U S D A

Natural Resources Conservation Service

(NRCS)

Missouri Basin NIDIS Kickoff Meeting
February 27, 2014

NRCS, Agriculture and Building Climate Resiliency

Presented by

Verlon Barnes
NRCS Missouri River Basin Coordinator

USDA-NRCS is an Equal Opportunity Provider and Employer

NRCS History

DROUGHT and the Dust Bowl led to creation of the
Soil Conservation Service (SCS) in 1935,
later renamed the Natural Resources Conservation Service (NRCS).

Established to help landowners install and use conservation practices in order to conserve and restore natural resources, and make them more resilient to environmental challenges.

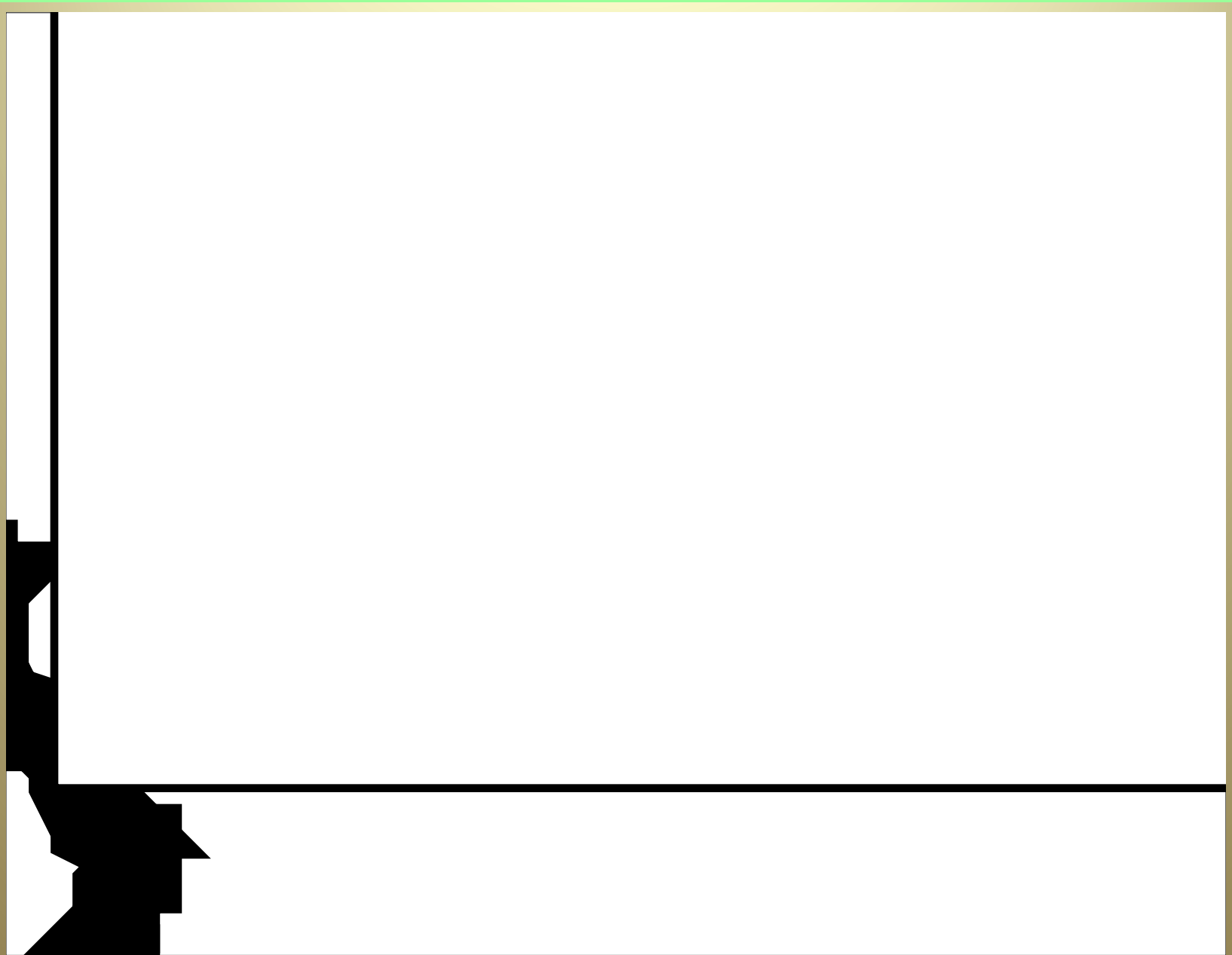
Vision

Productive Lands - Healthy Environment

Mission

Helping People Help the Land

NRCS has Staff in nearly every county across the nation. These staff members generally have strong connections with the local community.



NRCS provides Science-based Technical Assistance

NRCS works side-by-side and one-on-one with farmers and ranchers to plan, develop, design and implement conservation plans and practices that conserve, improve and/or restore identified natural resource concerns and degradation, including those affecting:

- Soil,
- Water (Drought & Flooding),
- Air,
- Plants,
- Animals,
- and Humans.

NRCS Policy, Programs, & Grants for Drought

* **POLICY** authorizes NRCS to address drought, and other natural resource issues impacting drought and to build drought resiliency.

* The 4 major NRCS **PROGRAMS** that provide Technical &/or Financial Assistance for drought issues are:

> Conservation Technical Assistance (CTA)
> Conservation Security Program (CSP)
> Environmental Quality Incentives Program (EQIP)
> Wetland Reserve Program (WRP)

* **GRANTS** that could potentially be used for drought issues:

> Conservation Innovation Grants (CIG)
> Sustainable Agriculture Research and Education Grants (SARE)

Some NRCS's drought activities include:

***Building Resiliency on the ground to Reduce Vulnerability**

*Outreach/Communication/Education/Information Delivery

(Producer visits to office, mailings, producer meetings and events…)

*In-Field Evaluations

*Monitoring and Forecasting

*Research and Development of Tools

*Planning

*Emergency Response

Two key activities NRCS is involved with that have tremendous potential for Building Climate Resiliency are:

*NRCS's **National Soil Health Campaign** initiated in 2012

The **National Cover Crop Campaign initiated just last week with a Goal of 20 million acres of Cover Crops by year 2020

- Cover Crop Survey results of 2012-2013 showed a 5-10% increase in yields when using cover crops compared to conventional methods.

- Cover Crops have demonstrated neutral or net gains in soil moisture.

- Cover Crops have shown net economic gain for producers.

2012 Drought Comparison: Grassland

Two different land management conditions on
similar soils within 10 miles of each other.
Central Nebraska, July 2012, D3-D4 drought category.

Long-term, severely
over utilized grassland

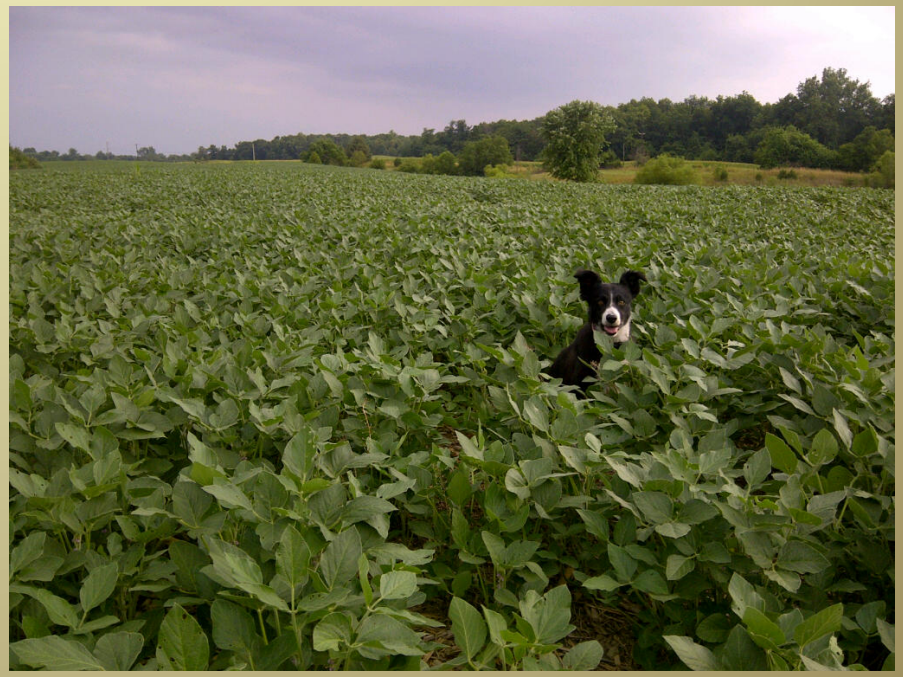
Well managed grassland

2012 Drought Comparison: Soybeans

Greencastle, Indiana, July 2012—Side-by-Side Fields

Minimum / vertical till (Conventional Till)

11-year continuous No-Till plus 5 years of Cover Crops



Infiltration Demonstration

YouTube video on infiltration entitled “Soil lessons in a minute: benefits of no-till farming” (1:13 min) at http://www.youtube.com/watch?v=Rpl09XP_f-w

We know drought is going to happen fairly often. We need to plan for it and to build our resiliency to it.

Areas Under Moderate to Extreme Drought Over Time 1900-2012

Note: Precipitation measured in June of each year.

Source: *The New York Times*, from data from the National Climatic Data Center, National Oceanic and Atmospheric Agency

Land Alterations over past 200-300 years.

Hydrologic conditions/cycles/functions/processes have been dramatically altered …resulting in less groundwater recharge, more runoff, more soil erosion …leading to desertification, reduced biodiversity and water quality issues.

Beaver and beaver dams reduced by an estimated 80-98% (approximately 5-40 million dams lost). (Primarily by 1850s)

Water that was once held in storage, slowed-down, and/or retained, now runs down the watershed at a much accelerated rate, carrying with it greater amounts of ‘pollutants’, creating ‘flashier’ storms, and desertifying the waters in upland watershed.

Land Alterations over past 200-300 years.

Hydrologic and atmospheric conditions/cycles/functions/processes have been dramatically altered…resulting in less groundwater recharge, more runoff, more soil erosion, less greenhouse gases being sequestered…leading to desertification, climate change, reduced biodiversity and water quality issues.

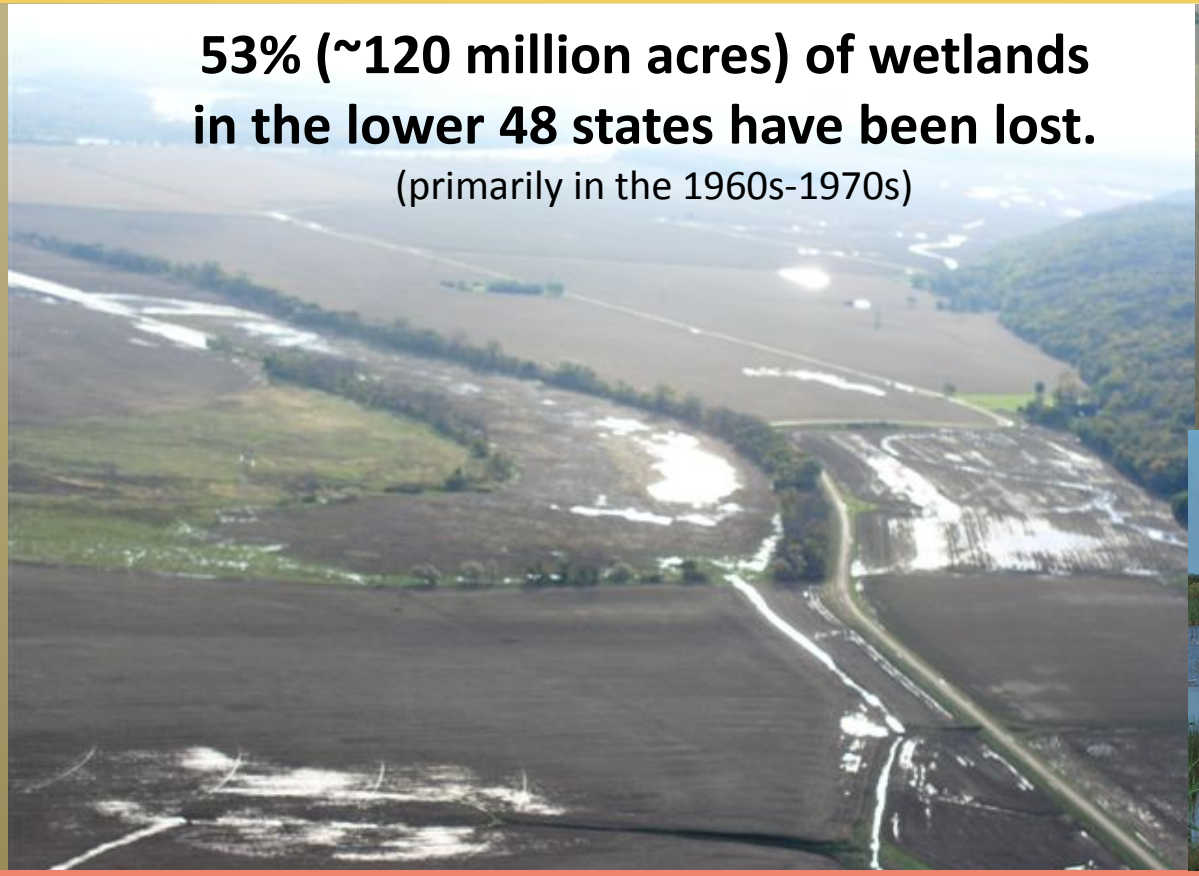
Reduced Vegetative Cover and More Compacted Soils

(largely by 1900)

Due to reduction in water infiltration into the soil, runoff of water overland has greatly increased which has in turn greatly accelerated sheet-rill-gully soil erosion.

Land Alterations over the past 200-300 years.

Hydrologic and atmospheric conditions/cycles/functions/processes have been dramatically altered…resulting in less groundwater recharge, more runoff, more soil erosion, less greenhouse gases being sequestered…leading to desertification, climate change, reduced biodiversity and water quality issues.

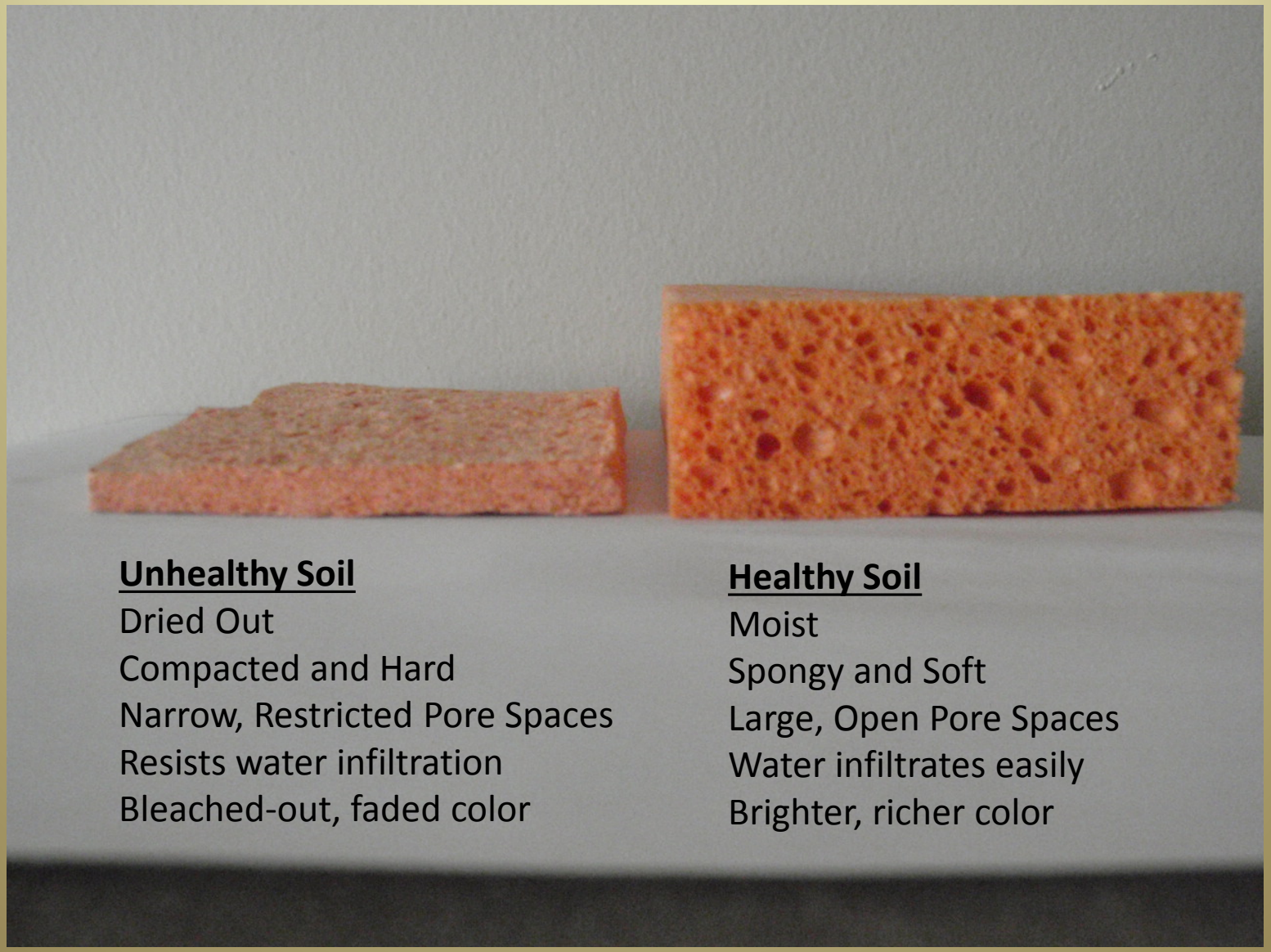


Water that was once held in storage, slowed-down, and/or retained, now runs down the watershed at a much accelerated rate, carrying with it greater amounts of ‘pollutants’, creating ‘flashier’ storms, and desertifying the waters in upland watershed.

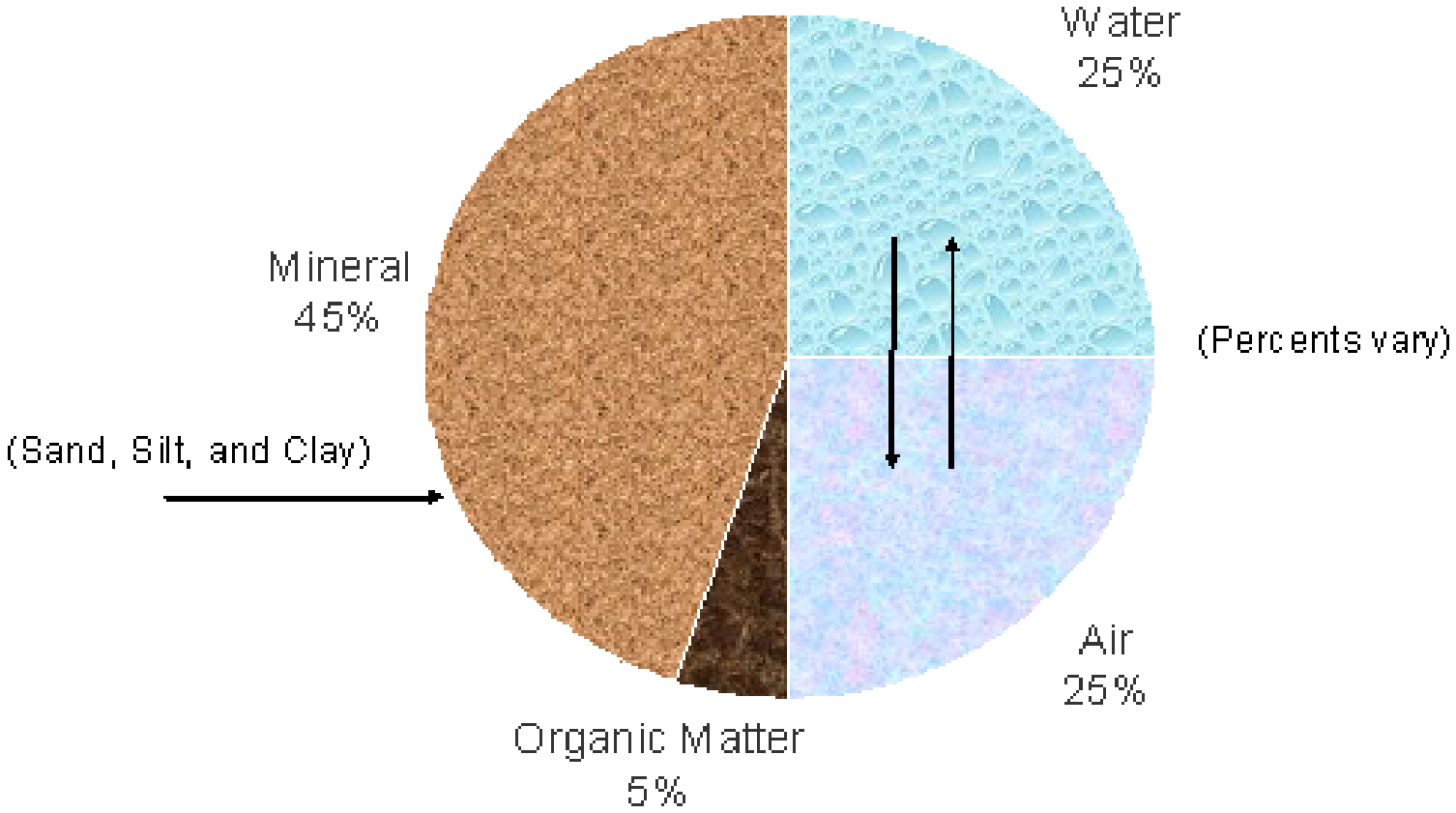
Land Alterations from 1850 to Today

-- Soils have become compacted and depleted of organic matter (aka 'soil organic carbon') leading to reduced infiltration of rainfall and increased soil erosion.

Soil is similar to a Sponge

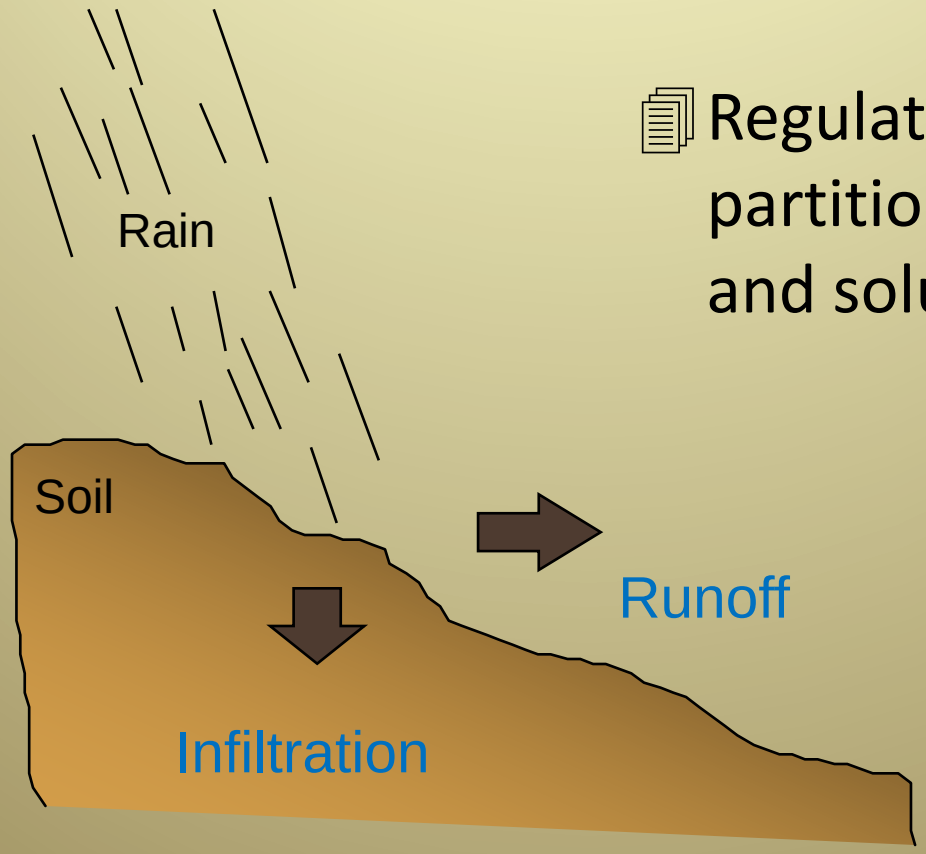


Physical components of a Healthy Soil



Graphic provided by Patrick Cowsert, Soil Scientist, NRCS

One of Soil's Functions is Regulation of Water and Solute Flow



- Regulating and partitioning water and solute flow

Soil Permeability

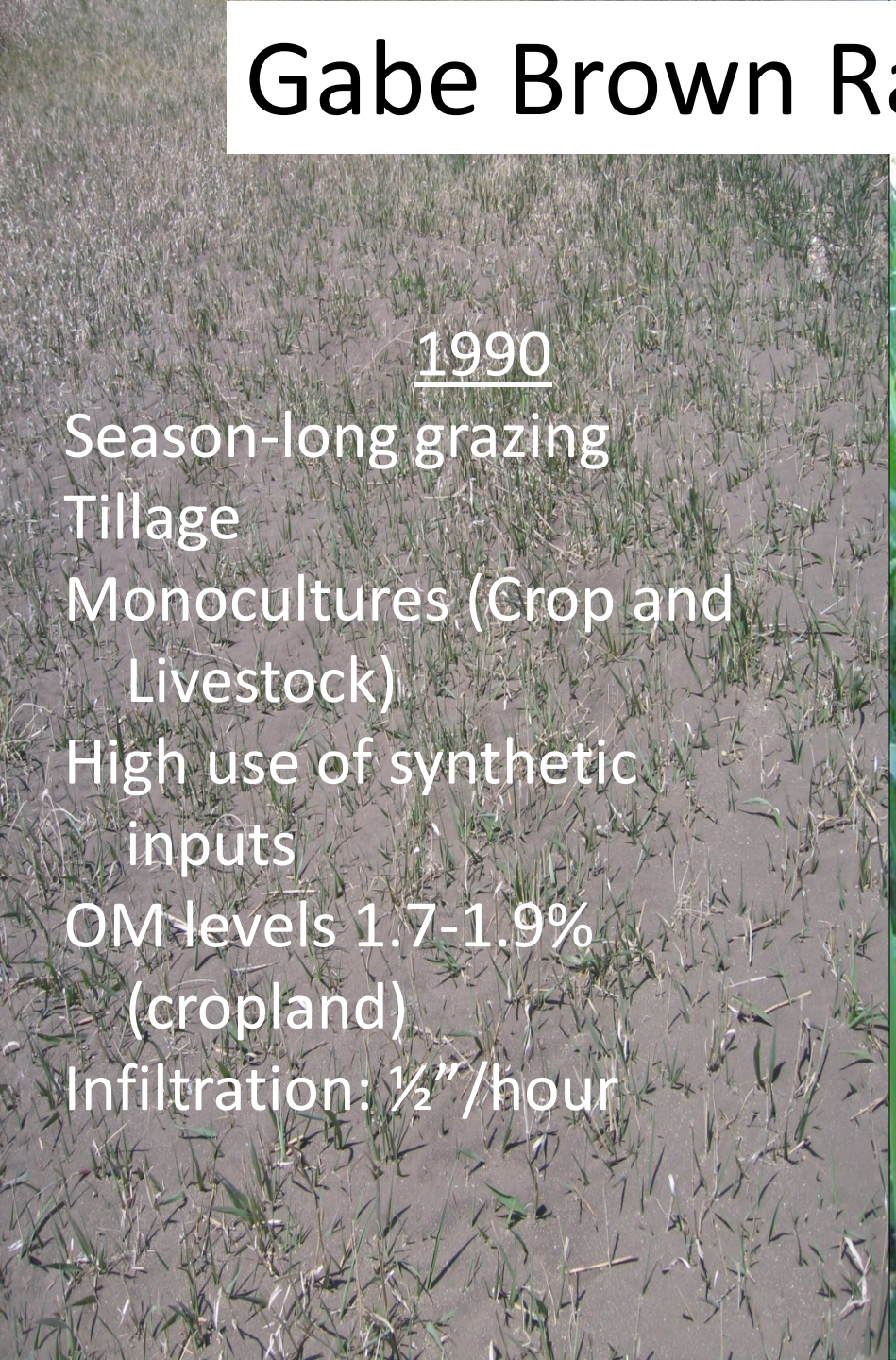
A 25+ year study by University of Nebraska

Disk-Disk	0.4 in/hr
Ridge-till	1.5 in/hr
Slot-plant (No-Till)	4.0 in/hr

A <u>ten-fold</u> difference in infiltration rate between a double disk system and a continuous no-till system!

UNL, SCREC, Clay Center, NE

Gabe Brown Ranch History



1990

Season-long grazing
Tillage
Monocultures (Crop and Livestock)
High use of synthetic inputs
OM levels 1.7-1.9% (cropland)
Infiltration: ½”/hour

2012

High Intensity - Short Duration Grazing
Continuous No-Till
High Diversity
No synthetic fertilizer since 2008
OM levels 5.3-6.1%
Infiltration: ~8”+/hour

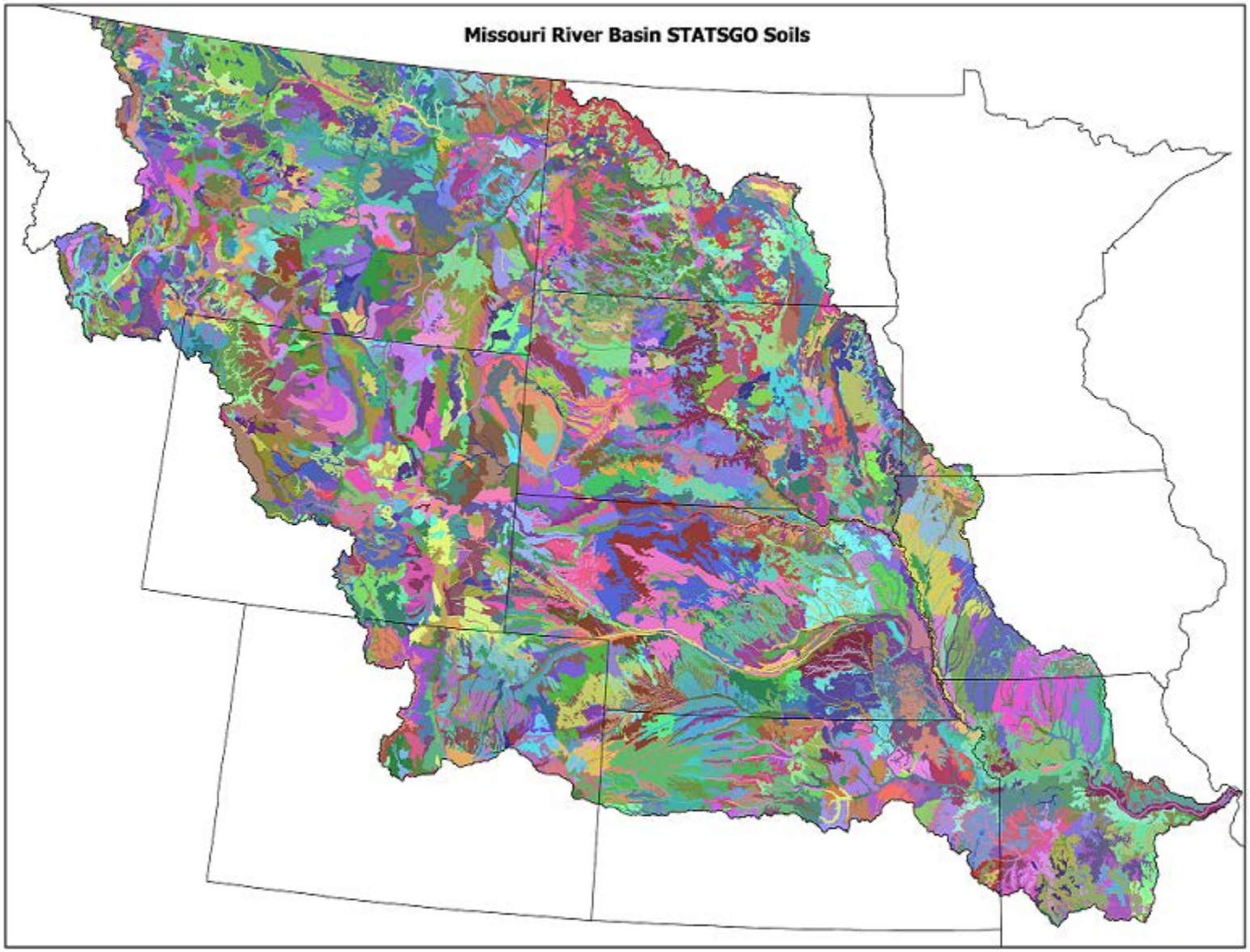
Organic Matter and Available Water Capacity
Inches of Water/One Foot of Soil

Percent SOM	Sand	Silt Loam	Silty Clay Loam
1	1.0	1.9	1.4
2	1.4	2.4	1.8
3	1.7	2.9	2.2
4	2.1	3.5	2.6
5	2.5	4.0	3.0

Berman Hudson
Journal Soil and Water Conservation 49(2) 189-194
March – April 1994
Summarized by:
Dr. Mark Liebig, ARS, Mandan, ND
Hal Weiser, Soil Scientist, NRCS, Bismarck, ND

Hydrology and Organic Matter

General Soils Map of Missouri Basin



NRCS has 12 National Centers of Expertise

Three examples are:

* National Soil Survey Center (NSSC)

http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/nssc

NRCS is recognized as the worldwide leader in soils!

* National Water Management Center (NWMC)

http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/nwmc

* National Water and Climate Center (NWCC)

http://www.wcc.nrcs.usda.gov/

EX: Snow Surveys, SNOTel, and Soil Climate Analysis Network (SCAN)

NRCS Rapid Carbon Assessment (RaCA)

Soil has tremendous potential to store carbon, which reduces the levels of carbon dioxide in the atmosphere, one of the leading greenhouse gases contributing to climate change. Increasing carbon in the soil increases soil organic matter which increases several important processes, including infiltration and water-holding capacity.

NRCS soil scientists took 148,000 individual soil samples and evaluated them for carbon content. **This Rapid Carbon Assessment, or RaCA, dataset serves as a baseline or snapshot in time for the amount of carbon each soil type is holding.**

Storage potential varies among soils, land covers, and land uses and management. We can target the ones with the greatest potential to store additional carbon. Several conservation practices, such as conservation crop rotations and cover crops, help increase carbon storage in soil. These crops take carbon dioxide out of the atmosphere and deposit it into the soil as organic matter.

Increasing soil carbon is considered the single most important component of soil health.

NRCS "COMET- Farm™" (CarbOn Management & Emissions Tool)

COMET-Farm™ is a free online tool that allows producers to enter information about their farm or ranch management practices and receive general guidance on actions they can take to build carbon in their soil. Thirty-five of NRCS's nearly 170 practices have been identified as positively reducing GHGs and increasing carbon sequestration.

COMET-Farm™ will help producers estimate the value of carbon credits they could earn from various conservation practices. Conservation will not only pay indirectly through improved yields, lower energy costs, soil resiliency and other production-related benefits,– but could also be profitable in the environmental marketplace.

COMET-Farm™ is applicable to all agricultural lands in the lower 48 states. The tool is available for use at www.comet-farm.com.

COMET-Farm™ was developed in partnership with Colorado State University.

NRCS has Numerous Technical Manuals, Handbooks, and Resources based on science and peer reviewed

Some examples include:

* Soil Surveys
(with detailed soils information for nearly every acre in the U.S.)
* Web Soil Survey
* Soil Data Mart
* National Agronomy Manual
* National Range and Pasture Handbook
* National Engineering Handbook
* Field Office Technical Guide (technical information that includes standards and specifications for approx. 170 conservation practices)

Conservation Practices and Systems

- A "systems approach" is used to address resource concerns, which will typically involve implementation of one or more conservation practices.
- Conservation practices and systems are science based and founded on trials, demonstrations, and practical application.
- There are nearly 170 conservation practice standards. A number of them are beneficial to addressing drought, including 35 that have significant relationships to Green House Gases (GHGs)/Carbon Sequestration, Particulate Matter, Ozone Precursors, Odors, and Ammonia.

Conservation Practice	Air Quality Benefits
Access Road	PM
Atmospheric Resource Quality Mgt	PM, Ozone Precursors, GHGs, Odors, Ammonia
Conservation Cover	PM, GHGs
Cover Crop	PM, GHGs
Cross Wind Strip-cropping	PM
Cross Wind Trap Strips	PM
Deep Tillage	PM
Hedgerow Planting	PM, GHGs, Odors, Ammonia
Irrigation Water Management	PM, Ozone Precursors, GHGs
Mulching	PM
Nutrient Management	PM, Ozone Precursors, GHGs, Odors, Ammonia
Obstruction Removal (Stake Disposal)	PM, Ozone Precursors, GHGs
Pest Management (IPM)	PM, Ozone Precursors, GHGs, Odors
Pumping Plant (Engine Replacement)	PM, Ozone Precursors, GHGs
Residue Management	PM, GHGs
Tree/Shrub Establishment	PM, GHGs, Odors, Ammonia
Tree/Shrub Pruning (Chipping)	PM, Ozone Precursors, GHGs, Odors, Ammonia
Vegetative Barrier	PM, GHGs, Odors, Ammonia
Waste Management	PM, Ozone Precursors, GHGs, Odors, Ammonia
Waste Utilization	PM, Ozone Precursors, GHGs, Odors, Ammonia
Windbreak/Shelterbreak Establishment	PM, Ozone Precursors, GHGs, Odors, Ammonia

Healthy Soil impacts
Hydrologic / Water Cycle

Implementing Soil Health Practices re-establishes the hydrology and water cycle closer to natural conditions

*Increases Infiltration

Increases Water Holding Capacity and Drought Resiliency

*Reduces Runoff and Flooding

Increases Recharge of Ground water

*Increases Recharge of Base Flows to Streams and maintains more consistent flows

The soil can be alive and resilient, your management just has to allow it to be!

QUESTIONS?

Verlon Barnes, NRCS Missouri River Basin Coordinator

(located at)

U.S. Army Corps of Engineers

1616 Capitol Avenue

Omaha, NE 68102

TEL: 402-995-2467

Email: Verlon.Barnes@ne.usda.gov

For more information on NRCS or Soils, see

NRCS Home Page: http://www.nrcs.usda.gov/

NRCS Soil Quality web link: http://soils.usda.gov/sqi/

USDA-NRCS is an Equal Opportunity Provider and Employer