

# Soil Conservation, Productivity and Environmental Quality

Remarks by  
Craig Cox  
2013 Agricultural Outlook Forum

## Topics I will cover...

- ⊗ What is “marginal” land...
- ⊗ What do we know about soil erosion and soil degradation...
- ⊗ Combination of markets, weather and policy is expanding the universe of “marginal” land...
- ⊗ A few policy implications...

What is “marginal” land...

Land that cannot be planted to annually-tilled crops unless aggressive conservation measures are taken to *improve* soil health and the environment.

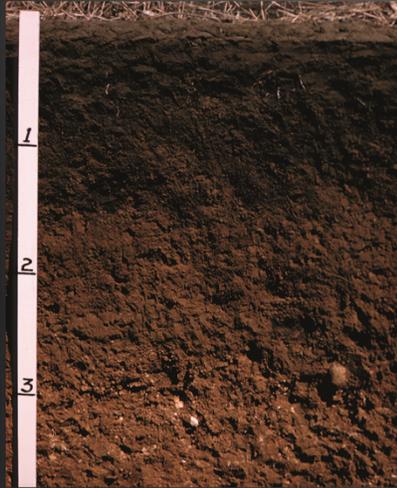
THIS IS HOW I THINK ABOUT MARGINAL LAND...

SOIL QUALITY OR HEALTH – FUNDAMENTAL FIRST STEP TO ADDRESS BOTH PRODUCTIVITY AND THE ENVIRONMENT...

BUT ADDRESSING ENVIRONMENTAL CONCERNS REQUIRES MORE THAN SOIL QUALITY...

NEED TO EXPLICITLY FOCUS ON IMPROVING SOIL QUALITY AND THE ENVIRONMENT...SUSTAINING THE STATUS QUO IS NOT GOOD ENOUGH.

## *Improve soil health*



“...the thin layer of soil covering the surface of the earth represents the difference between survival and extinction for most land-based life.”

“Like water, soil is a vital natural resource essential to civilization, but unlike water, soil is nonrenewable on a human time scale.”

Doran et al. 1999. Determinants of Soil Quality and Health. Chapter 2 in Soil Quality and Soil Erosion, R. Lal ed., Soil and Water Conservation Society, Ankeny, Iowa.

JUST TO REVIEW WHY WE SHOULD BE SO CONCERNED ABOUT SOIL HEALTH...

SOIL HEALTH IS SLOWLY EMERGING AS A DRIVING NATURAL RESOURCE AND ENVIRONMENTAL CONCERN...

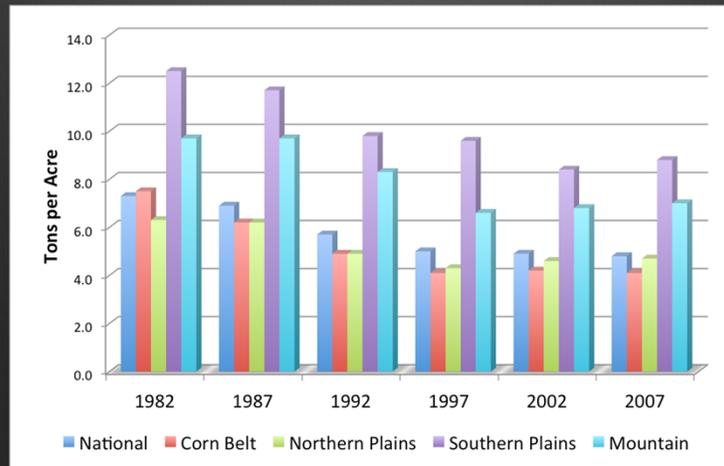
SOIL HEALTH IS MOST IMPORTANT WHEN THE WEATHER IS BAD – AND THE WEATHER WILL BE INCREASINGLY BAD, STRESSING CROP PRODUCTION AND THE ENVIRONMENT.

MANY CONCERNS ABOUT SOIL HEALTH – ORGANIC MATTER, COMPACTION, CHEMICAL CONTAMINATION

PRIMARY POLICY FOCUS HAS BEEN ON SOIL EROSION – FOR GOOD REASON

UPSHOT IS THAT SOIL EROSION IS WHAT IS TRACKED – WE KNOW LITTLE ABOUT OTHER FORMS OF SOIL DEGRADATION.

“Soil erosion, in turn, starts a chain reaction that exacerbates all aspects of environmental degradation.”



Rattan, L. 1999. Soil Quality and Food Security. Chapter 1 in Soil Quality and Soil Erosion, R. Lal ed., Soil and Water Conservation Society. 1999 and USDA NRCS National Resources Inventory, 2007 Summary Report.

WHAT IS THE NRI TELLING US ABOUT SOIL EROSION...

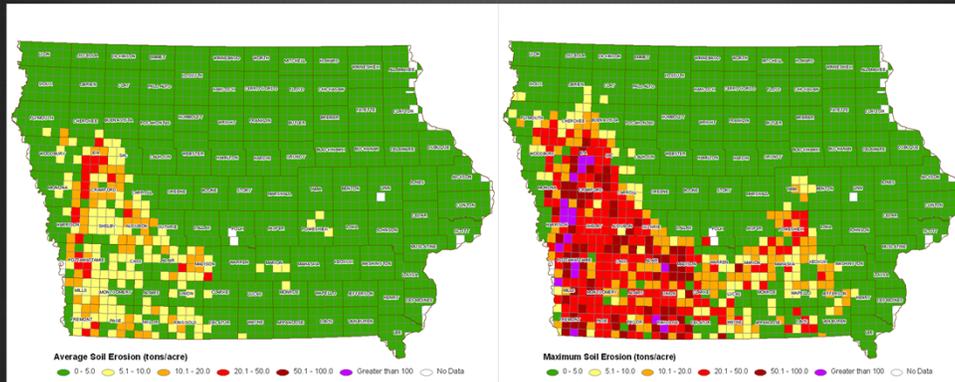
ON AVERAGE – ACROSS THE NATION -- WELCOME REDUCTION IN EROSION BETWEEN 1982 AND 1997 – PROGRESS HAS STALLED OUT SINCE THEN.

BUT IN KEY REGIONS NRI TELLS US THAT – ON AVERAGE -- SOIL EROSION IS GETTING WORSE...NORTHERN PLAINS – SOUTHERN PLAINS – MOUNTAIN AS WELL AS SOME STATES IN THE CORN BELT.

## May 5-7, 2007 Storm

Average Erosion

Maximum Erosion



Cox C. and A. Hug. 2011. Losing Ground. Environmental Working Group, Washington DC. <http://www.ewg.org/losingground/>

BUT "AVERAGE" EROSION CAN BE QUITE MISLEADING

EROSION IS AN EPISODIC EVENT – DRIVEN BY UNIQUE STORM EVENTS.

ISU DAILY EROSION PROJECT ESTIMATES EROSION AFTER EACH STORM THAT PASSES OVER IOWA.

AVERAGE EROSION RANGED BETWEEN 5 AND 50 TONS PER ACRE IN THE STORM AREA.

MAXIMUM EROSION – MOST VULNERABLE AND POORLY PROTECT LAND – RANGED FROM 5 TO OVER 100 TONS PER ACRE.

AVERAGES ARE LARGELY MEANINGLESS – WHAT IS SUSTAINABLE IS WHAT CAN STAND UP AGAINST THESE KIND OF EVENTS.

## Epidemic of gully erosion



POORLY PROTECTED FIELDS COUPLED WITH MORE INTENSE RAINSTORMS ARE PRODUCING AN EPIDEMIC OF EPHEMERAL GULLY EROSION.

A PARTICULARLY DAMAGING FORM OF EROSION THAT CREATES A DIRECT PIPELINE FOR POLLUTED RUNOFF FROM FIELDS TO STREAMS.

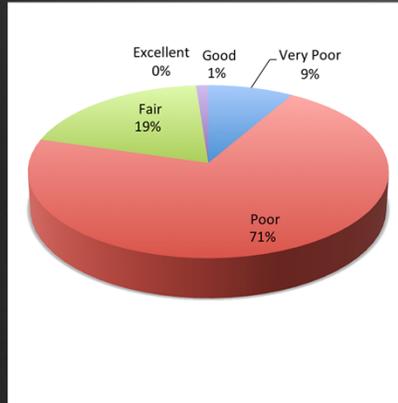
A FORM OF EROSION THAT IS NOT ACCOUNTED FOR IN NATIONAL ESTIMATES OF EROSION.

ESTIMATES OF EROSION WOULD BE FAR HIGHER IF GULLY EROSION WAS INCLUDED.

**NEXT SLIDE**

# Runoff from farms is the leading source of impairments to surveyed rivers and lakes...

## Iowa Water Quality Index



- ⊗ 80% of monitored streams segment in poor or very poor condition in the summer.
- ⊗ 60% poor or very poor year round.
- ⊗ Mostly because of N and P runoff from farm fields.

Cox, C. and A. Hug. 2012. Murky Waters. Environmental Working Group, Washington DC. <http://www.ewg.org/research/murky-waters>

OFFSITE EFFECTS LOOM LARGE – WHERE POLICY IS INCREASINGLY FOCUSED NOW.

IOWA DNR MAINTAINS A WATER QUALITY INDEX – 98 MONITORING SITES, WHICH WE RECENTLY ANALYZED AS PART OF OUR “MURKY WATERS” REPORT.

80 PERCENT OF MONITORED STREAMS IN POOR OR VERY POOR CONDITION IN SUMMER – 60 PERCENT YEAR ROUND.

MOSTLY BECAUSE RUNOFF FROM FARM FIELDS.

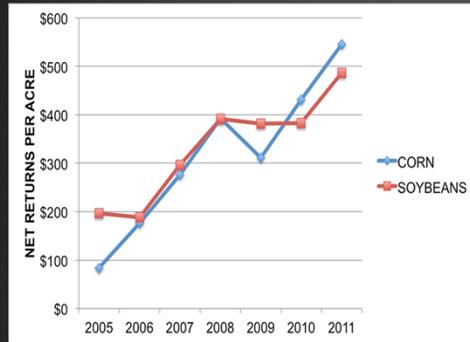
FROM AN “OFF-SITE” PERSPECTIVE, WE ARE STARTING FROM AN ALREADY UNSUSTAINABLE BASELINE IN IOWA – PROBABLY SIMILARLY ACROSS THE CORN BELT.

**NEXT SLIDE**

# Pressure on soil and water mounting

## Soaring Land Rents

### Soaring Crop Prices



*The Farmer's Exchange, Dec. 21, 2012*

*"That's right, an auction where the right to crop one family's five parcels of Fremont County, Iowa, the absolute southwest corner of the state, went on the block that Saturday at the appropriately-named Skyline Sportsman Club."*

- ✿ Tract One, \$545 per acre;
- ✿ Tract Two, \$470 per acre;
- ✿ Tract Three, \$520 per acre;
- ✿ Tract Four, \$485 per acre and
- ✿ Tract Five, \$615 per acre.

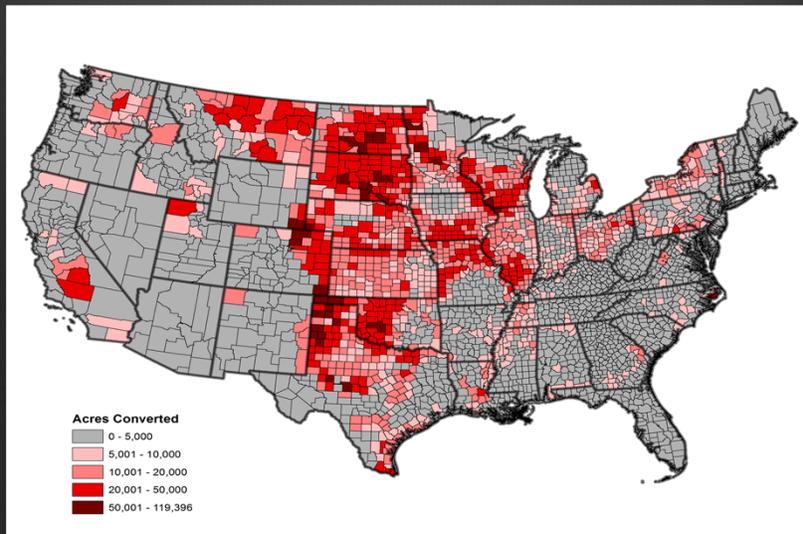
PRESSURE MOUNTING ON THE AGRICULTURAL LANDSCAPE...

SOARING CROP PRICES...

COMPETITION FOR LAND...

PUSHING CONVERSION OF GRASSLAND – PASTURE – CRP TO ROW CROPS

## 23 million acres converted to cropland between 2008 and 2011...

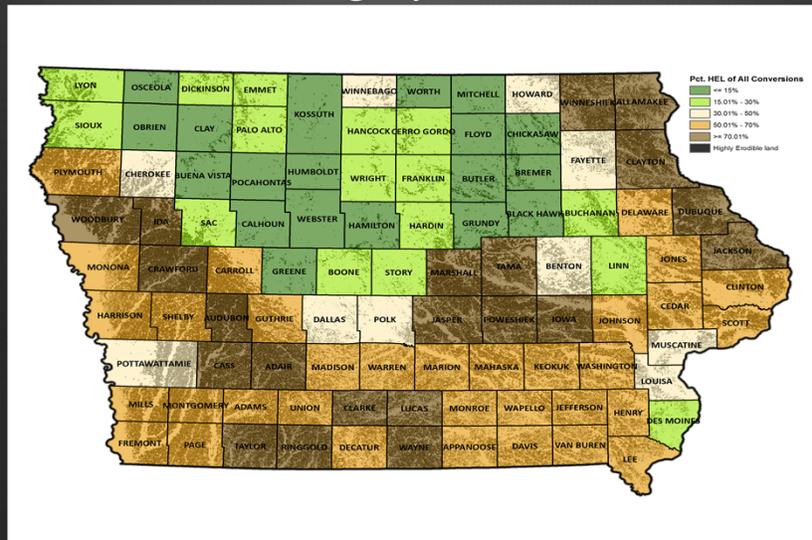


Faber, S. et al. 2012. Plowed Under. The Environmental Working Group, Washington DC. <http://www.ewg.org/research/plowed-under>

OUR ANALYSIS OF USDA CROPLAND DATA LAYER INDICATES THAT 23 MILLION ACRES WERE CONVERTED BETWEEN 2008 AND 2011.

RESULTS RECENTLY CONFIRMED BY A SDSU STUDY PUBLISHED IN PNAS THAT WAS BEEN CIRCULATING THIS WEEK.

## Much of the converted acres are highly erodible land



Rundquist, S. 2013. Unpublished analysis. Environmental Working Group, Ames, Iowa.

WE TOOK A CLOSER LOOK AT THIS CONVERSION IN IOWA AND FOUND THAT A LARGE PROPORTION OF THE CONVERTED LAND IS CONSIDERED HIGHLY ERODIBLE.

## Extreme events – more frequent and more severe...

“One of the clearest trends in the United States observational record is an increasing frequency and intensity of heavy precipitation events... Over the last century there was a 50% increase in the frequency of days with precipitation over 101.6 mm (four inches) in the upper Midwestern U.S.; this trend is statistically significant “

U.S. Climate Change Science  
Program



U.S. Climate Change Science Program. 2012. The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States. <http://www.sap43.ucar.edu/documents/>

ON TOP OF THESE PRESSURES THE INCREASING FREQUENCY OF SEVERE STORMS IS  
INTENSIFYING CONCERNS ABOUT EROSION AND POLLUTED RUNOFF

DRIVING CONCENTRATED FLOW AND EPHEMERAL GULLY EROSION

DRIVING STREAM BANK EROSION, WHICH IS NOW A PRIMARY SOURCE OF SEDIMENT AND  
PHOSPHORUS IN MANY AGRICULTURAL WATERSHEDS.

## Large sediment losses even from continuous no-till fields



- ⊗ New weather regime means what we have traditionally considered a sustainable level of conservation is no longer adequate
- ⊗ Far more acres require aggressive treatment in order to improve soil quality and the environment.
- ⊗ Run faster just to stay in place

STRIPs at Neal Smith National Wildlife Refuge. <http://www.nrem.iastate.edu/research/STRIPs/research/index.php>

WHAT WE HAVE TRADITIONALLY CONSIDERED A SUSTAINABLE LEVEL OF CONSERVATION IS NO LONGER ADEQUATE.

IOWA STATE UNIVERSITY “STRIPs” PROJECT DOCUMENTING SUBSTANTIAL LOSSES OF SEDIMENT FROM CONTINUOUS NO-TILL FIELDS.

UPSHOT – WE MUST REDEFINE WHAT IS SUSTAINABLE – WHAT IS SUSTAINABLE IS WHAT CAN RESIST AND RECOVER FROM EXTREME EVENTS.

WHAT IS SUSTAINABLE UNDER AVERAGE CONDITIONS IS NO LONGER GOOD ENOUGH.

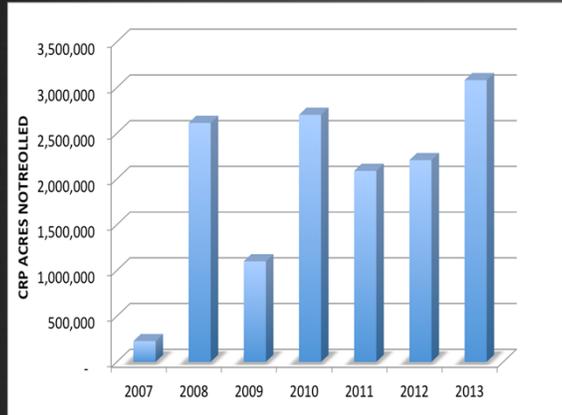
**NEXT SLIDE**

## Upshot...

- ⊗ We are starting from an unsustainable and unacceptable level of soil and environmental quality.
- ⊗ The area of “marginal” land is growing – much if not most of cropland acres will need aggressive conservation measures to protect soil quality and the environment.
- ⊗ “Retiring” “marginal” land will be an important component of conservation going forward – urgent need to intensify conservation on land that stays in production.
- ⊗ Conservation policy going forward must focus on:
  - ⊗ Durability
  - ⊗ Accountability

# Short-term rental contracts won't work as well in a high price environment

## CRP Acres Not Re-enrolled



USDA Farm Service Agency. Conservation Reserve Program Statistics.  
<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=rns-css>

- ⊗ 14,015,963 million CRP acres were not re-enrolled when contract expired.
- ⊗ Years of taxpayer's investment likely lost as acres go back into production.

SLIDE ON YOUR LEFT SHOWS THE NUMBER OF CRP ACRES WERE NOT RE-ENROLLED WHEN THEY EXPIRED EACH YEAR IN MINNESOTA.

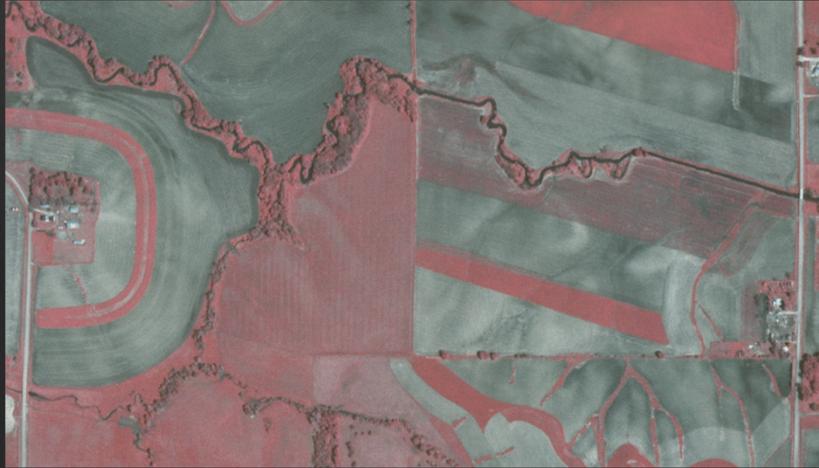
FAILURE TO RE-ENROLL MEANS 10-YEARS OF TAXPAYER INVESTMENT – MAYBE 20 YEARS OR MORE OF INVESTMENT – WERE LOST AS THOSE LANDS WENT BACK UNDER THE PLOW.

MEANWHILE – ON THE RIGHT – RIM ACRES CONTINUED TO GROW, IF SLOWLY, OVER THE SAME TIME PERIOD.

SHOULDN'T THIS TELL US SOMETHING ABOUT HOW TO RUN OUR PROGRAMS DESIGNED TO CHANGE LAND USE OR RESTORE ECOSYSTEMS?

**NEW SLIDE**

Conservation practices come and go...  
Marshall County, Iowa - 1980



AND A LAST EXAMPLE.

WE ARE EXPERIMENTING WITH HIGH RESOLUTION COLOR INFRARED PHOTOGRAPHY TO SEE IF WE CAN TELL – IN REAL TIME – WHAT IS HAPPENING ON THE AGRICULTURAL LANDSCAPE.

WHAT YOU SEE HERE IS A SMALL PIECE OF MARSHALL COUNTY IOWA IN 1980 – ALL HIGHLY ERODIBLE CROPLAND, BY THE WAY.

THE RED IS GRASS – OR SOMETHING ELSE THAT IS GREEN IN THIS SPRING PHOTOGRAPHY.

PAY PARTICULAR ATTENTION TO...

**NEW SLIDE**

## Durable Conservation? Marshall County, Iowa - 2009

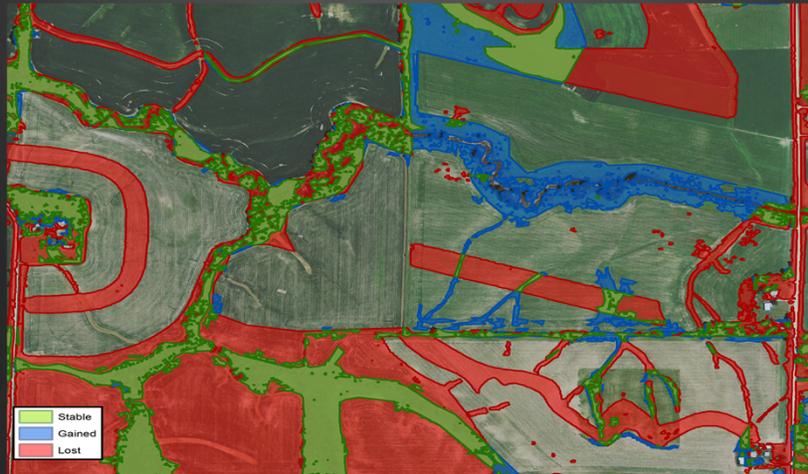


HERE ARE THE SAME FIELDS IN 2009.

NOTE...

**NEW SLIDE**

## Durable Conservation? Marshall County, Iowa – Net 2011



AND HERE IS A SUMMATION OF CHANGE ON THIS LANDSCAPE BETWEEN 1980 AND 2011.

GREEN COLOR HIGHLIGHTS AREAS THAT HAVE BEEN IN GRASS SINCE 1980

BLUE COLOR HIGHLIGHTS AREAS THAT ARE IN GRASS NOW, BUT WEREN'T IN 1980

RED COLOR HIGHLIGHTS THE AREAS THAT USED TO BE IN GRASS BUT ARE GONE NOW.

GAINED A RIPARIAN BUFFER, BUT LOST CONTOUR GRASS STRIPS AND GRASSED WATERWAYS.

**NEW SLIDE**

## Four Pillars of Durable Conservation

- ⊗ Mandatory basic standard of care.
- ⊗ Securely funded voluntary programs that:
  - ⊗ Drive more permanent change on the landscape
  - ⊗ Drive precision conservation at landscape scales.
- ⊗ Robust scientific and technical infrastructure.

SO WHAT TO DO?

HERE IS A QUICK SUMMARY OF WHAT WE ARE THINKING NEEDS TO BE DONE. I WILL TOUCH ON ALL FOUR BUT SPEND MORE TIME ON THE FIRST BECAUSE I THINK IT MUST BE THE FOUNDATION OF CONSERVATION GOING FORWARD.

**NEW SLIDE**

## Mandatory Standard of care

- ⊗ Purely voluntary approach has failed and will continue to fail to produce durable conservation.
- ⊗ Define a basic standard of care that goes hand-in-hand with the rights of landownership.
- ⊗ Don't want every farmer to have an EPA permit.
- ⊗ Do want to restrict practices that are disproportionately damaging.
- ⊗ Practices many, if not most, farmers could agree are just bad business and bad for agriculture's brand.



IT IS TIME TO FACE FACTS – A PURELY VOLUNTARY APPROACH HAS FAILED TO PRODUCE DURABLE CONSERVATION TO DATE – AND WILL BE EVEN MORE CHALLENGED GIVEN THE NEW PRESSURE ON OUR LAND, WATER AND WILDLIFE.

WE NEED TO DEFINE A BASIC STANDARD OF CARE THAT GOES HAND IN HAND WITH THE RIGHTS OF LAND OWNERSHIP

WE THINK THAT BASIC STANDARD OF CARE SHOULD FOCUS ON SIMPLE, OFTEN VERY CONVENTIONAL PRACTICES, THAT TAKE CARE OF PROBLEMS THAT ARE DISPROPORTIONALLY DAMAGING TO SOIL, WATER AND AQUATIC HABITAT.

TAILORED TO THE LANDSCAPE AND FARMING SYSTEMS.

WE DON'T WANT EVERY FARMER TO HAVE A PERMIT FROM THE MPCA

WHAT WE DO WANT IS TO RESTRICT THE RISK AND HIGHLY DAMAGING PRACTICES THAT MANY, IF NOT MOST FARMERS WOULD AGREE ARE JUST BAD BUSINESS PRACTICE AND BAD FOR AGRICULTURE'S BRAND.

**NEW SLIDE**

## Focus on permanence

Flexible easements to restore critical landscape and ecological components.

- Range from purchase of selected land use rights.
- To full restoration and no economic uses.

Support transition to sustainable farming systems.

- Subsidize practices that are most likely to stay in place once the subsidies end.
- Level the playing field for diversified farming operations.



ON TOP OF THAT BASIC STANDARD OF CARE, WE ARE GOING TO NEED A SUITE OF CONSERVATION PROGRAMS THAT SEEK MORE PERMANENT CHANGE:

- 1) FLEXIBLE AND WELL FUNDED EASEMENT AND LAND ACQUISITION PROGRAMS – RANGE FROM PURCHASE OF SELECTED CROPPING RIGHTS TO FEE PURCHASE OF LAND – AGAIN, MINNESOTA WELL AHEAD OF THE PACK.
- 2) FOCUS COST SHARE AND INCENTIVES ON PRACTICES THAT ARE MOST LIKELY TO STAY IN PLACE AND THAT SUPPORT A TRANSITION TO MORE SUSTAINABLE FARMING SYSTEMS.

**NEW SLIDE**

Thank you...