



www.dakotalakes.com

Dakota Lakes Research Farm

- **OWNED BY FARMERS**
- **BOTH IRRIGATION AND DRYLAND**
- **100% LOW-DISTURBANCE NO-TILL**
- **PRODUCTION ENTERPRISE
PROFITS SUPPORT RESEARCH**

UNITED STATES OF AMERICA







**A FARMER MANAGES
ECOSYSTEMS AND TAKES
SUNLIGHT, WATER, AND
CARBON DIOXIDE AND
MAKES THEM INTO
PRODUCTS TO BE SOLD.**

ECOSYSTEM PROCESSES

- **WATER CYCLE**
- **ENERGY FLOW**
- **MINERAL CYCLE**
- **COMMUNITY DYNAMICS**

ECOSYSTEM PROCESSES

- **WATER CYCLE-Does rain feed plants and recharge groundwater or does it run off and cause erosion and water quality degradation?**

The Dakota Lakes Research Farm began to use diverse, low-disturbance, no-till and cover cropping to control runoff from center-pivot irrigators.







ECOSYSTEM PROCESSES

- **ENERGY FLOW-How much sunlight strikes green leaves and makes food for the ecosystem? How much falls on dead vegetation or bare ground?**

ECOSYSTEM PROCESSES

The Dakota Lakes Research Farm uses cover and forage crops to fine-tune crop rotations, increase carbon capture, sequester nutrients, fix nitrogen, encourage friendlies, etc.

















ECOSYSTEM PROCESSES

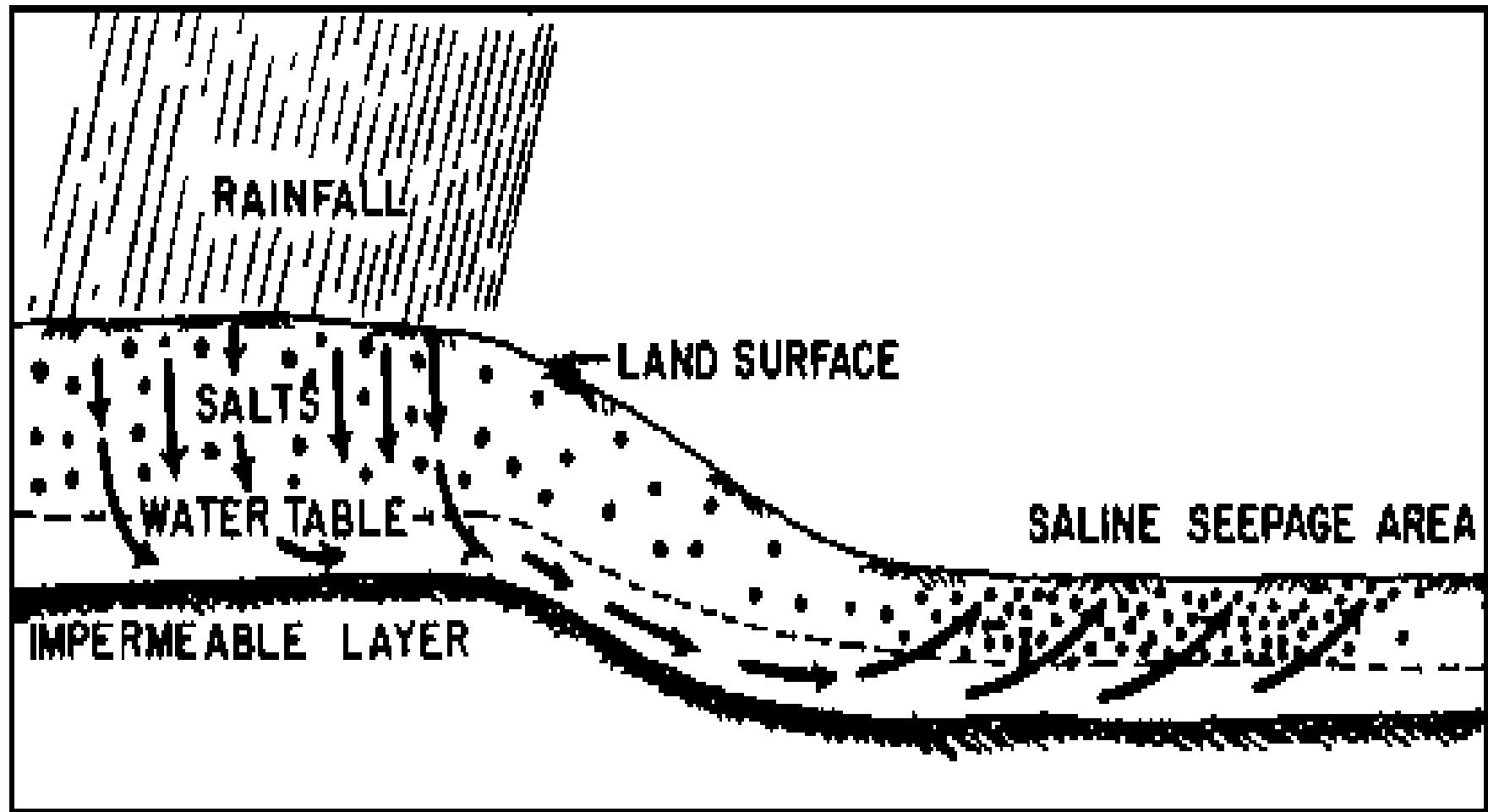
- **MINERAL CYCLE**-Are the nutrients available for plant use and environmental services’”? Or have they been leached, eroded, or transported from the landscape?

ECOSYSTEM PROCESSES

- **MINERAL CYCLE-**

- **Ecosystems that leak nutrients become deserts.**
- **Saline seeps indicate leakage**
- **Decreasing pH indicates leakage**
- **One unit train of soybeans contains 1 million pounds of phosphorus**

Saline Seep Formation









**MOST NITROGEN IN FEED
HAULED TO THE FEEDLOT
DOES NOT MAKE IT BACK TO
THE FIELD. MOST N IN FEED
CONSUMED IN THE FIELD
REMAINS THERE.**

ECOSYSTEM PROCESSES

- **COMMUNITY DYNAMICS**-Do many species (great and small) have fairly stable populations of all ages? Or does the population of just a few species fluctuate widely?

ADEQUATE DIVERSITY

**Weeds and diseases are
nature's way of adding
diversity to a system
that lacks diversity.**

ADEQUATE DIVERSITY

**Nature's efforts to add
diversity can be
countered by adding
beneficial diversity to
the system.**



**COVER AND FORAGE
CROPS ARE A TOOL NOT AN
END. THEY ARE A WAY TO
IMPROVE ROTATION
DIVERSITY AND INTENSITY
WHILE PROVIDING
COMPETITION.**

COVER and FORAGE CROPS

Cover and forage crops provide the opportunity to increase both intensity and diversity in situations where production of a grain crop would not be possible, would be unprofitable, or would be excessively risky.

COVER and FORAGE CROPS

In humid environments (tall-grass prairie or wetter) the goal should be to have something growing at all times. In areas with a limited growing season this will require the use of cover crops and/or forage double crops.

COVER and FORAGE CROPS

In subhumid, semiarid, and arid environments cover crops can be utilized to increase organic matter and biological activity.

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Decide what you want to do before trying to choose a cover crop, forage crop, or cover crop mixture.**

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Think of the cover crop as another component in a rotation.**

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Using a mixture of cover-crops allows meeting several goals simultaneously. Mixtures add more diversity, grow at different times, better compete with weeds, optimize nutrient cycling, etc.**

Working With Forage Soybean



Silage Corn



Silage Corn - Forage Soybean



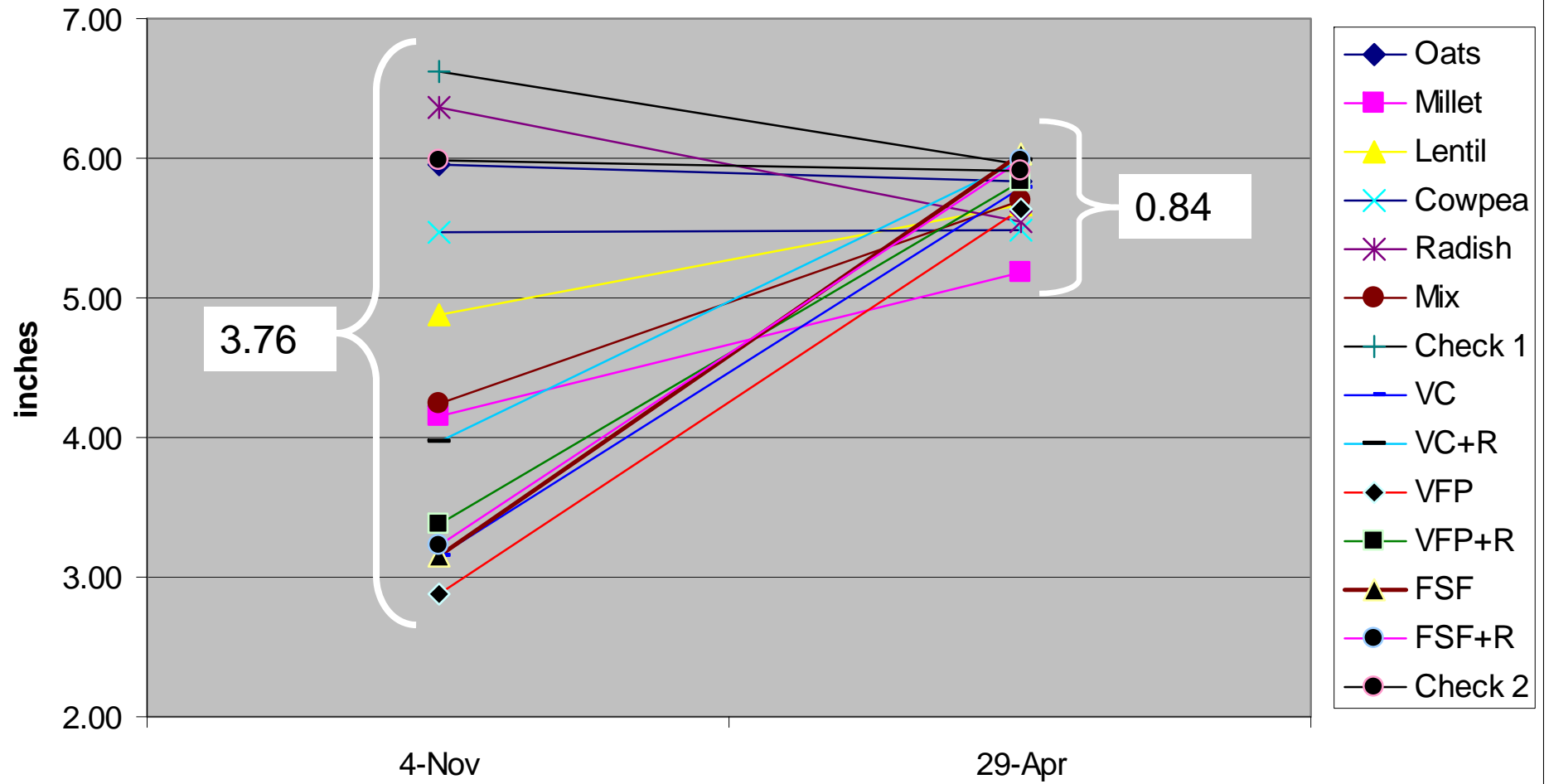
TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Creating conditions beneficial to the next crop is usually one of the primary goals of a cover-crop.**

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Water and nutrient management is often another primary goal. Water used by a cover-crop during the non-crop period can often be regained during the growing season because of better infiltration, reduced runoff, and improved water relations BUT THE COVER NEEDS TO BE MAINTAINED.**

Soil water content 11-4-10 and 4-29-11



TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Understanding rainfall patterns in your area and the water holding characteristics of your soils is mandatory to fully benefit from cover and forage crop programs. USE WEB SOIL SURVEY AND RAINFALL DATA.**

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Cover crop seed must be INEXPENSIVE in terms of its potential benefit. Small seeds mean less volume/acre thus requiring less tank fills.**

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **Small seeds grow better on the surface than larger seeds while large seeds usually emerge better through a mat of residue.**

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

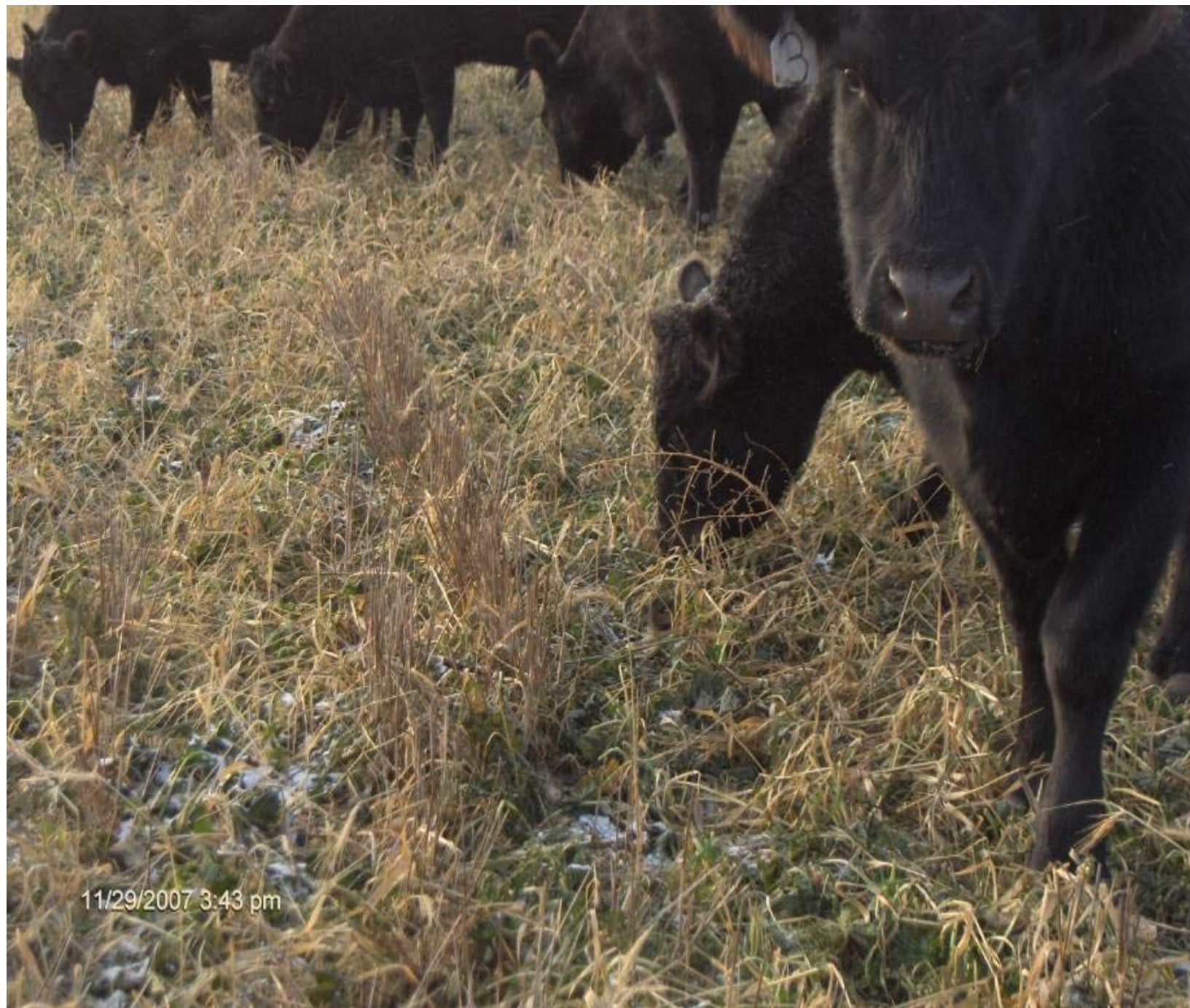
- **Using harrows to improve the stand of surface broadcast seed also improves the stand of weeds.**

TOP 10 THINGS TO KNOW ABOUT COVER CROPS

- **One important goal is to use the cover crop to balance the diet of soil organisms. High carbon residue (low protein) requires low carbon (high protein) cover crops to balance the diet. Low residue crops (low C) require high residue crops (high C).**

**MANAGING COVER
CROPS IS MORE
GUESSWORK THAN
SCIENCE AT THIS
POINT**

**ROTATION,
SANITATION, AND
COMPETITION ARE THE
PRIMARY TOOLS OF
PEST CONTROL.**



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CATCH AND RELEASE NUTRIENTS

























“Within all textural groups, as organic matter increased from 1 to 3%, the available water capacity approximately doubled. When organic matter content increased to 4%, it then accounted for more than 60% of total AWC“.8

27,000 gallons of water with 1% OM in 6 inches of soil.

This is 0.26 inches of water.

If we can increase by 4% that is 1 inch in the top 6 inches or 2 inches in the top foot,

When soil water storage capacity is low, much of the rain that falls during extended periods of precipitation is lost. In contrast, a high water storage capacity, combined with the effective capture of rain and snowmelt over the fall, winter and spring can support a crop through an extended dry period.



Commonality Among Tillage Tools

- All Tillage Tools Destroy Soil Structure.
- All tillage tools decrease water infiltration
- All tillage tools reduce organic matter
- All tillage tools increase weeds.

**Continuous Low-Disturbance
No-till in Combination with
Diverse Rotations and Cover
Crops:**

**A BIOLOGIC ANSWER TO A
BIOLOGICAL PROBLEM**

