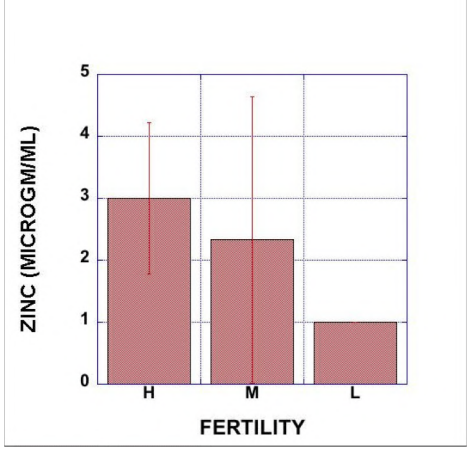


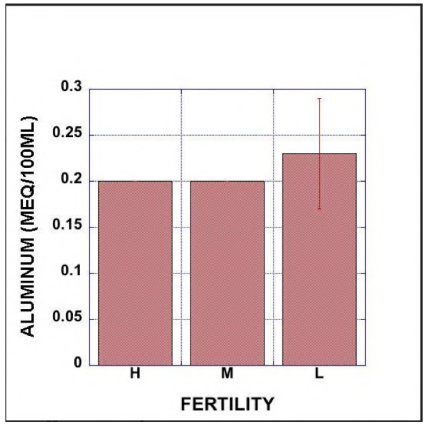


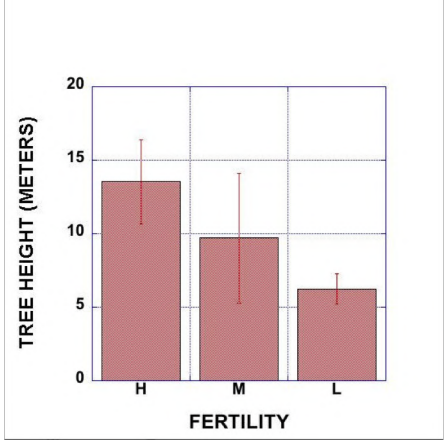


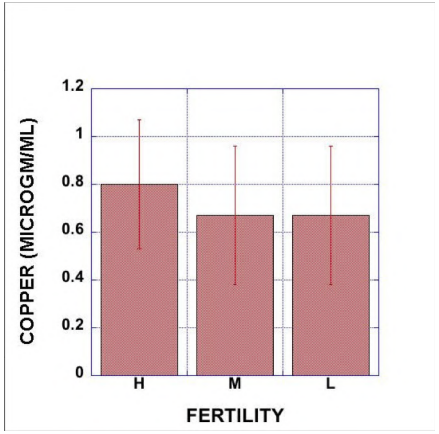
H (basalt quarry rock powder), M (transition zone), L (local soil)

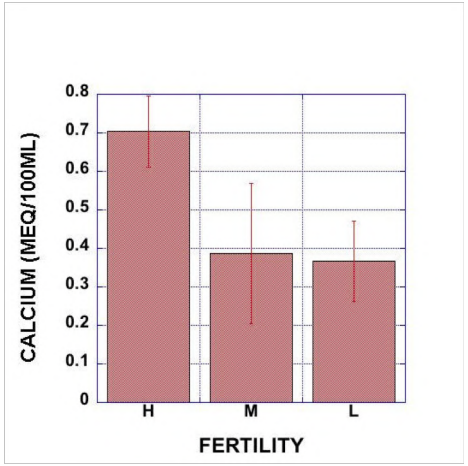
Panama

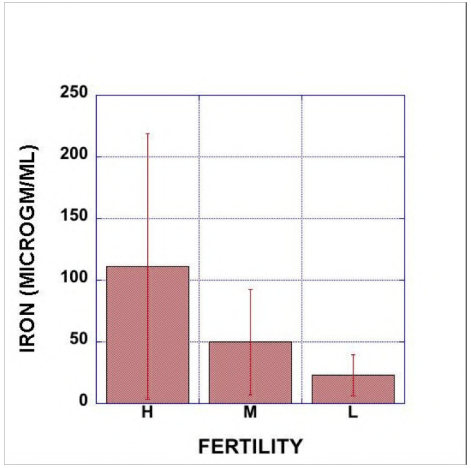












H (basalt quarry rock powder), M (transition zone), L (local soil)

Panama

Sudden Oak Life
Lee Klinger

Sudden Oak Life is a movement aimed at improving the health of trees and forests in California and elsewhere through practice, education, and research.




California - From Sudden Oak Death to Sudden Oak Life

Lee Klinger, PhD

Dr. Lee Klinger is an independent scientist living in Big Sur, California. Since 2005 he has served as director of Sudden Oak Life.

Dr. Klinger's treatment is called 'fire mimicry.'

Reviving Grandmother Oak

“A few years ago I encountered an ancient coast live oak that was so magnificent, it took my breath away. At first sight the oak was barely noticeable, hidden behind a wall of young Douglas fir and bay laurel trees. But after slipping past the young trees Grandmother oak appeared. Her trunk was massive, at least 20 feet in girth, and was clearly pollarded by the native people. I estimated her age to be about 500 years, possibly older.”

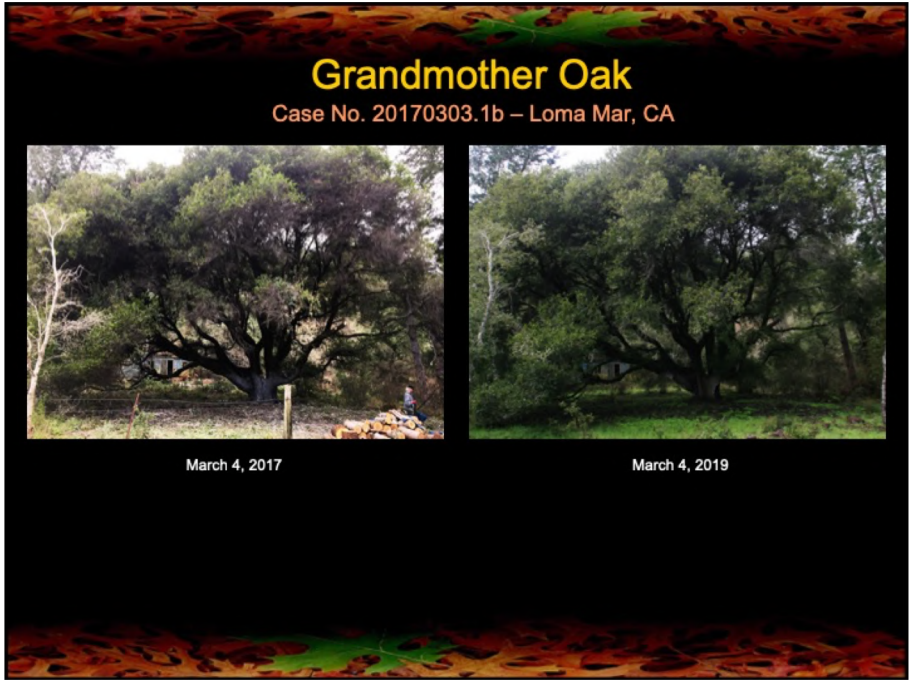
-Dr. Lee Klinger

Treated with compost tea, alkaline-rich minerals, and a limewash poultice to the trunk

...In early March of 2017, I and my dedicated crew, began treating Grandmother oak, first clearing away the encroaching fir and bay trees, pruning the dead branches, and removing the mosses and lichens from the trunk. We then fertilized the soils beneath the canopy with compost tea, followed by alkaline-rich minerals, and applied a limewash (a kind of poultice) to the trunk.

The results after just two years of treatments are exciting. as the photos below show Grandmother oak is clearly recovering. If all goes well, she may live another 500 years!

-**Dr. Lee Klinger**



California Indians of the Sierra Nevada and Coastal Ranges practiced silviculture – Lee Klinger

Researchers have found California Indians of the Sierra Nevada and Coast Ranges likely practiced remineralization long before Europeans arrived in the ‘New World.’

Ancient wisdom casts new light on the ability of remineralization to save aging ecosystems. Studies show that adding lime-rich minerals to declining forests can:

- Improve soil fertility, tree health, as well as root and mycorrhizae growth.
- Reduce levels of toxic metals in soils, as well as moss cover.

- Lee Klinger, PhD

Fire Mimicry

While they undoubtedly applied ashes to promote growth of edible plants and trees, these Native tribes also may have known (in lieu of fire) that periodic application of lime-rich minerals promotes healthy soil.

Klinger, L., ‘Ecological Evidence of Large-Scale Silviculture by California Indians’ in D. T. Jacobs (ed.), *Unlearning the Language of Conquest*, University of Texas Press, Austin, 2006, pp. 153 - 165.

Mollusk shell fragments in ancient mounds, along with rocks, pebbles, charcoal and animal bones

The Whaleback Shell Midden in Maine resulting from oyster harvesting from 200 BC to 1000 AD.

How do we know Natives practiced soil remineralization? Excavations show compacted mollusk shell fragments in ancient mounds, along with rocks, pebbles, charcoal and animal bones. Most materials were broken down and charred in situ.

Bedrock mortars throughout the Sierras suggest a close link with both middens and giant sequoia groves. At 200-plus sites, researchers found big circular depressions (rock basins or "Indian bathtubs") used to grind large volumes of material at once.

Composition and stratigraphy, as well as close association with bedrock mortars and large trees, suggests these middens served as recycling centers for processing (piling, smashing or burning) mineral-rich materials to enhance acidification for use in remineralization.

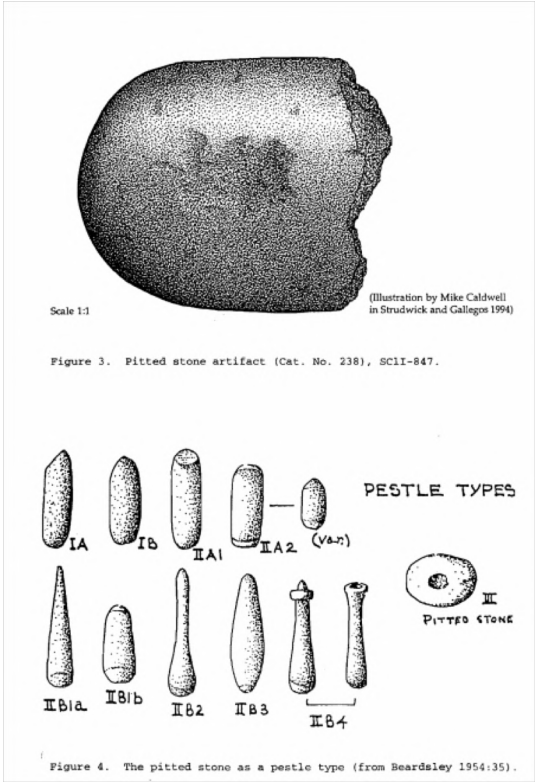
-Dr. Lee Klinger

“Ancient wisdom could help cure many other tree-decline syndromes simply by improving mineral nutrition”

Ancient Native Americans likely ground midden materials into fine particles using mortars and pestles, spreading them around trees to suppress moss growth and enhance soil fertility. It appears they stockpiled middens, as cultures worldwide have done strategically in regions containing heavily-tended trees.

Further, it appears they also painted a limewash mixture of finely-ground midden materials on bark, much like whitewash still used within Indigenous cultures.

-Dr. Lee Klinger



Mounting a Campaign to Restore Forests and Stabilize the Climate

Remineralizing forests will increase resistance to insects, disease, frost, and drought. Remineralize forests from the air through mobilizing local, state, federal, National Guard, or other means in California, Oregon and Washington.




Wildfires on a Vast Scale Worldwide

Greece 2018 (National Public Radio)

The widespread fires this year have magnified concerns that we are locked in a worldwide pattern of conflagration that is both persistent and catastrophic.

The Earth Ablaze
The New York Times
August 8, 2018

Destructive and deadly wildfires of enormous size raged in California, Chile, Argentina, British Columbia, Portugal, United Kingdom, Sweden, Denmark, Estonia, Finland, Latvia, Malta, the Netherlands, Poland and Germany.

Remineralize Forests on a Vast Scale

Research, Outreach, and Policy Making

Remineralizing forests will increases resistance to insects, disease, frost, and drought.

Remineralized forest in Brixlegg, Austria (1986)

Lake County, CA (LA Times)

Mount a Campaign

Remineralize forests from the air– mobilize local, state, federal, National Guard, or other means.

California Gov. Gavin Newsom declares state of emergency, promises funding due to increased wildfire risk

Rich Pedroncelli | AP

Gov. Gavin Newsom discusses emergency preparedness during a visit to the California Department of Forestry and Fire Protection CalFire Colfax Station Tuesday, Jan. 8, 2019, in Colfax, Calif.

On January 8, 2019, California Gov. Gavin Newsom declared a statewide emergency Friday as result of “a vast tree die-off throughout the state” and deteriorating forest conditions that have increased the risk of wildfires.

The governor announced earlier this year that:

- the state will spend $1 billion on forest land management over the next five years, with funding coming from proceeds from California’s cap-and-trade auctions.

- the state will propose to spend more than $300 million to upgrade its planning and response to wildfires and other disasters.

Grassroots Action – Mounting a Campaign
A Bioregional Approach

State, city and community level

- Contact the governor – Emergency funding
- Grassroots action initiatives

NGOs

- TreePeople
- California ReLeaf
- Leonardo DiCaprio Foundation
- The Forest Foundation and others

Brainstorm

What would mounting a campaign look like?

Important forestry organizations in California

- National Association of State Foresters
- California Natural Resources Agency
- California Forestry Association
- Forest Management Task Force
- California Urban Forest Council
- Forest Landowners of California

CASCADIANOW!

TREEPEOPLE

LEONARDO DICAPRIO FOUNDATION

THE FOREST FOUNDATION

CALIFORNIA RELEAF

Thank You!

Remineralize the Earth

Joanna Campe
Founder and Executive Director
jcampe@remineralize.org

Sudden Oak Life

www.remineralize.org

Parking Lot

Volcanic ash additions control soil carbon accumulation in brown forest soils in Japan

Akihiro IMAYA Shuichiro YOSHINAGA Yoshiyuki INAGAKI Nagaharu TANAKA
Seiichi OHTA

First published: 25 November 2010

The results suggest that volcanic ash additions control the soil carbon accumulation of forest soil in Japan.

Earth Dance Institute and students remineralize Grandfather Mountain (1991)

These rock dust applications will have the effect of replacing many of the micronutrients that have been leached out of the soil due to the persistent acid deposition in high elevations over the passed 50 years.

… [Rock dust] will revitalize soil microorganism populations, which will tend to stabilize and rejuvenate detrimental effects on these high altitude mountains.

If our results turn out to be similar than those reserved in Central Europe, we may have a short-term "magic bullet" for the rejuvenation of these devastated high altitude forest communities.

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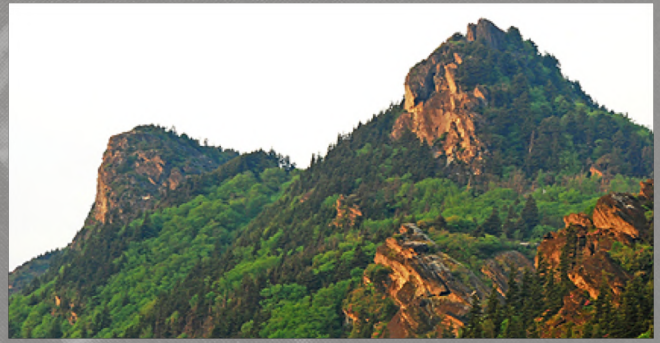


The Soil Carbon Sink by David Yarrow

To reverse climate change, a key is to remove greenhouse gases by conversion to solid substances. Soil is one of Earth's largest carbon sinks. **Carbon Sequestration** by soil regeneration is high priority to avert global thermal overload. Farms, forests, lawns, and landscapes are front lines in this urgent effort to re-carbonize, remineralize and revitalize soils in this century. **Regenerative Agriculture** is emerging to raise soil carbon with biocarbon, biochar, organic matter, humus, manure, cover crops, no-till, crop and livestock rotations.

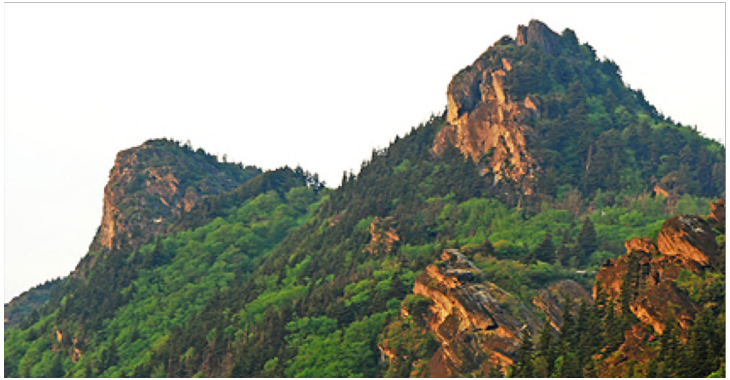
Soil Food Web are communities of microbes and larger lifeforms to convert minerals into nutrients, living cells & plants. Changing farming faces obstacles, needs a coherent plan, requires cooperative action. Growers need training & support to rapidly adopt **carbon-smart** methods, and markets to buy **carbon-smart** crops. Public opinion must endorse **carbon- smart** reform of food systems, public policy must prioritize programs to advance **carbon-smart** strategy, fund **carbon-smart** technology research deployment.

Remineralize the Earth
The Science

A survey of studies

Forest Growth Increased with Rockdust on Grandfather Mountain near Asheville, North Carolina

In 1990, EarthDance, a non-profit environmental group in Asheville, NC, asked Dr. Bruck to participate in their plan to plant 5000 seedlings on Mt. Mitchell and Grandfather Mountain, each fertilized with a megadose of micronutrients in the form of Planters II rock dust. In April 1991 5,000 seedlings were dug in by adolescents, college students and a few adult volunteers. This is now the largest controlled study of forest remineralization currently underway in North America. Just back from a trip to study European efforts to regenerate their own dead and dying forests, Dr. Bruck spoke to Remineralize the Earth Editor Joanna Campe. Contained is an interview with Bruck and the results of his field study. Summary of findings: http://remineralize.org/site/index.php?option=com_content&view=article&id=94:forest-growth-increased-with-rockdust-on-grandfather-mountain-near-asheville-north-carolina-1991&catid=21:research&Itemid=201



Dr. Robert Bruck, North Carolina State University