



The road to Soil Health: Principles for Farming and Ranching in the 21st Century



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United States Department of Agriculture
Natural Resources Conservation Service

United States Department of Agriculture is an equal opportunity provider and employer.

“As to methods, there maybe a million and then some, but principles are few. The man who grasps principles can successfully select his own method”

Ralph Waldo Emerson

**The greatest roadblock in
solving a problem is the
human mind!**

Gabe and Paul Brown:
ND Rancher



What Have WE Learned In 79 Years?

Timpas, Colorado, Jan 12, 2014



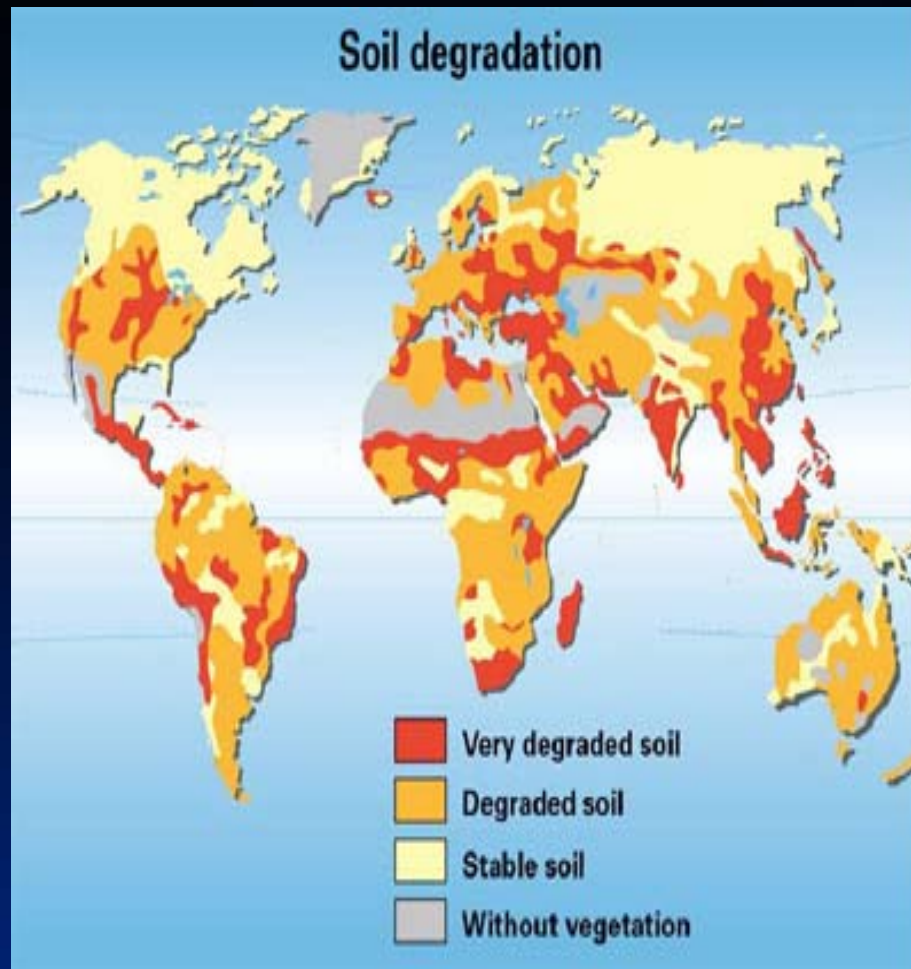
April 14, 1935



December 19, 2012
Texas Panhandle
23 Vehicles in Chain Reaction
Crashes



National and Global Context:



- Map created by Philippe Rekacewicz, UNEP/GRID-Arendal and presented in the Atlas of desertification in the world, Second edition, Arnold Publishers, London, 1997.

Keep reaping the same mistakes...hoping for different results

22

COUNTRY GENTLEMAN

March, 1948

★★★ Our National Program for Soil Conservation Needs a Change

By MILTON S. EISENHOWER
President, Kansas State College

FOR each federal dollar spent in the name of conservation during the past dozen years the United States has had a return of about ten cents in actual reduction of soil and fertility losses. Even in rich America we must do better than that. After twenty years of research aimed specifically at checking soil and fertility losses, fifteen years of nationwide demonstrations of conservation practices, and twelve years of spending billions of dollars for conservation, the curve of productive soil resources still slants sharply downward. Our best hope is that the slope isn't quite as steep as it used to be.

I am convinced that we cannot expect better results unless Congress refashions the legislation which authorizes public conservation services, for it is obvious that at least part of our public conservation policy was unwisely conceived.

There are strong statements, but I believe they can be justified. It is important that something be done about them soon, for the House Agricultural Committee is now considering what our long-time farm policies should be, and laws soon to be enacted are likely to be with us for many years. If these new

laws are not consistent with the requirements of farmers and the nation alike for a progressive rebuilding of our badly damaged land resources, we shall face disaster sooner than we suspect.

Up to the present time, the United States has made two kinds of public effort at conservation on private farm and ranch lands.

In the first of these, scientists began with the physical problem itself. They analyzed it into its physical components—fertility losses, runoff, erosion of soils, and so on. They then developed a physical solution for the physical problem, a solution which involved interdependent combinations of terraces, contour plowing, strip cropping, better rotations, controlled grazing, and improved use of fertilizers. Naturally this physical solution required social action, so Congress and most state legislatures authorized simple social instruments through which the physical solution might be applied within the framework of democratic traditions.

The second attempt at a solution was very different. Congress went at the problem the other way around. Here Congress was concerned primarily

with a social problem, and proceeded to what it believed, or pretended to believe, were its physical implications. It attacked the soil problem in terms of prices and incomes. The results were hideously unsatisfactory, so far as true conservation is concerned. It is hard to say it, but I think it is true: In making our first great effort in conservation, we—by expressing our will through Congress—were honest with ourselves, but in our second effort we were not. And this second effort has been of such overwhelming importance that it has confused the general public about the true nature of the conservation problem and its solution.

It was the Soil Conservation Service, under the evangelized leadership of Dr. Hugh H. Bennett, which began with soil conservation as a physical problem. Early in the 1930's it launched an integrated program for wise land-use which, despite many initial mistakes, was a major contribution to the permanent agricultural life of America. It employed not one but all of the control devices needed to solve the conservation problem on each individual farm, and in each small watershed. Conservation workers analyzed the soil, slope, and other factors of each farm before suggesting a combination of practices to yield conservation, just as a physician makes a full diagnosis before prescribing medicine. Soon specialists began taking into account the farmer's financial problems and the farm-management implications of the physical changes required in farming methods for the achievement of maximum conservation. And soon it was found that an integrated program not only reduced soil and fertility losses to negligible proportions, but resulted in increased financial profit to the farm operator—a 20 per cent increase, on the average.

In time, experience demonstrated that almost any farm operator could, with technical help, develop a practical land-use plan for his own farm, install the many elements of that plan, and begin making greater returns—all within a period of about five years. (I shall return to this point again, for it has an important bearing on what our future conservation policy should be.)

Then came two tremendously important developments. First was the soil-conservation district, a subdivision of state government brought into being through a democratic referendum of landowners and operators, and designed exclusively to enable farmers themselves to make a concerted attack against soil and fertility losses. By November 15, 1947, there were some 2000 such districts in the United States. They encompass more than one billion acres of crop, pasture, and range lands, and approximately four million farms. However, only a fraction of the one billion acres—less than 10 per cent—is covered by conservation practices.

As a second development Congress authorized flood-control surveys which, as they progressed, showed that conservation on a vast scale could contribute substantially to flood control on an economically feasible basis—that in most watersheds a combination of engineering structures in streams and conservation practices on the land works together for maximum results in flood-control operations.

Then, then, is about where we stand, so far as the physical soil-conservation (Continued on Page 174)

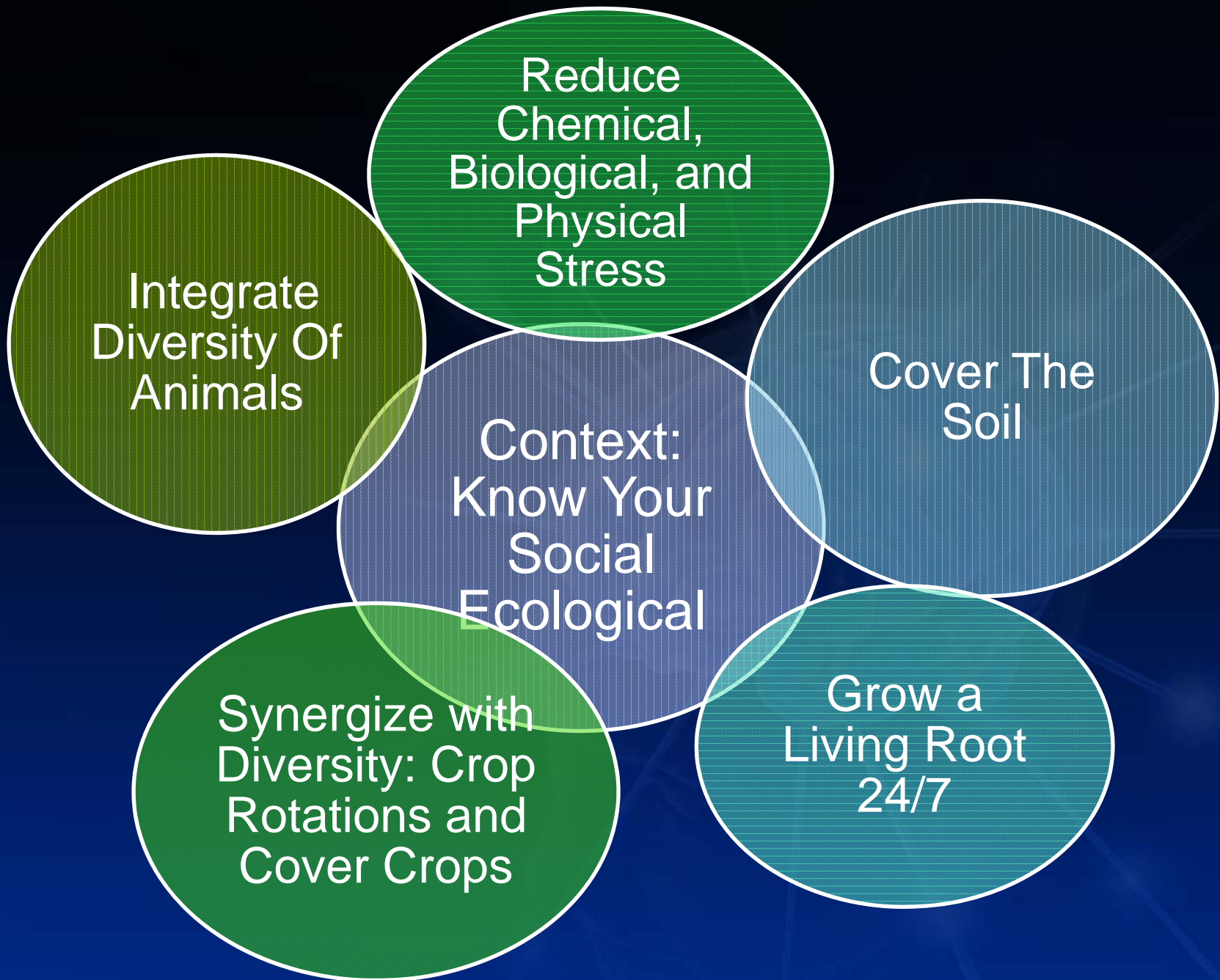


"For each federal dollar spent in the name of conservation during the past dozen years the United States has had a return of about ten cents in actual reduction of soil and fertility losses."

“For each federal dollar spend in the name of conservation during the past dozen years the United States has a had a return about 10 cents in actual reduction of and fertility losses” Why?:

- 1) Our soil mining attitude
- 2) Program Handouts...attack the problem with prices and incomes..

Milton S. Eisenhower, President KSU
1948, Article in the Country Gentleman



Chronic Physical, Chemical, and Biological Stress: diminishes ecosystem processes

Effective

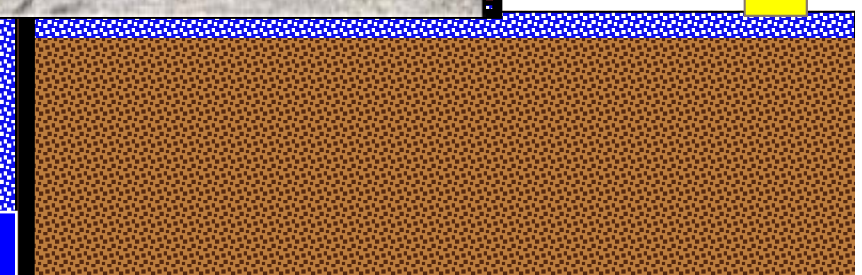
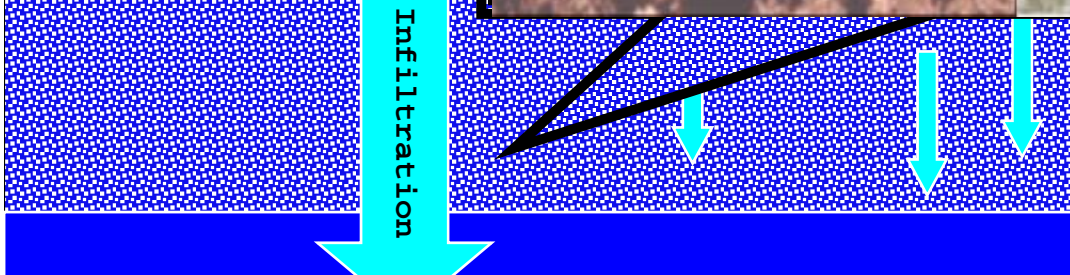


Not effective



C
A
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Infiltration



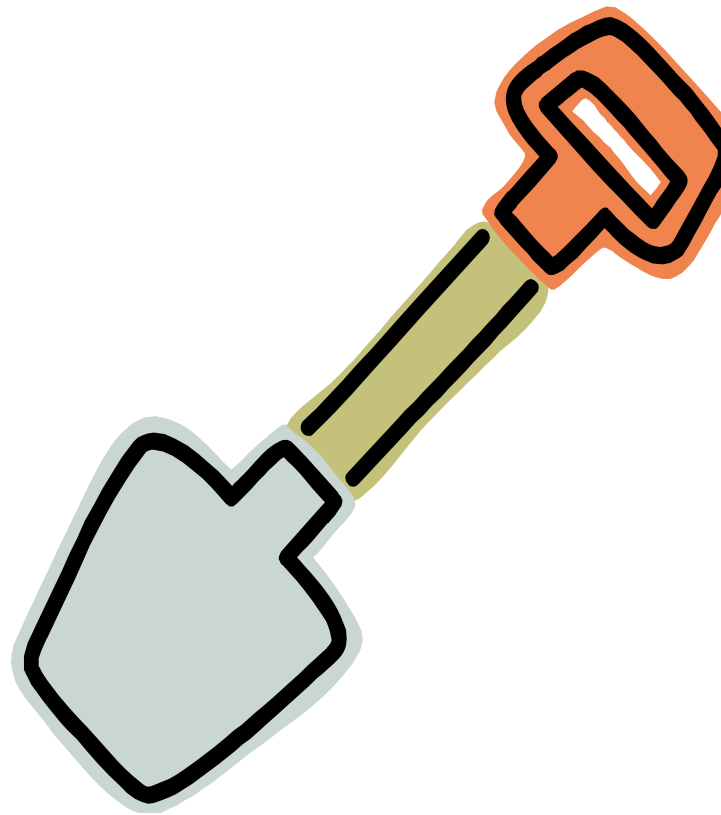


Personal Knowing versus Information Knowing

This soil is naked, hungry, thirsty and running a fever!

Ray Archuleta 2007

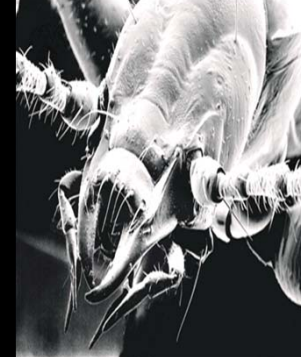
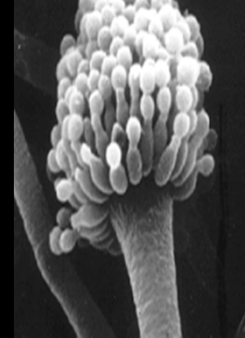
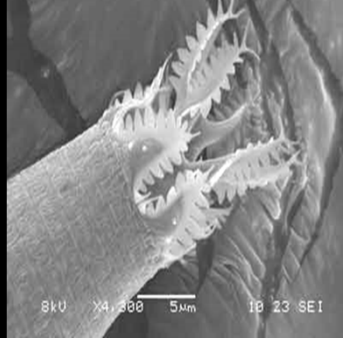
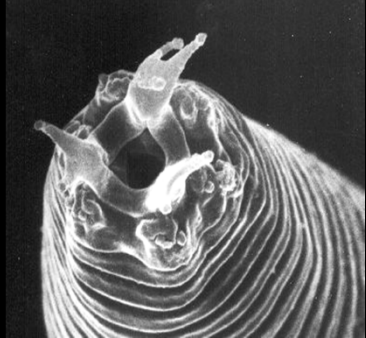
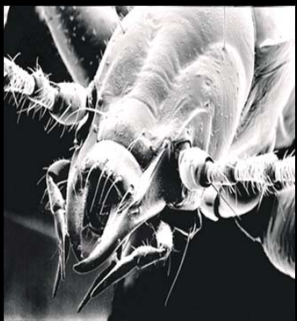
Shovel: A Tool to determine soil health





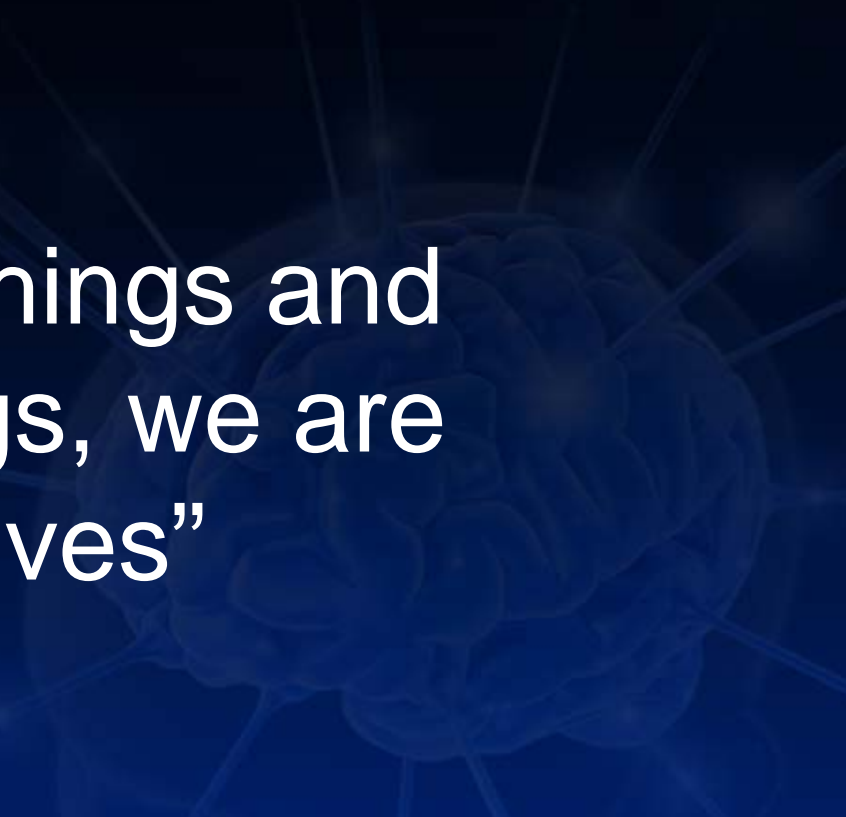
Holism-Ecology:
the study of
relationships
between people,
animals, and plants,
and their
environment.
Interconnectedness

Soil Surface



Native American Proverb (Sioux):

“With all things and
in all things, we are
relatives”



Soil Health is Biomimicry

Natural System:

- 3.8 Billions years of research and development
- 10-30 million species with well adapted solutions

TED: Ideas worth spreading

Janine Benyus: Biomimicry



Big Ideas From Biology:



BURR=VALCRO



Velcro was invented by Swiss engineer George de Mestral in 1941

JOB 12: 7

But ask the beasts and they will teach you; the birds of heaven, and they will tell you or the bushes of the earth and they will teach you and the fish of the sea will declare to you

How do these Ecosystem flourish without human inputs?

Prairie



Forest

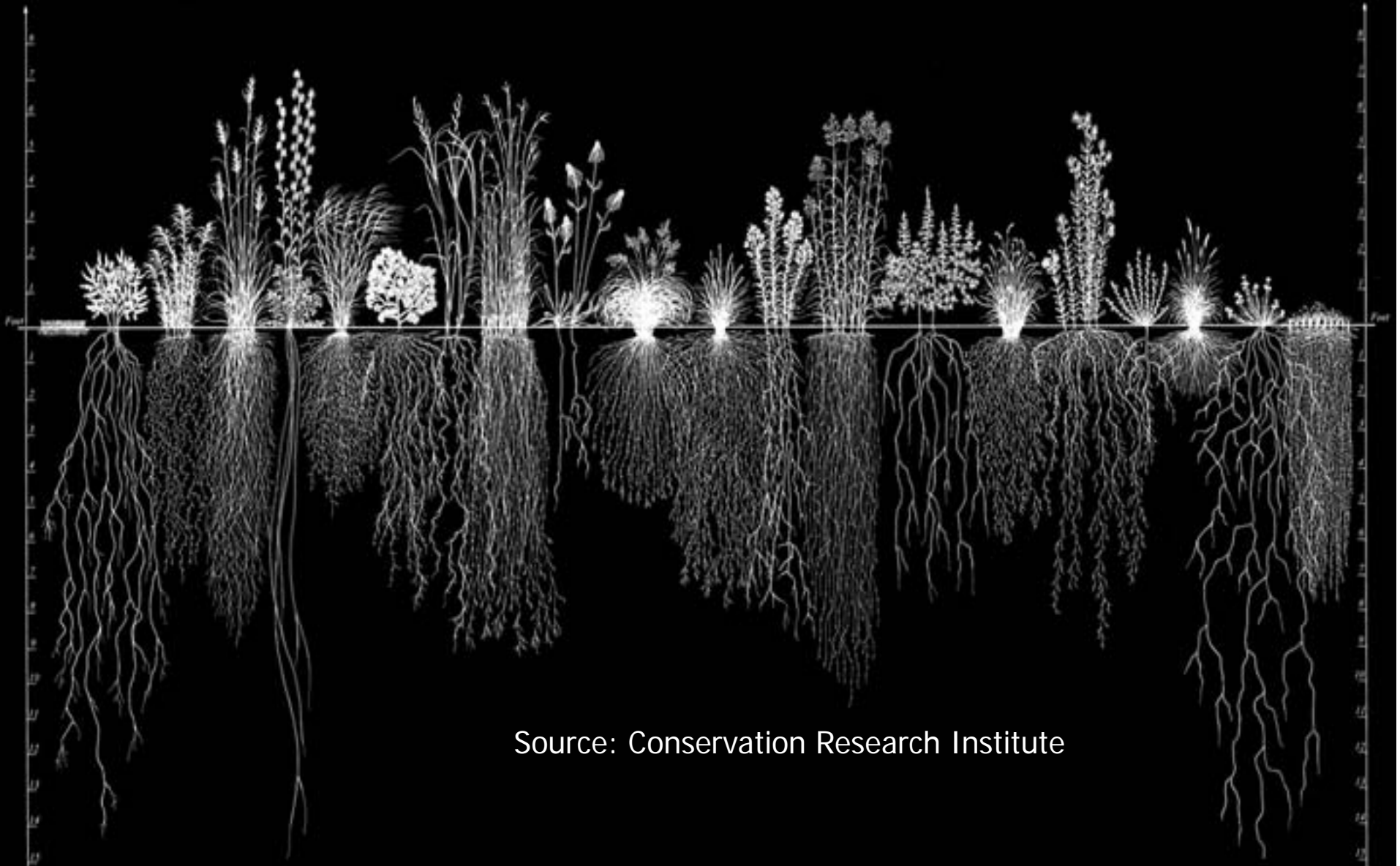


Cover crop Cocktail Mix: Restoring Ecological Memory



Sunflower 1 lb
Soybean 15 lbs
Cowpea 10 lbs
Turnip 1 lb
Radish 2 lbs
Proso Millet 3 lbs
Pearl Millet 3 lbs
Corn 1 lb
Squash 1 lb
Canola 1 lb

Ecological Architecture:



Source: Conservation Research Institute

Build it... they will come!



The power of biology







Control and Command



Livestock as a proxy for wild herds



Gabe Brown Proxy.....





Increase nutrient cycling: Herd Impact



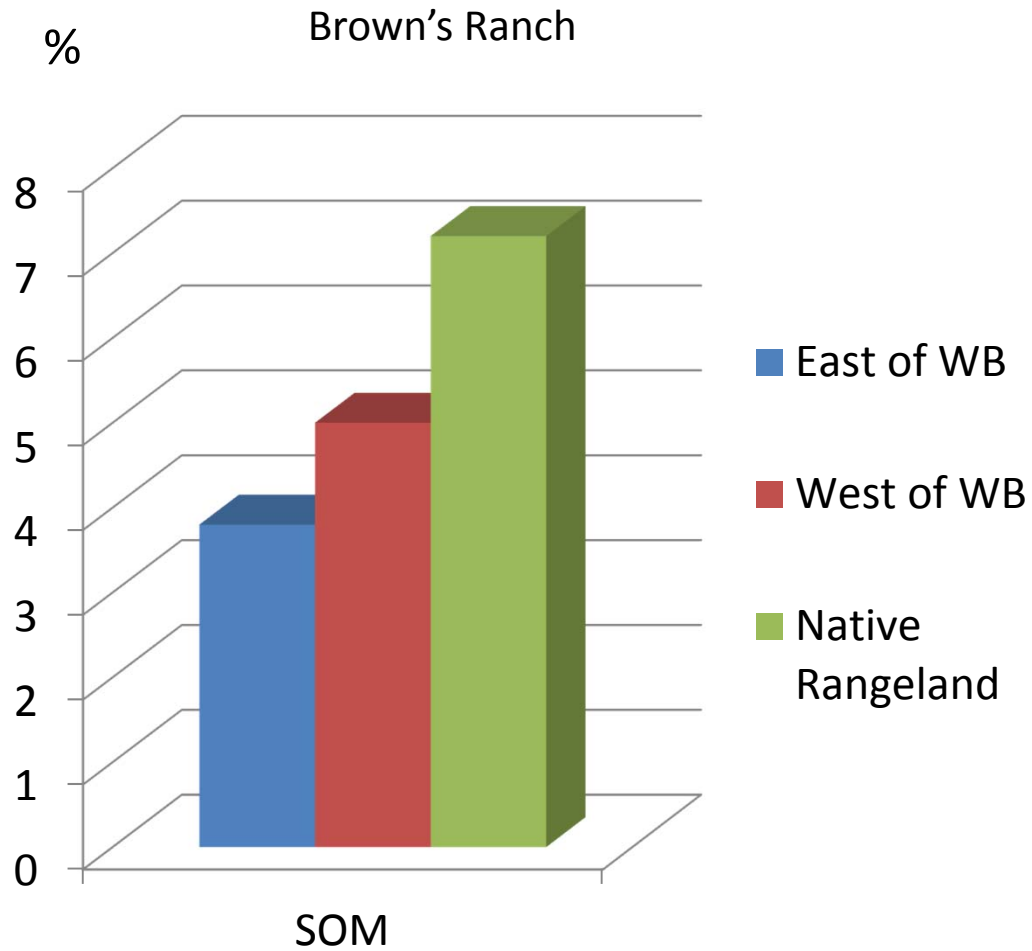
Nutrient Cycling through density



Brown's Ranch
Home of Sustainable Ranching
www.sustainable ranching.com



Huge Carbon Sink



East of WB – Cropland With No Livestock
West of WB – Cropland With Livestock
Ward Laboratories, Inc – Test Date 10/2012

Michael Thompson and Dad



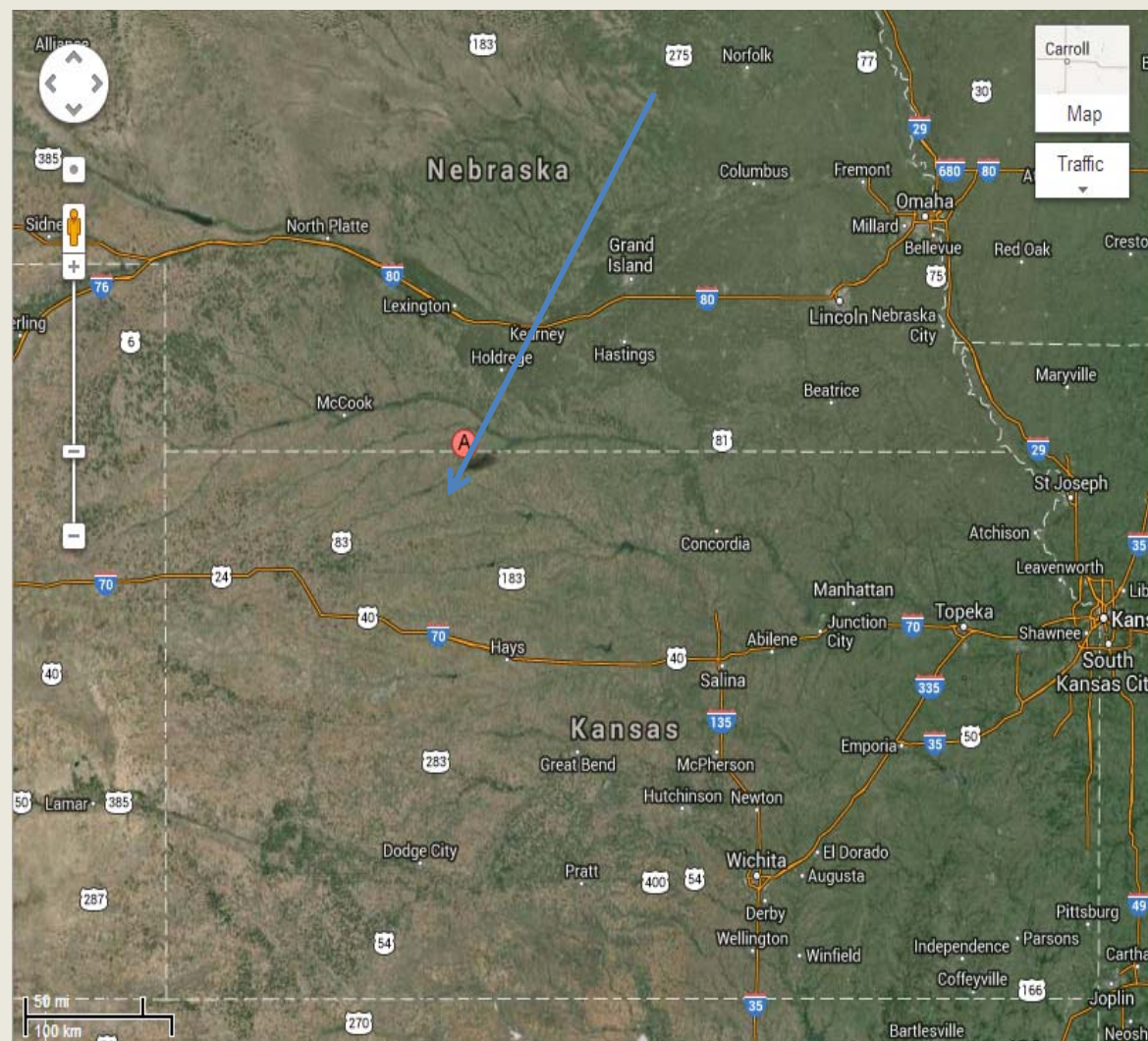
Applying
all the
SH
Principles

The Science of
Conservation,
We Deliver!

NRCS 
East NTSC

2013 Drought

Michael Thompson, Thompson Farm and Ranch



The Science of
Conservation,
We Deliver!

NRCS
East NTSC

Michael Thompson, Thompson Farm and Ranch -2013 drought



No-till corn with cover crops made 58 bu./ac. (on 7 in. of total rainfall)



For reference: The 2012 dry land yield average was 31.2 bu./ac.

Neighbor- conventional tilled corn made 5 bu./ac.

The Science of
Conservation,
We Deliver!

NRCS 
East NTSC

Teaching Moment:



The Science of
Conservation,
We Deliver!

NRCS 
East NTSC

Russ (Fireman) 30 ac.

Soil Health Score: 10 thru 12



Restoring Ecological Memory:



FOCUS ON FRAGILITY RATHER THAN PREDICTING AND CALCULATING PROBABILITIES

Table 1: THE CENTRAL TRIAD:THREE TYPES OF EXPOSURE

Subject	Fragile	Robust	Antifragile
Biological and economic systems	Efficiency optimized	Redundancy	Functional redundancy
Science	Directed research Separable		Antifragile tinkering Holistic
Regulation	Rules	Principles	Virtue
Ethics	System <u>without</u> skin in the game	System with skin in the game	System with <u>soul</u> in the game
Stress	Chronic stressors		Acute stressors with recovery

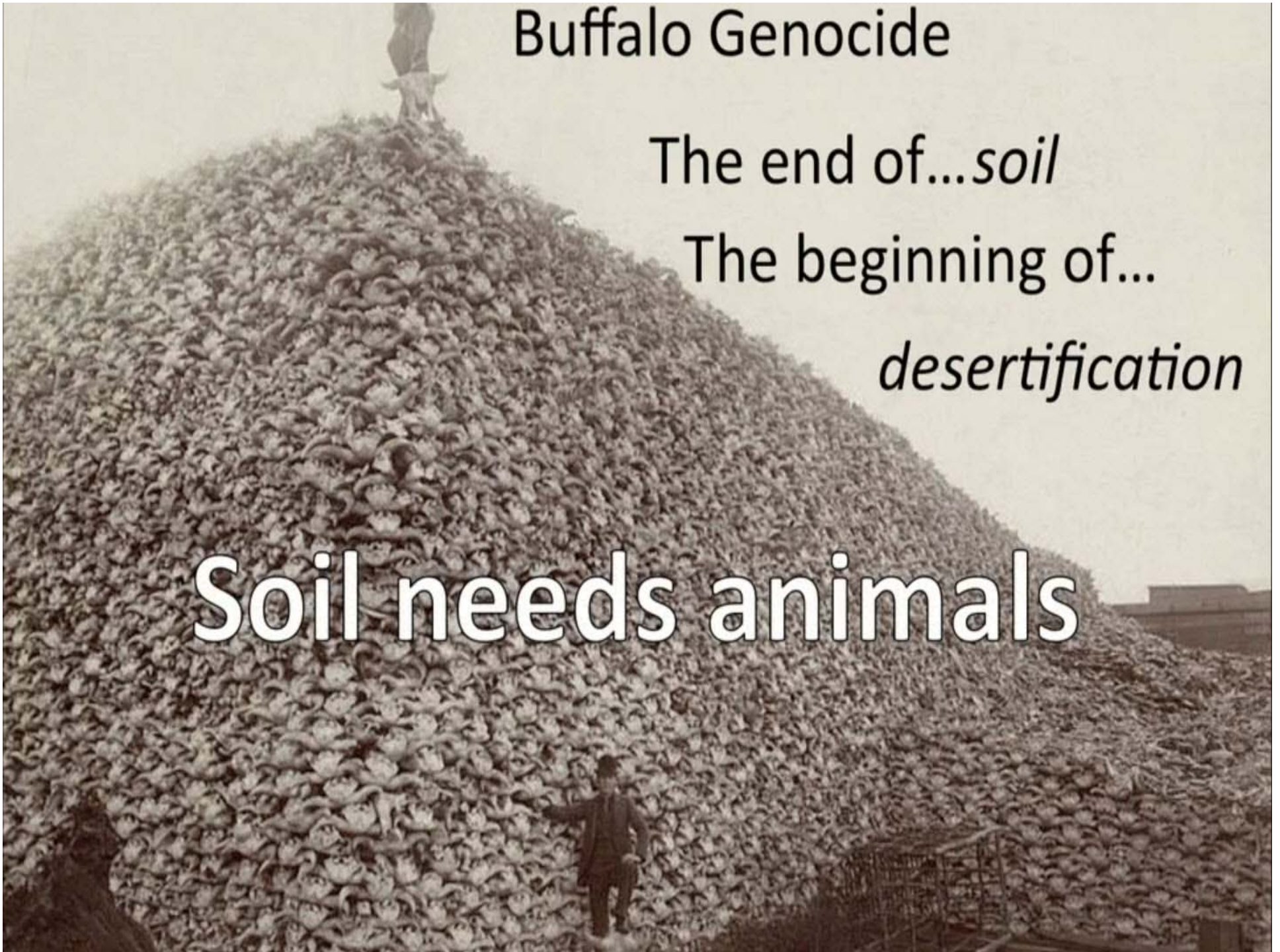
Buffalo Genocide

The end of...*soil*

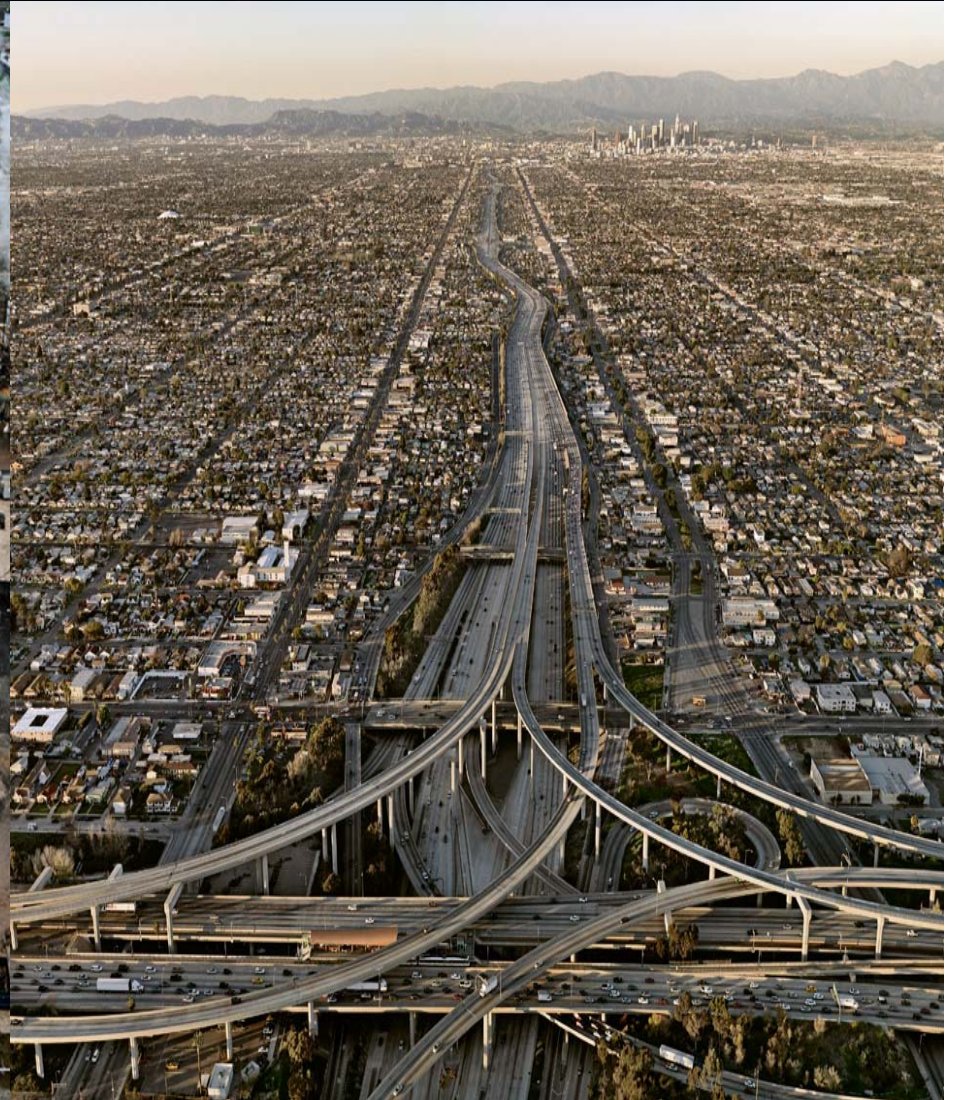
The beginning of...

desertification

Soil needs animals



The “refinement” of modern Agriculture

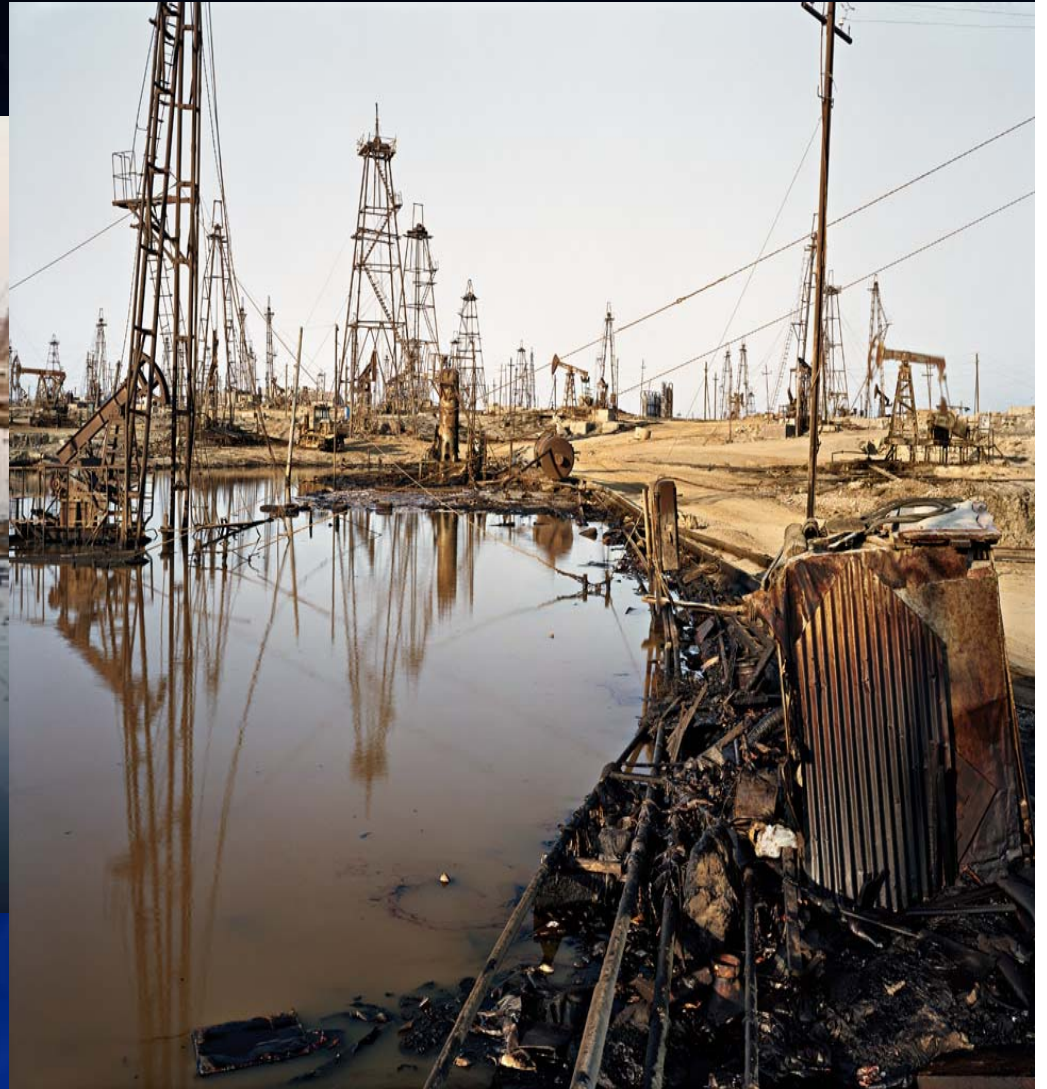


The real cost of farming and ranching

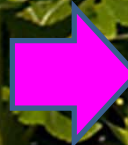
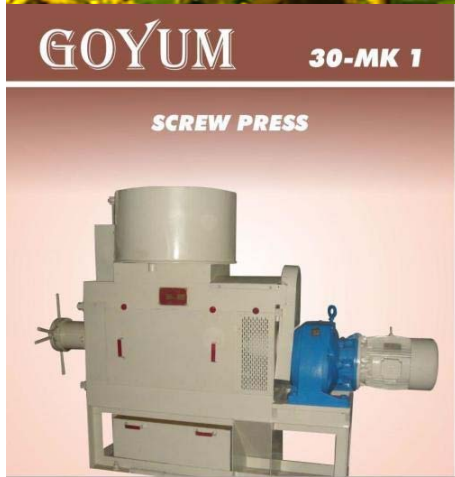


Edward Burtynsky, *Oil Fields #27, Bakersfield, California, USA, 2004*

No Free Lunch!



Use Soil to make oil (biodiesel) for Transport, Planting, Spraying, and harvesting!



http://www.journeytoforever.org/biodiesel_link.html

Restorative Agriculture Feeds the Whole





Plant and Soil are One

Ray Archuleta