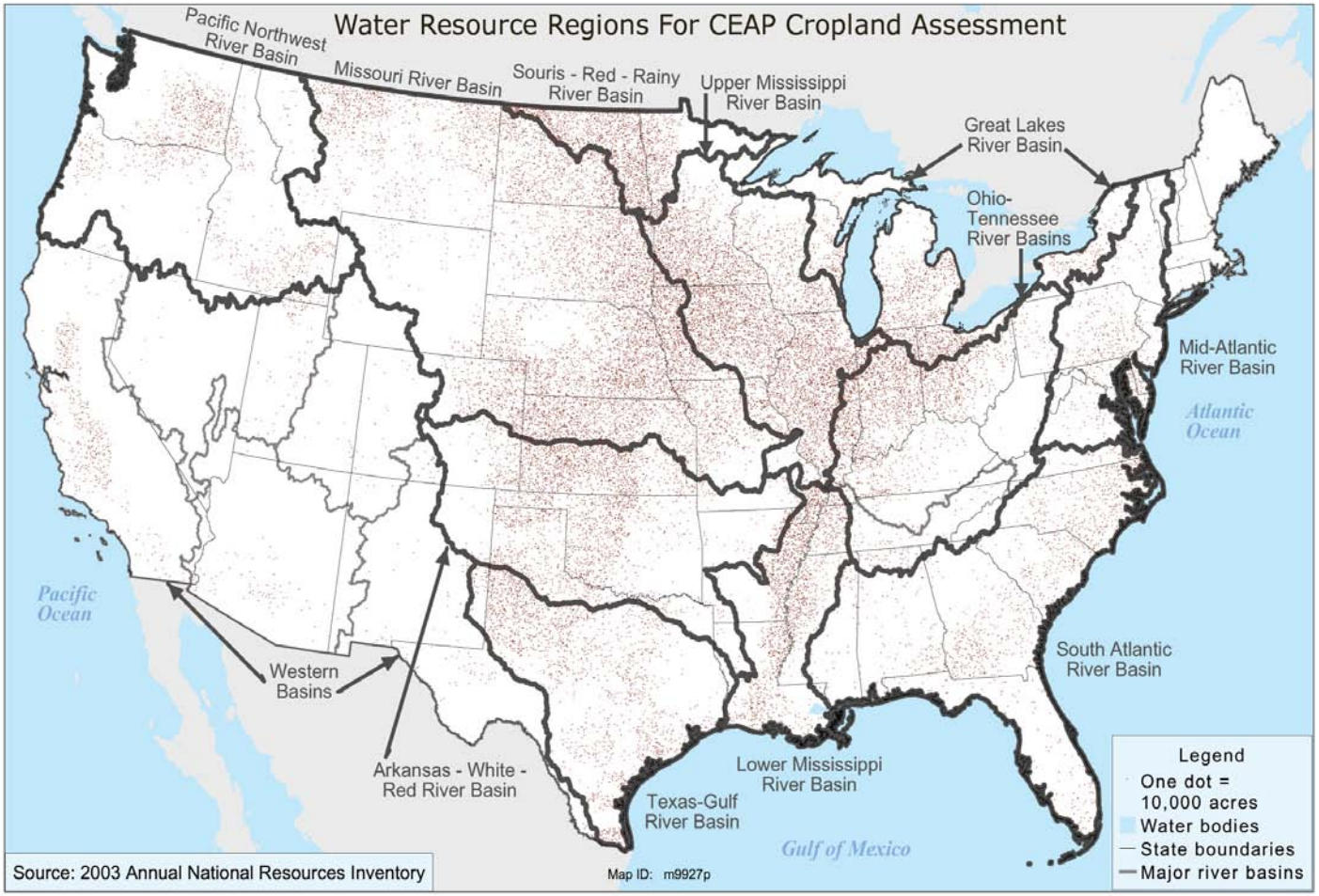
United States Department of Agriculture
Natural Resources Conservation Service

CEAP—Conservation Effects Assessment Project

Assessment of the Effects of Conservation Practices on Cultivated Cropland in the Upper Mississippi River Basin

Cropland Regional Assessments



What the reports address

- Evaluation of practices in use in 2003-2006
- Effects of conservation practices in use in 2003-2006
- Estimates of conservation treatment needs
- Potential gains with additional conservation treatment
  - Soil erosion control
  - Nutrient management

How Are We Doing This?

- Statistical sampling and modeling approach
- NRI-CEAP Cropland Survey
- Field-level model for onsite effects
- National water quality model for offsite water quality effects

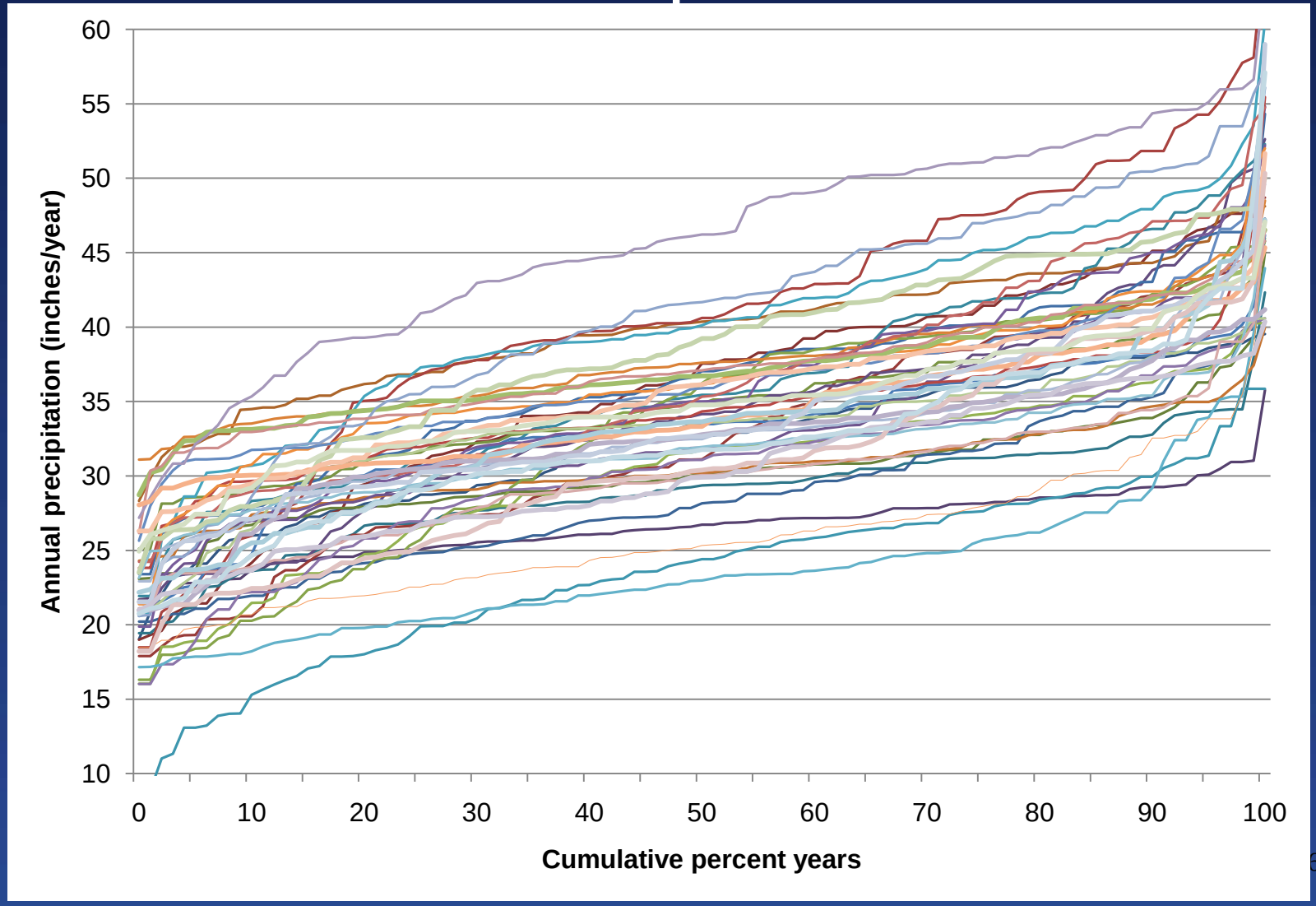
Modeling Strategy

1. **Estimate a CEAP Baseline using farmer survey information at NRI sample points**

2. **Construct an alternative scenario that simulated "no practices"**

The difference between these two scenarios represents the benefits of the accumulation of conservation practices currently in place on the landscape.

47 Years of Precipitation Simulated



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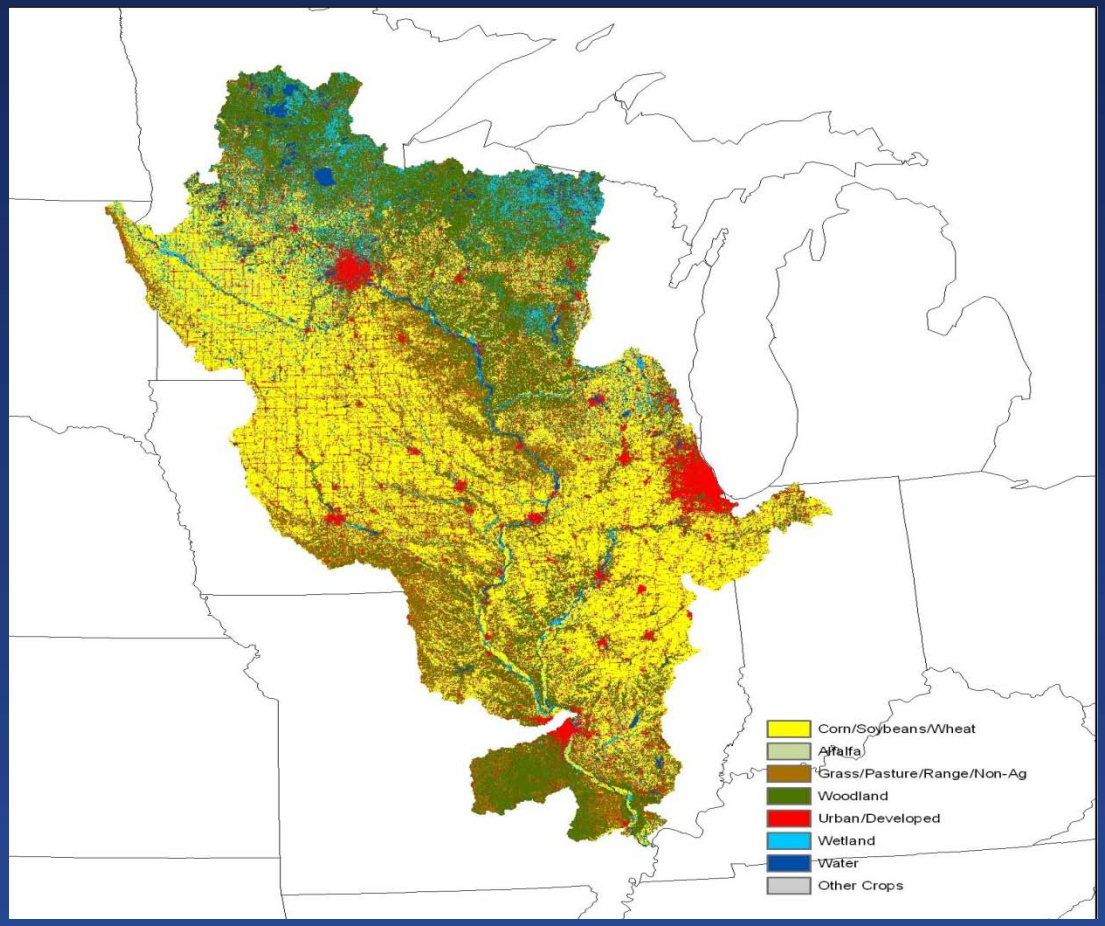


Evaluation of Conservation Practices in Use in the UMRB

The Baseline Conservation Condition

- Structural practices—45% of all acres, 72% of HEL acres.
- No-till or mulch till *and* gaining soil organic carbon—71% of the acres.
- Appropriate rates of nitrogen application—34% of the acres.
- Good nitrogen management—14% of the acres.
- Good phosphorus management—29% of the acres.
- On most acres, consistent use of appropriate rates *and* timing *and* method for nitrogen and phosphorus application are lacking.

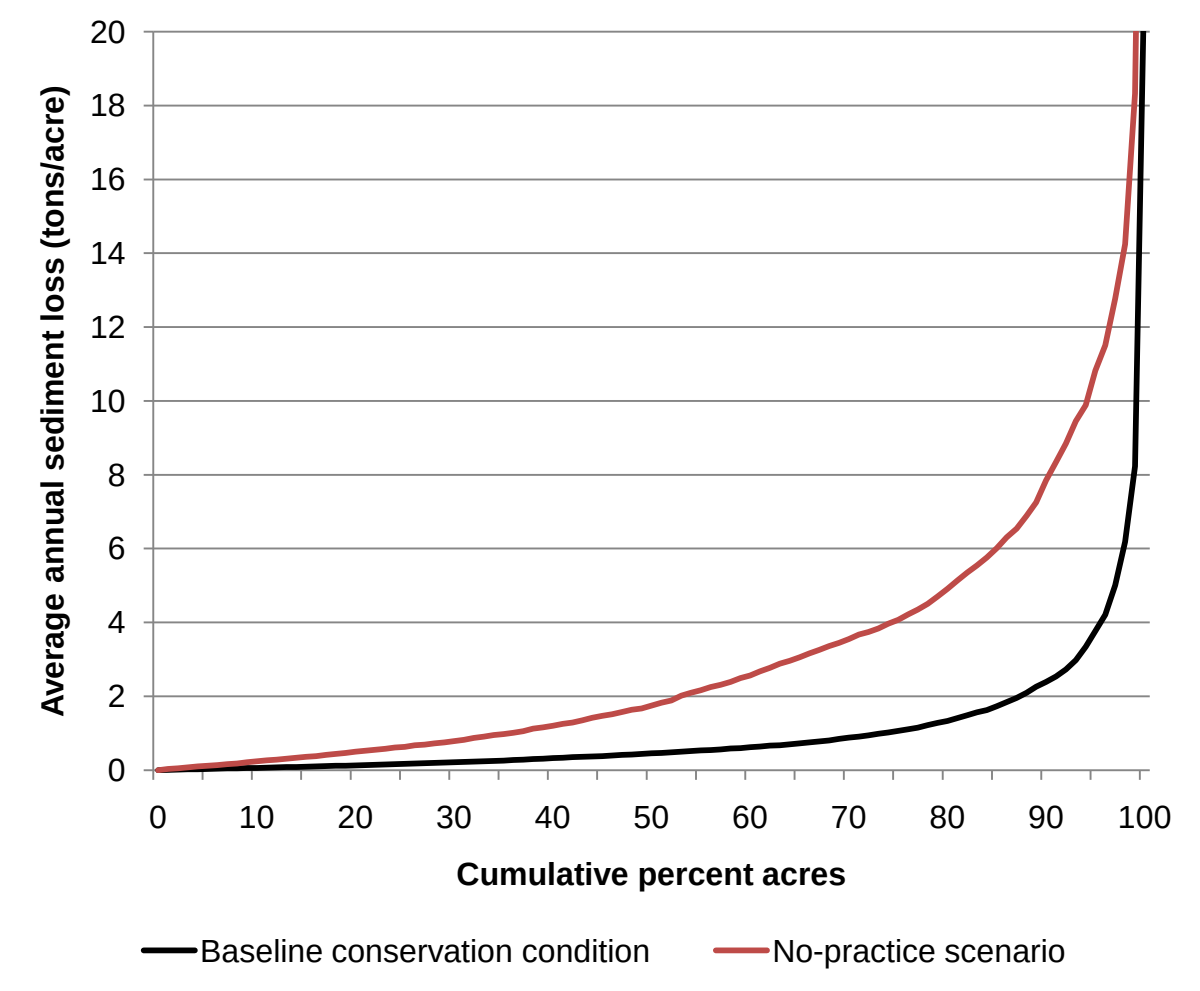
Effects of Conservation Practices in Use in the UMRB

Field-Level Effects of Practices Currently in Use in the UMRB

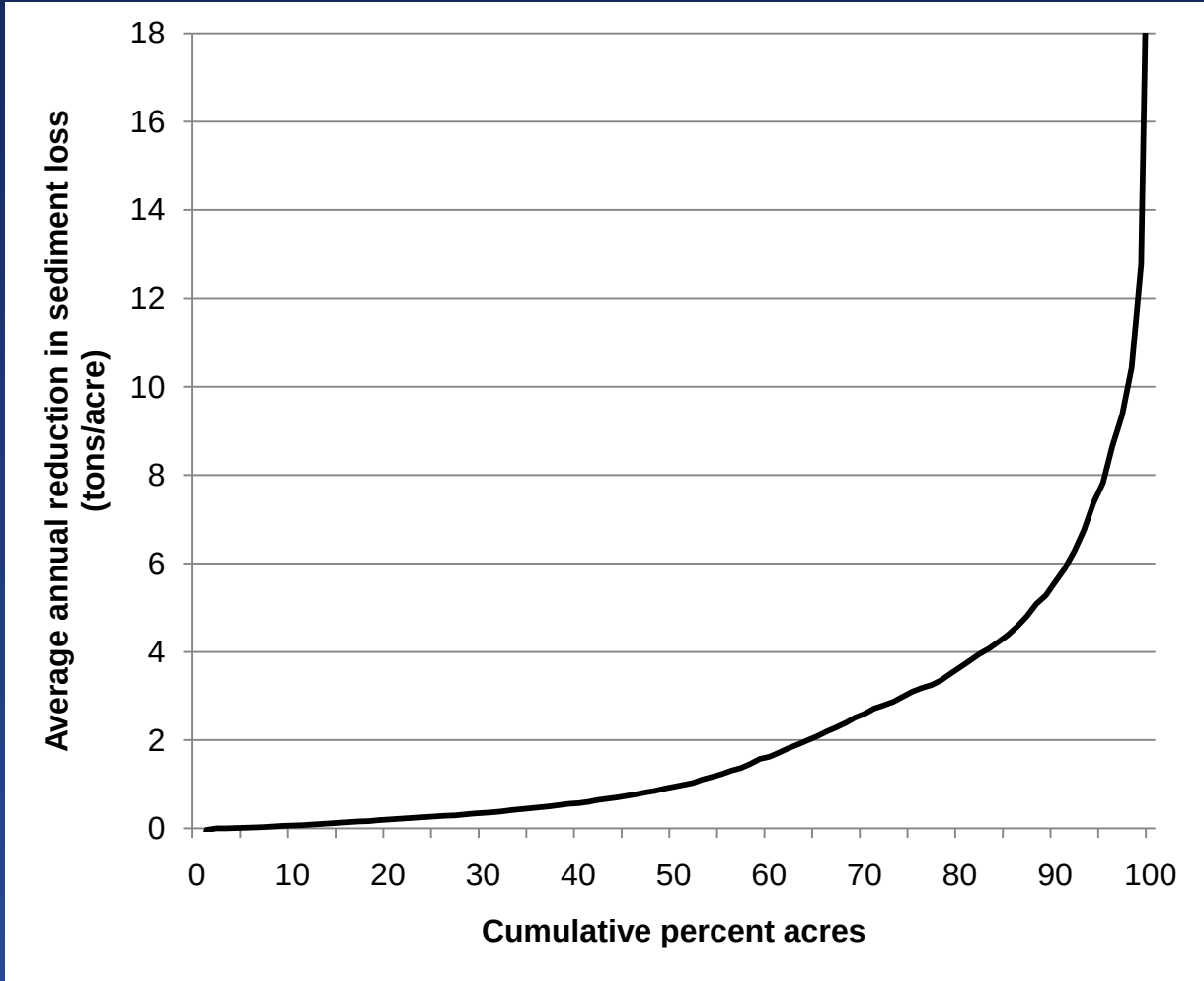
Conservation practices in the UMRB have, on average for the region:

- Reduced surface water flow 16%… by re-routing water to subsurface pathways
- Reduced sediment loss 69%
- Reduced total nitrogen loss 18%
- Reduced total phosphorus loss 49%
- Increased soil organic carbon
- Reduced pesticide risk for aquatic ecosystems

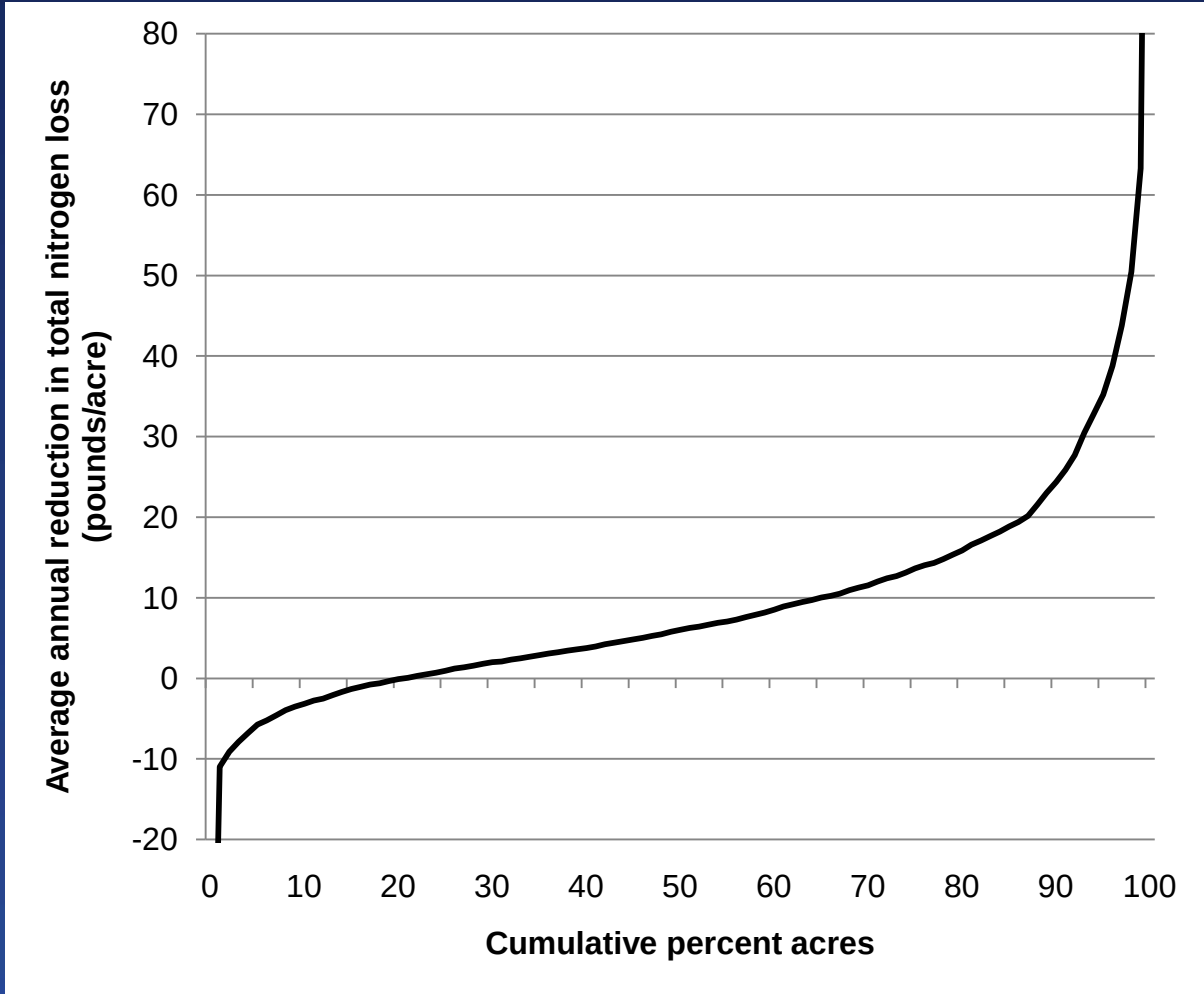
Average Annual Sediment Loss



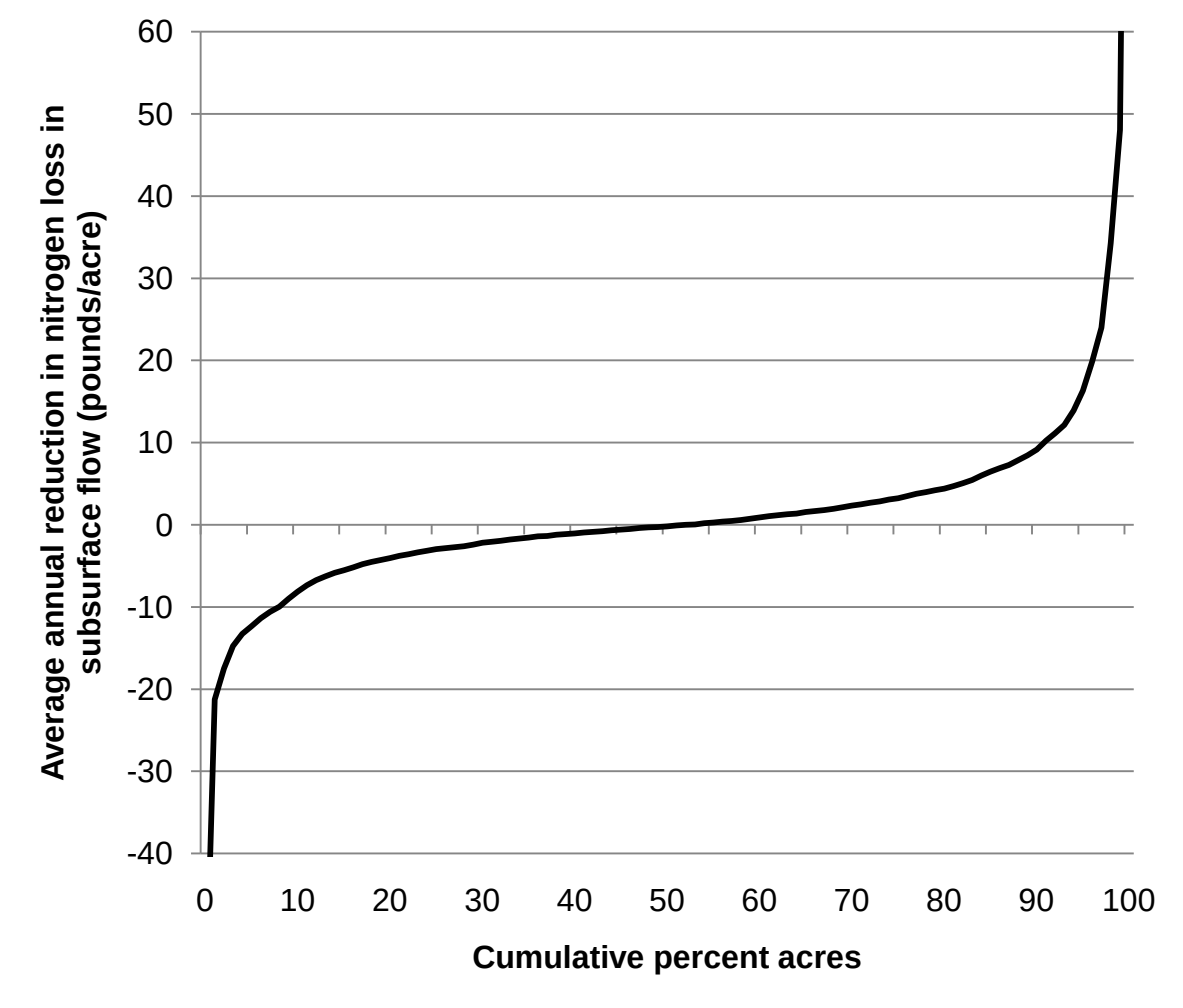
Average Annual Reduction in Sediment Loss



Average Annual Reduction in Nitrogen Loss



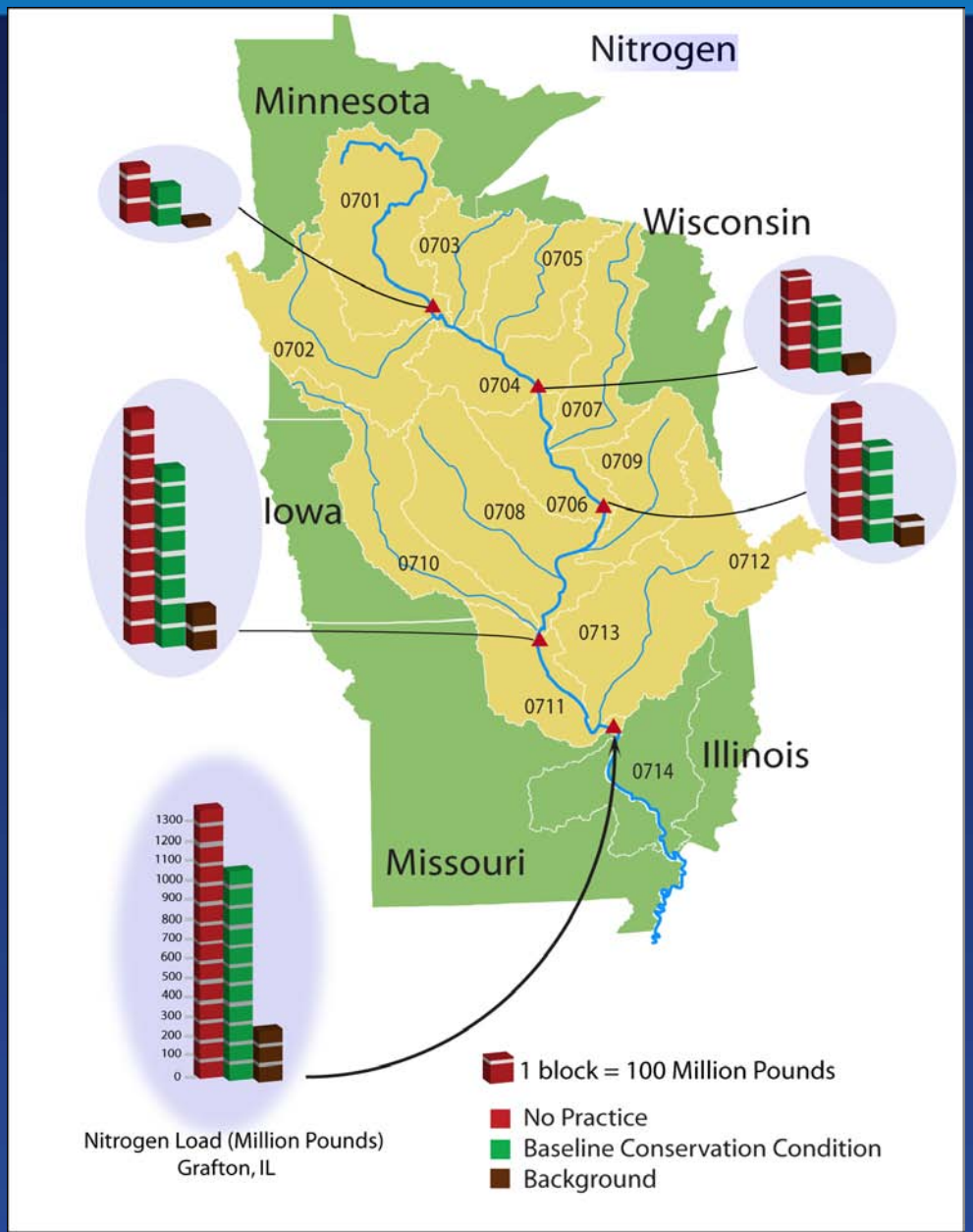
Average Annual Reduction in Nitrogen Loss in Subsurface Flow



Water Quality Effects of Practices Currently in Use in the UMRB

Instream reductions at the outlet of the UMRB due to conservation practices in use in the region have—

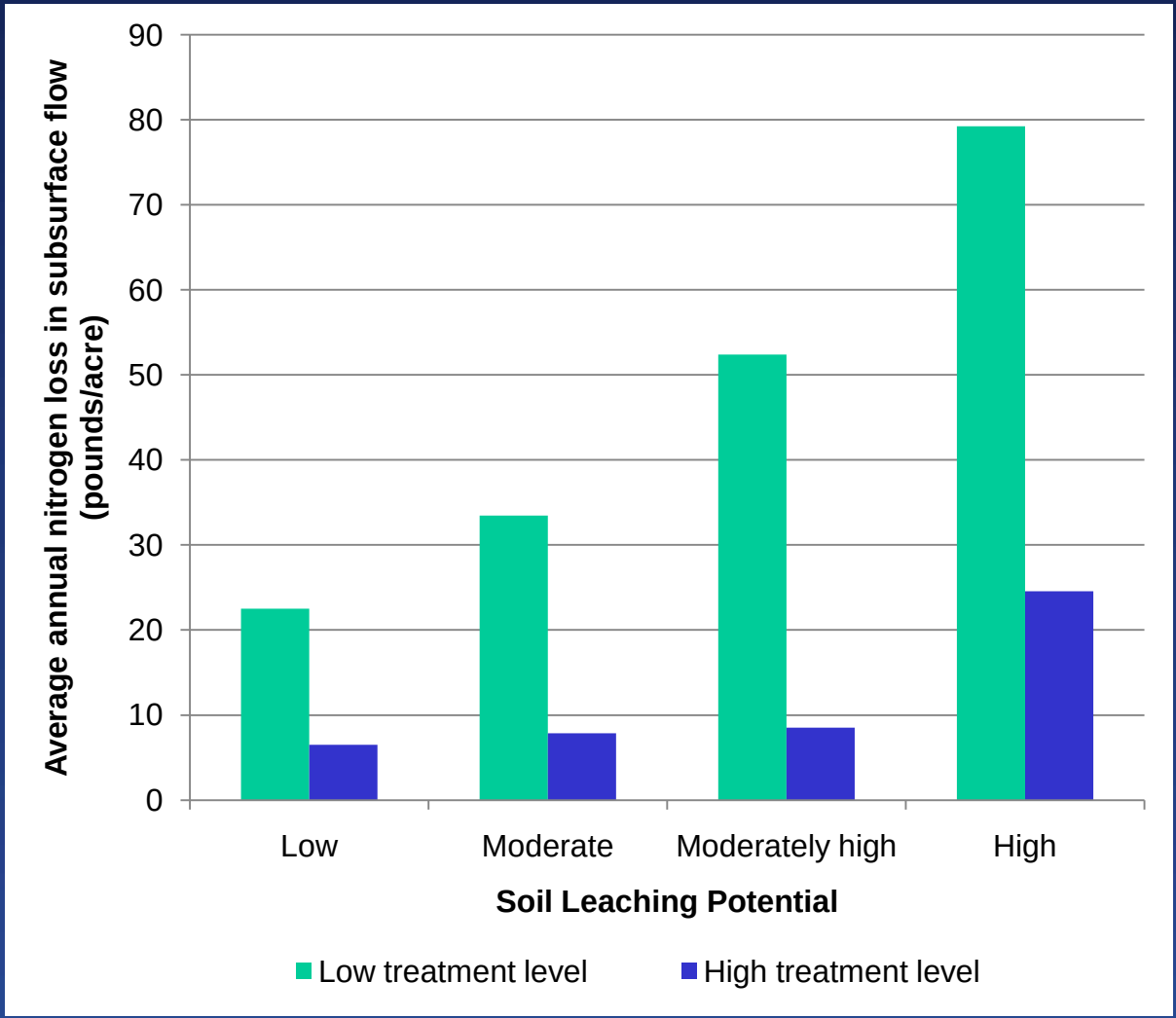
- reduced sediment loads by 37%;
- reduced total nitrogen loads by 21%;
- reduced total phosphorus loads by 40%; and
- reduced atrazine loads by 51%.


Nitrogen
Minnesota
Wisconsin
Iowa
Illinois
Missouri
0701
0702
0703
0704
0705
0706
0707
0708
0709
0710
0711
0712
0713
0714
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Nitrogen Load (Million Pounds)
Grafton, IL
1 block = 100 Million Pounds
No Practice
Baseline Conservation Condition
Background

Conservation Treatment Needs in the UMRB

- Edge-of-field sediment loss
- Edge-of-field nitrogen lost with surface runoff
- Edge-of-field nitrogen loss in subsurface flow
- Edge-of-field phosphorus loss

Nitrogen Loss in Subsurface Flow



Conservation Treatment Needs

- 62% of cropped acres are under-treated for one or more resource concerns:
  - 33% of cropped acres require additional treatment only for nitrogen loss in subsurface flow
- 15% of cropped acres are critically under-treated
  - 6% of cropped acres are critical under-treated acres that need treatment for all four issues.

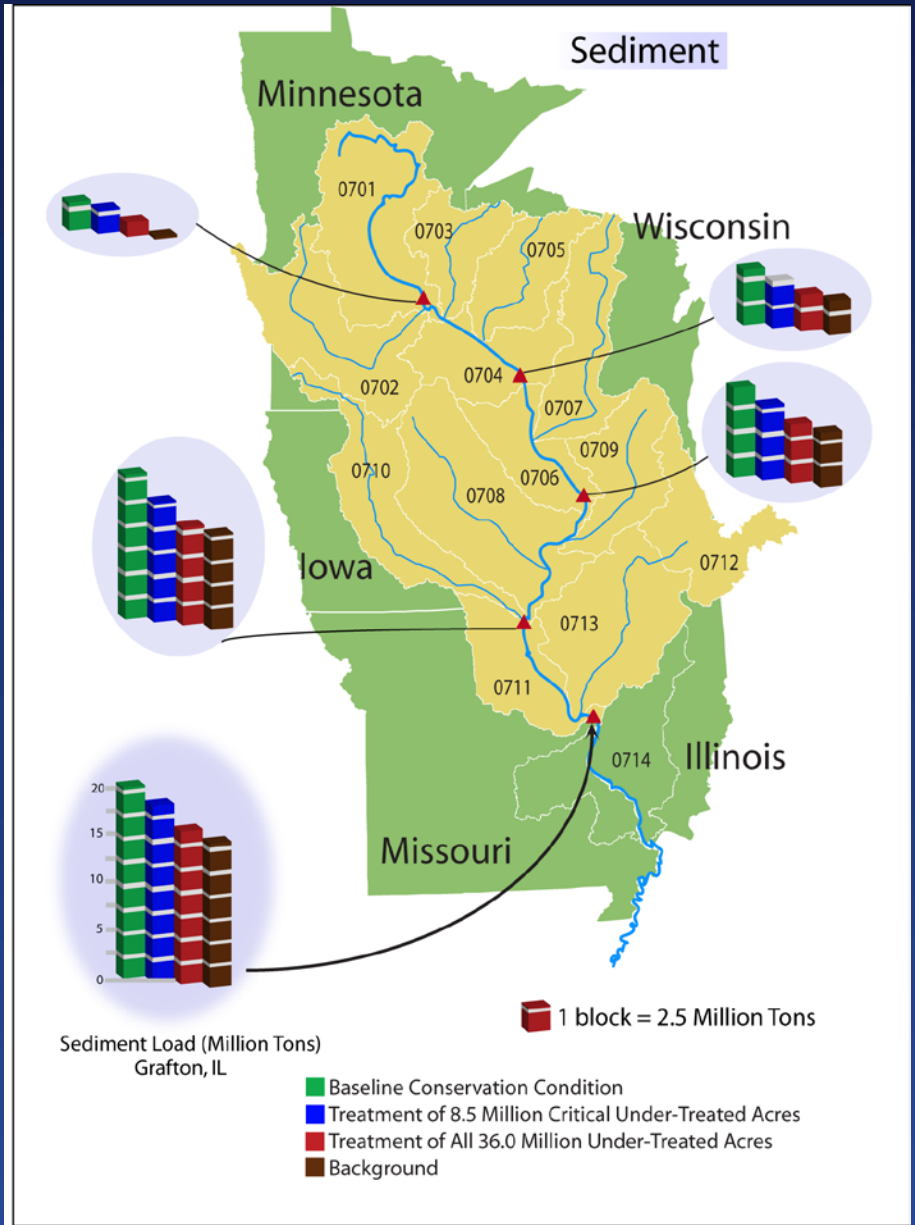
Additional Conservation Treatment

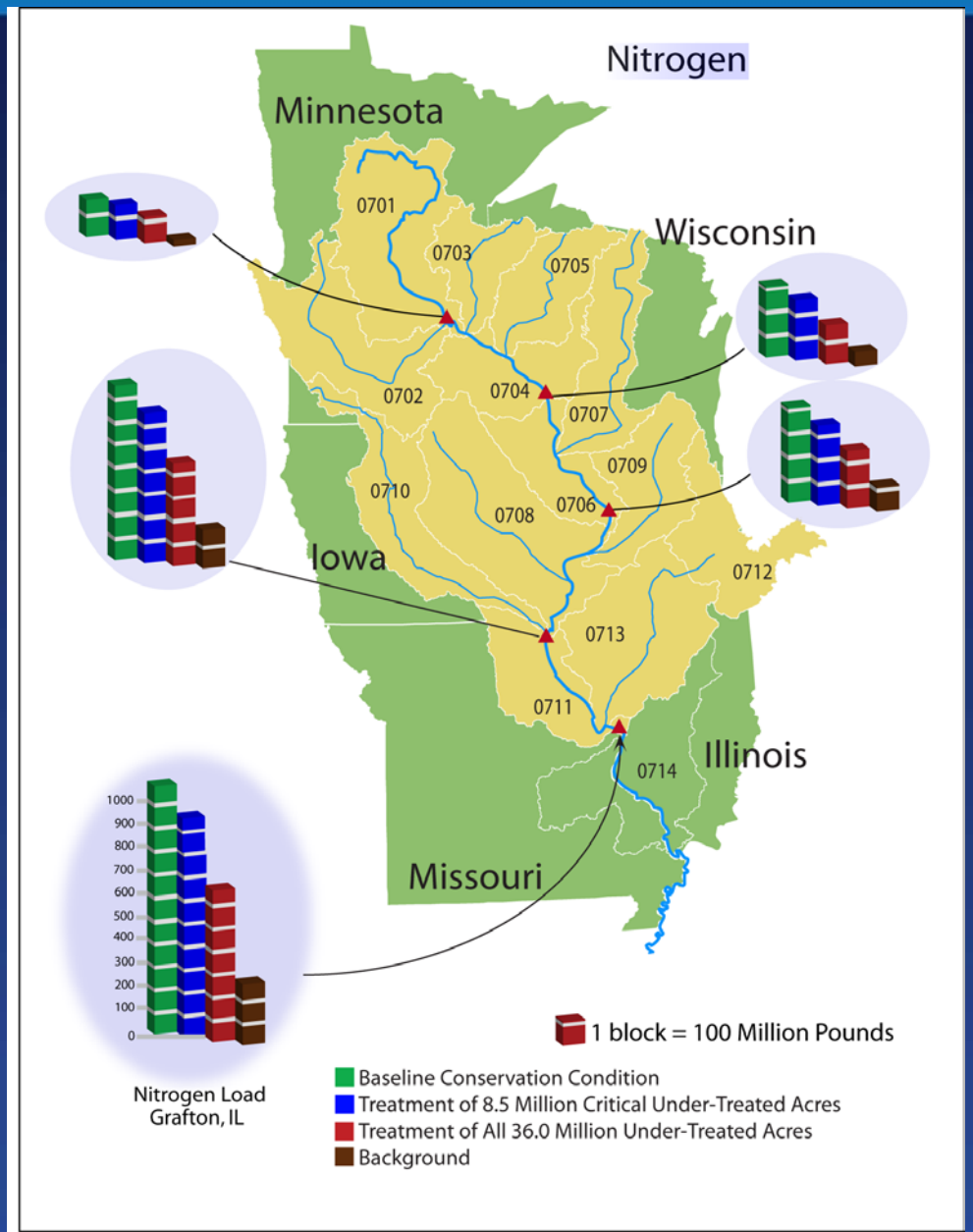
Two levels of treatment simulated:

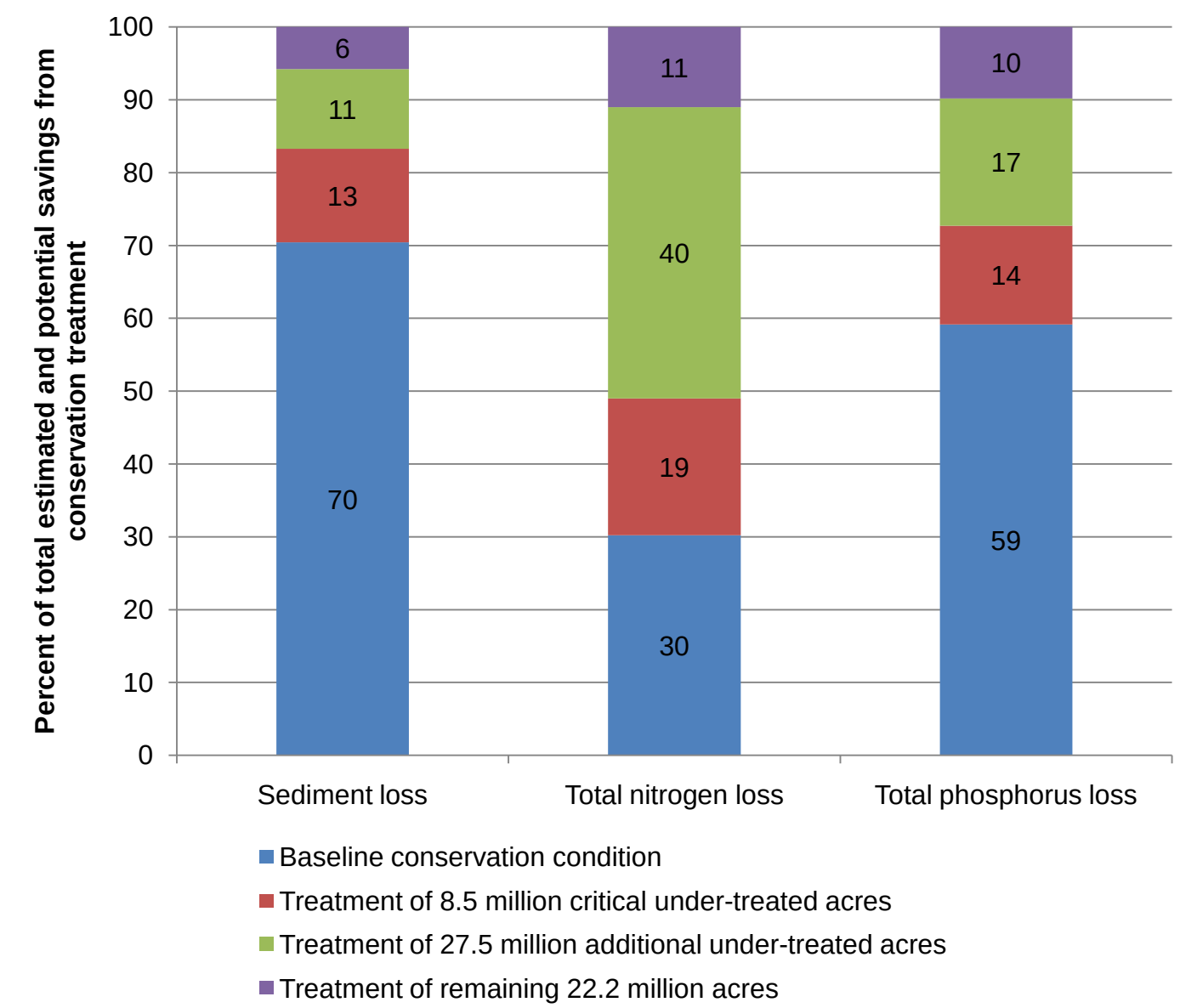
- Water erosion control
- Water erosion control with nutrient management

Two groups of acres treated:

- 8.5 million critically under-treated acres
- All 36.0 million under-treated acres


Sediment
Minnesota
Wisconsin
Iowa
Illinois
Missouri
0701
0702
0703
0704
0705
0706
0707
0708
0709
0710
0711
0712
0713
0714
20
15
10
5
0
1 block = 2.5 Million Tons
Sediment Load (Million Tons)
Grafton, IL
Baseline Conservation Condition
Treatment of 8.5 Million Critical Under-Treated Acres
Treatment of All 36.0 Million Under-Treated Acres
Background


Nitrogen
Minnesota
Wisconsin
Iowa
Illinois
Missouri
0701
0702
0703
0704
0705
0706
0707
0708
0709
0710
0711
0712
0713
0714
1000
900
800
700
600
500
400
300
200
100
0
Nitrogen Load
Grafton, IL
1 block = 100 Million Pounds
Baseline Conservation Condition
Treatment of 8.5 Million Critical Under-Treated Acres
Treatment of All 36.0 Million Under-Treated Acres
Background


Percent of total estimated and potential savings from conservation treatment
100
90
80
70
60
50
40
30
20
10
0
6
11
13
70
11
40
19
30
10
17
14
59
Sediment loss
Total nitrogen loss
Total phosphorus loss
Baseline conservation condition
Treatment of 8.5 million critical under-treated acres
Treatment of 27.5 million additional under-treated acres
Treatment of remaining 22.2 million acres

Conclusions for the UMRB

Progress has been made, but significant challenges remain.

- Some of the acres vulnerable to erosion are still not adequately treated.
- Complete and consistent use of nutrient management (proper rate, timing, method, and form) is generally lacking throughout the region.
- About 62 percent of the cropped acres require additional conservation treatment.

Conclusions for the UMRB

- The most critical conservation concern in the region is nitrogen leaching.
- About half of the acres require additional nutrient management to address excessive leaching loss of nitrogen from fields.
- Nutrient management is especially important for acres with erosion control treatment. Treatment of erosion alone can exacerbate the nitrogen leaching problem.

Conclusions for the UMRB

- Conservation practices have the greatest effect on the more vulnerable acres, such as highly erodible land and soils prone to leaching.
- Targeted treatment of these under-treated vulnerable acres is the most efficient strategy for reducing sediment and nutrient loads to water bodies in the region.

Copy of UMRB report can be found at:

http://www.nrcs.usda.gov/Technical/nri/ceap/