Don't overlook the benefits of perennial forages for soils, crops, and water quality

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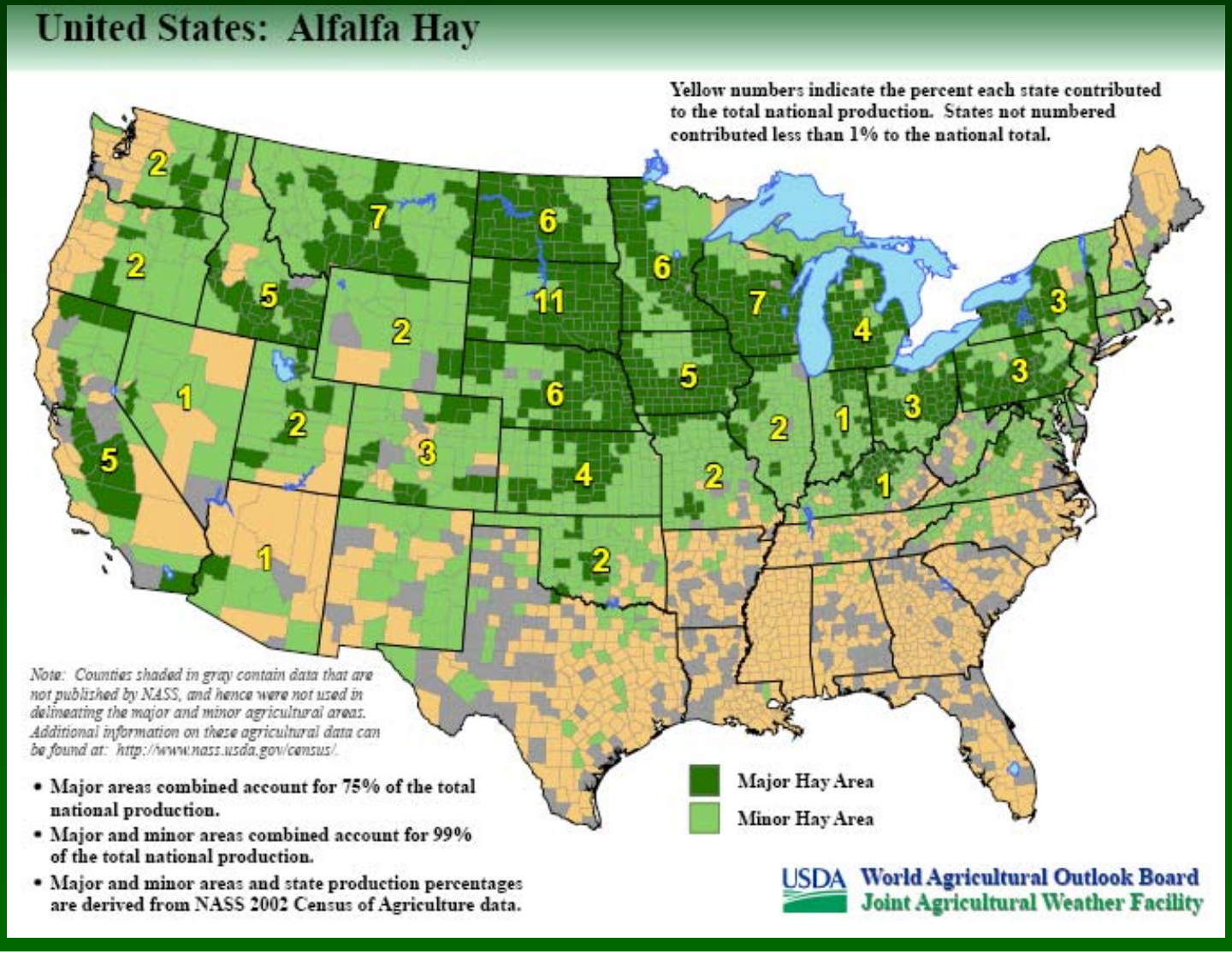
Alfalfa is widely adapted in the USA

2002 Agricultural Census

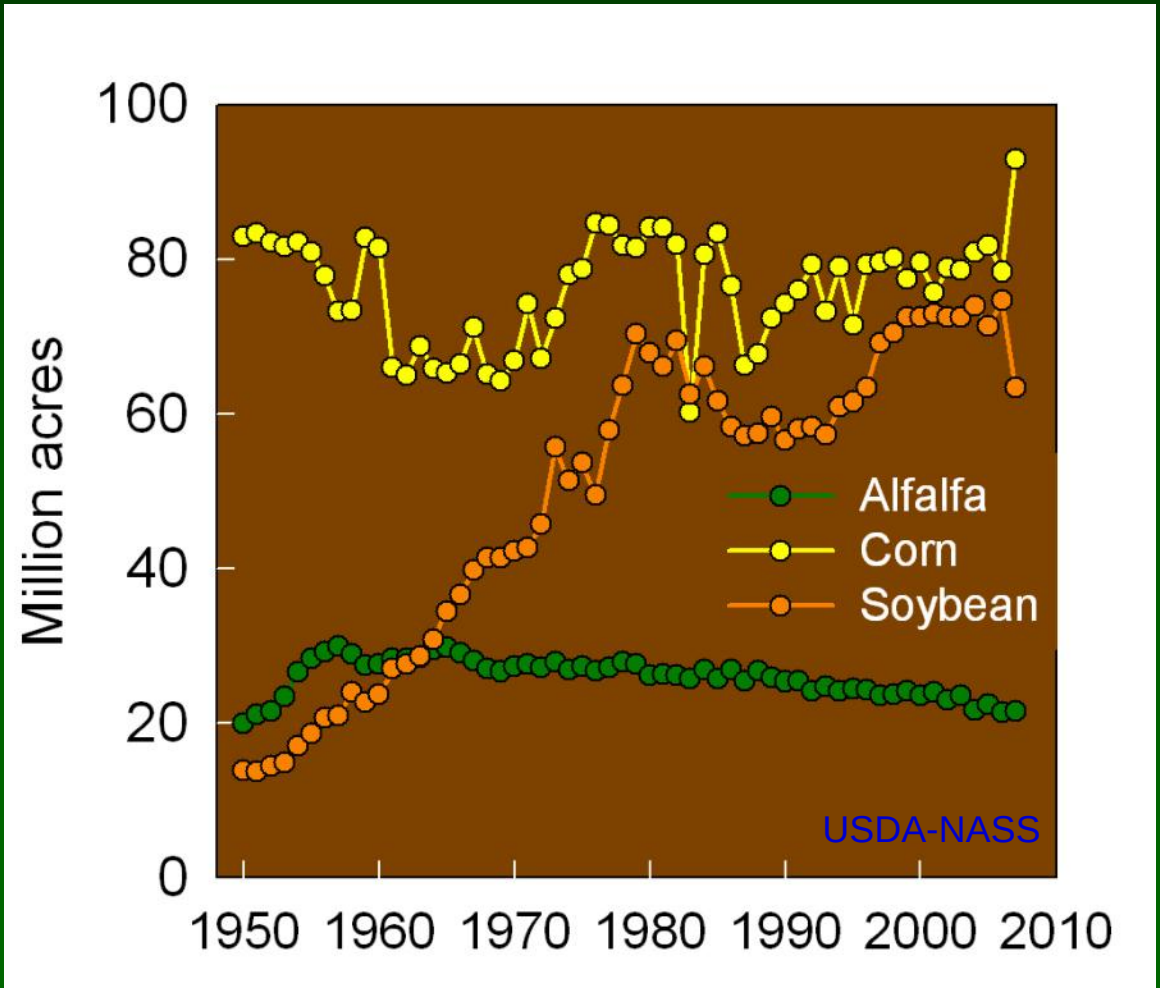


Declining alfalfa acreage

Consolidation of livestock industry

Changing feed practices

(increased corn silage & soybean meal)



In the past 50 years alfalfa declined by 136,000 acres annually

Shift to more corn silage and less alfalfa for lactating cows

- DM and energy per acre
- Alfalfa winter-kill
- High degradability of alfalfa protein
- Improved corn silage hybrids
- More consistent forage quality
- Faster silo filling
- Manure nutrient management

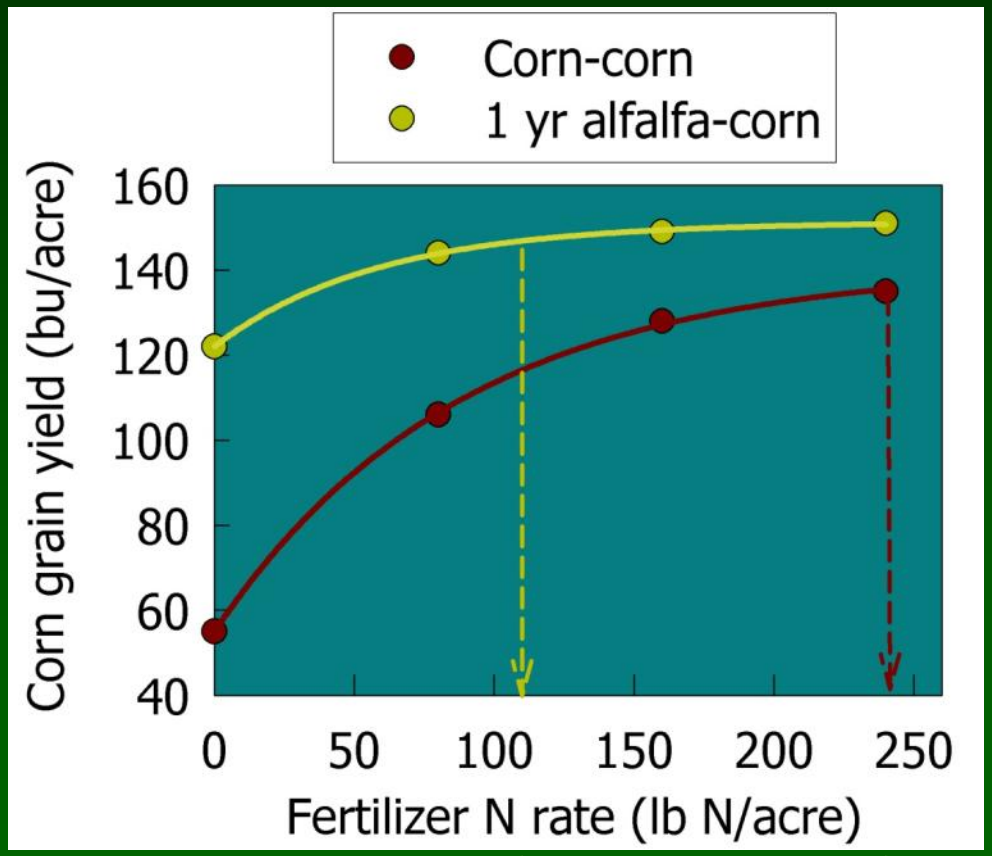
R. Shaver, UW-Dairy Science

But… Other considerations

Perennial forages in rotations conserve resources

- Fertilizer N credit
- Corn yield increase
- Less pesticide use
- Spread labor needs
- Improves soil quality
- Erosion control
- Improves water quality
- Wildlife habitat

Fertilizer N replacement value



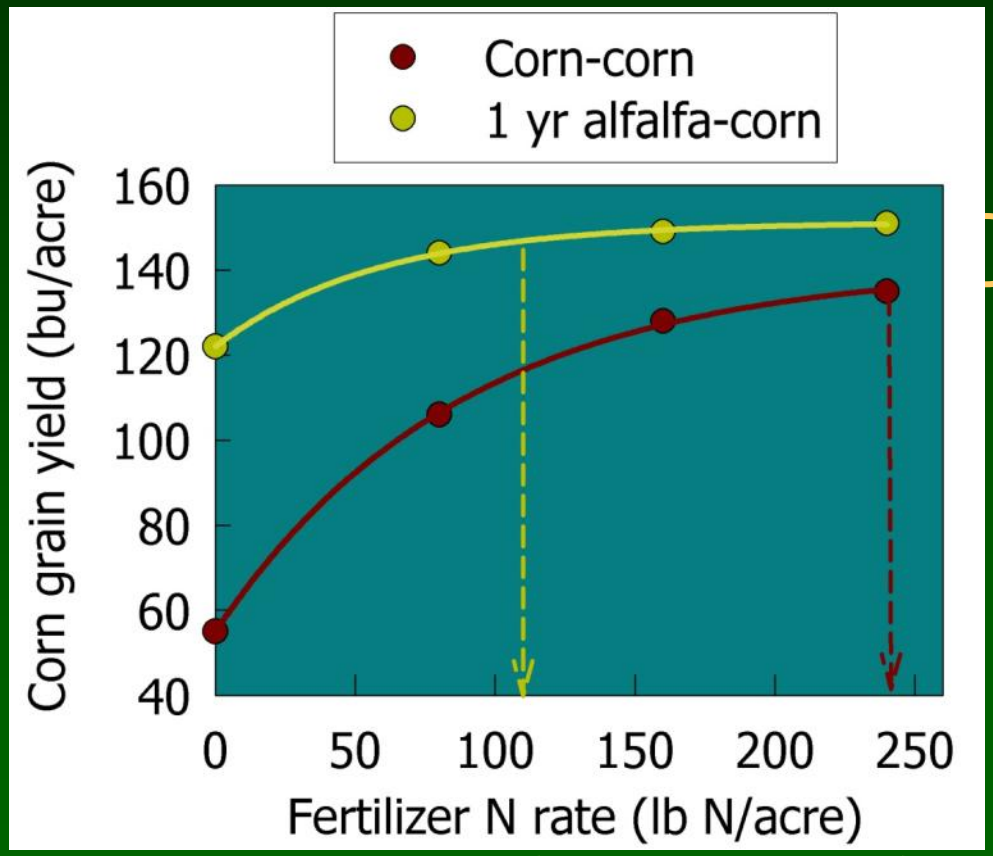
Lower fertilizer N costs (2 yr)

No insecticide required (1 yr)

DeWitt, 2002

Fertilizer N replacement value

Fertilizer N replacement value and other rotation effects



Other rotation effects

Lower fertilizer N costs (2 yr)

No insecticide required (1 yr)

Corn yield benefit

DeWitt, 2002

Fertilizer N replacement value

Fertilizer N Credits

Crop		Typical	Range	$ @.40	$ @.80
Alfalfa	Good	130	110-150	52	104
	Fair	100	70-120	40	80
	Poor	70	40-90	28	56
Red Clover /Trefoil	Good	90	80-120	36	72
	Fair	70	60-90	28	56
	Poor	50	40-70	20	40
Grass	Good	70	---	28	56
	Fair-Poor	40	---	16	32
2nd Year		50	0-75	20	40

Ext Recommendations: WI, MN, PA, VT; costs are per lb of fertilizer N

Regrowth makes a difference in N Credit

Alfalfa Stand	Regrowth	
	> 8 inches	< 8inches
	lb N/acre	
Good	190	150
Fair	160	120
Poor	130	90

Medium/fine textured soils; Univ Wisc Ext (Laboski et al, 2006)

Regrowth of > 8 inches = extra 40 lb N/A

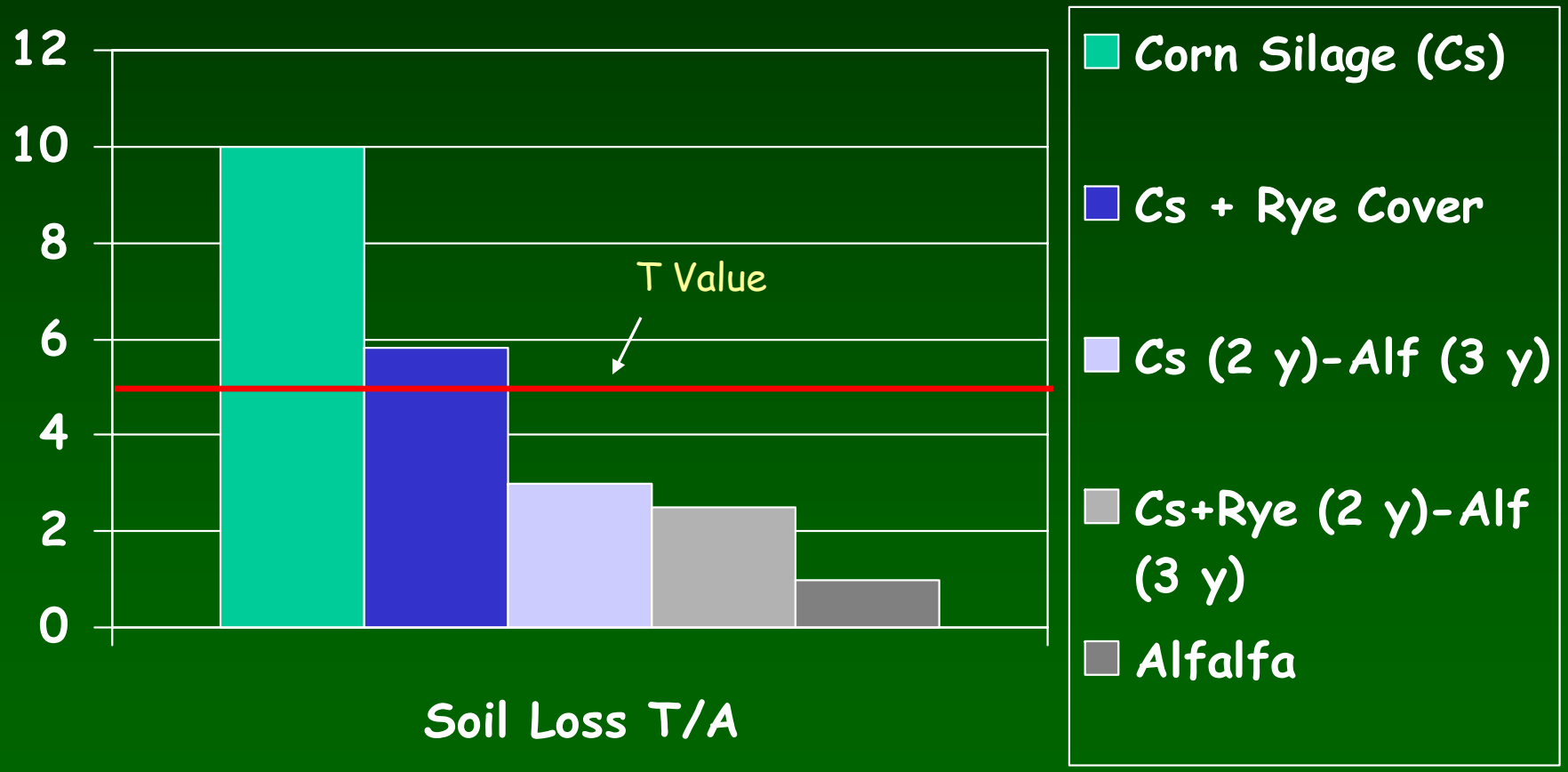
Should you harvest or plow down year-end regrowth?

- Do you need the extra N credit?
- Compare to net value of extra forage.

Perennial Forages and Soil and Water Quality

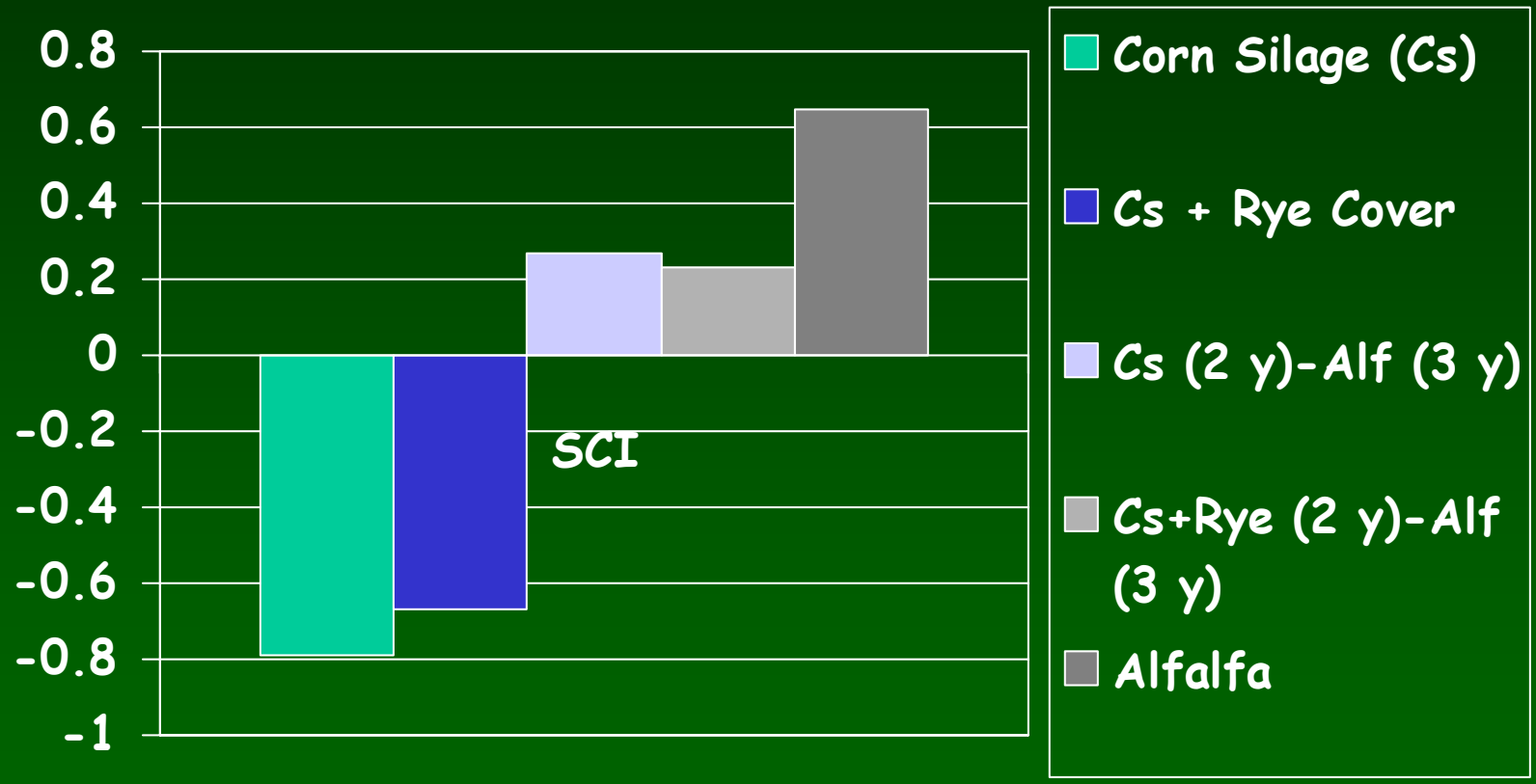
- Erosion control
- Soil quality
- Water quality
  - Runoff
  - leaching

Alfalfa in Rotation Reduces Erosion (RUSLE2)



Miami silt loam, 200 ft 5% slope; Dodge Co, WI; alfalfa-spring seeding w oats
RUSLE2 Calculations by Brian Hillers, NRCS-WI

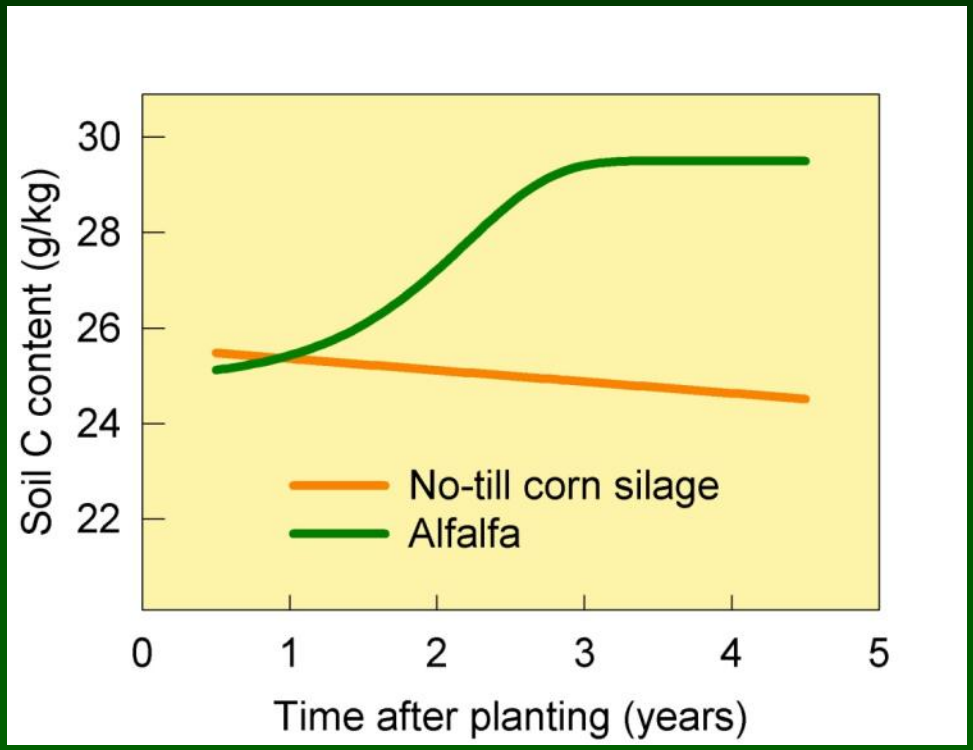
Alfalfa Improves NRCS Soil Conditioning Index (SCI)



+ Soil OM Increase
- Soil OM Decrease

Miami silt loam, 200 ft 5% slope; Dodge Co, WI; alfalfa-spring seeding w oats
SCI Calculations by Brian Hillers, NRCS-WI

Alfalfa builds soil C and N



Quebec, Canada

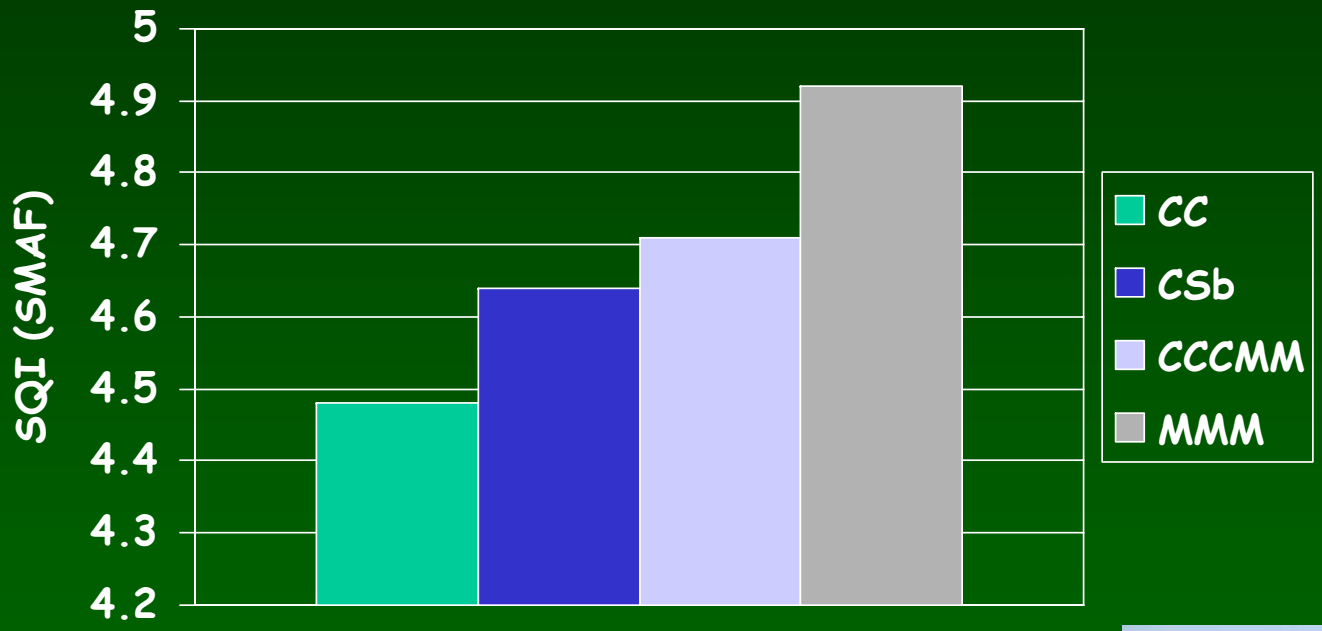
Angers, 1992

Annual cropping

3 yr perennial - 3 yr annual

40-yr study. Alejandro La Manna, INIA, Uruguay

Perennial forages in rotation improve soil quality (SQI)



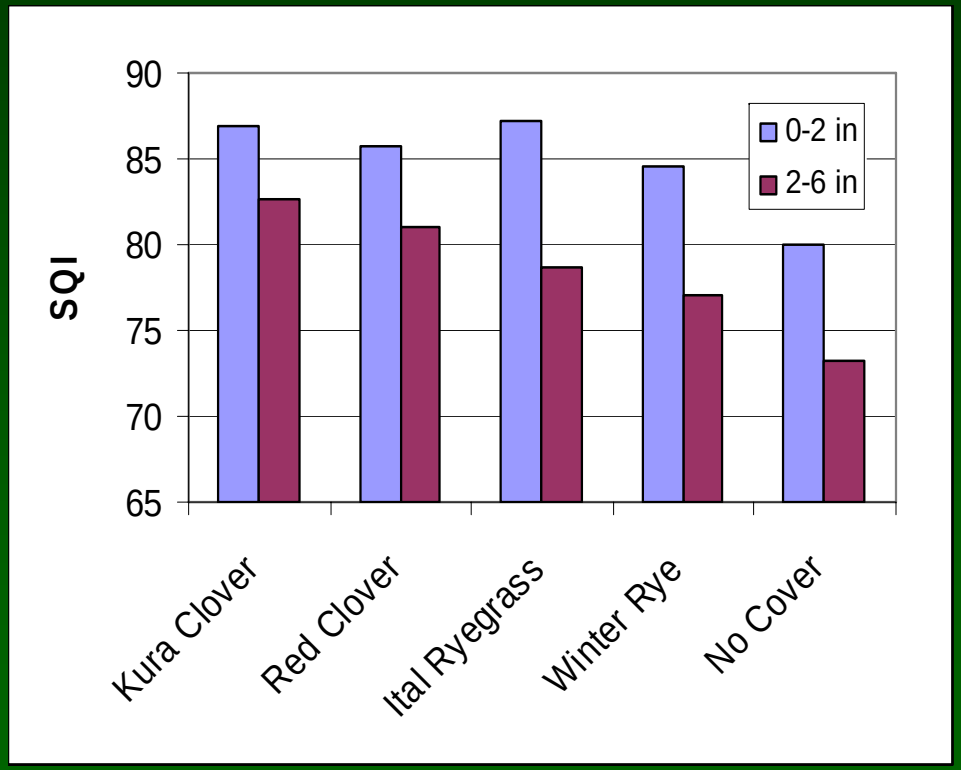
SQI = SMAF Soil Quality Index

Karlen et al., 2006

30-yr, Lancaster, WI
C=corn, Sb=soybean,
M=alfalfa/red clover

Forage cover crops improve soil quality (SQI) in no-till silage corn

Prairie du Sac, WI; 4-yr; liquid manure applied annually.

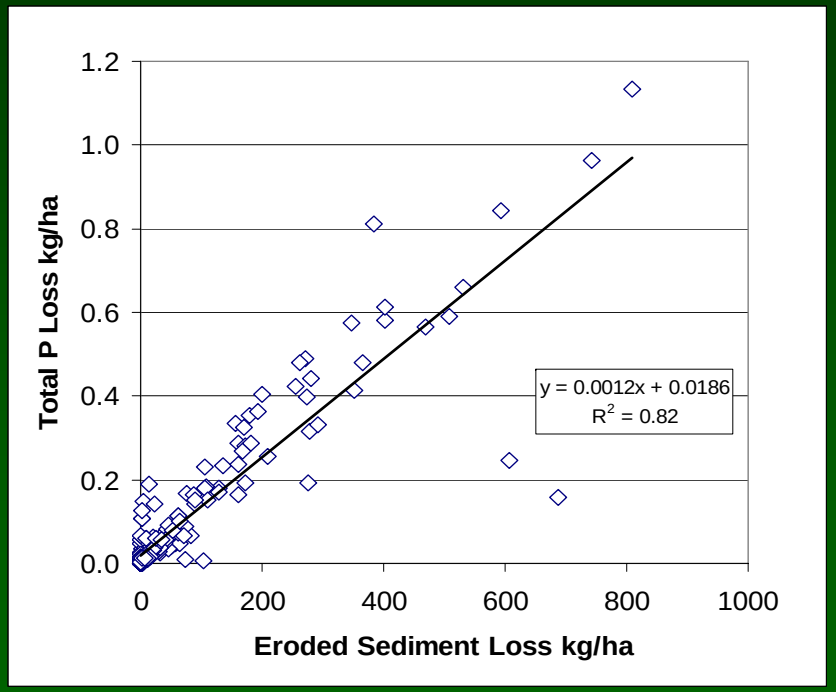


SQI = SMAF Soil Quality Index

Jokela et al., 2009

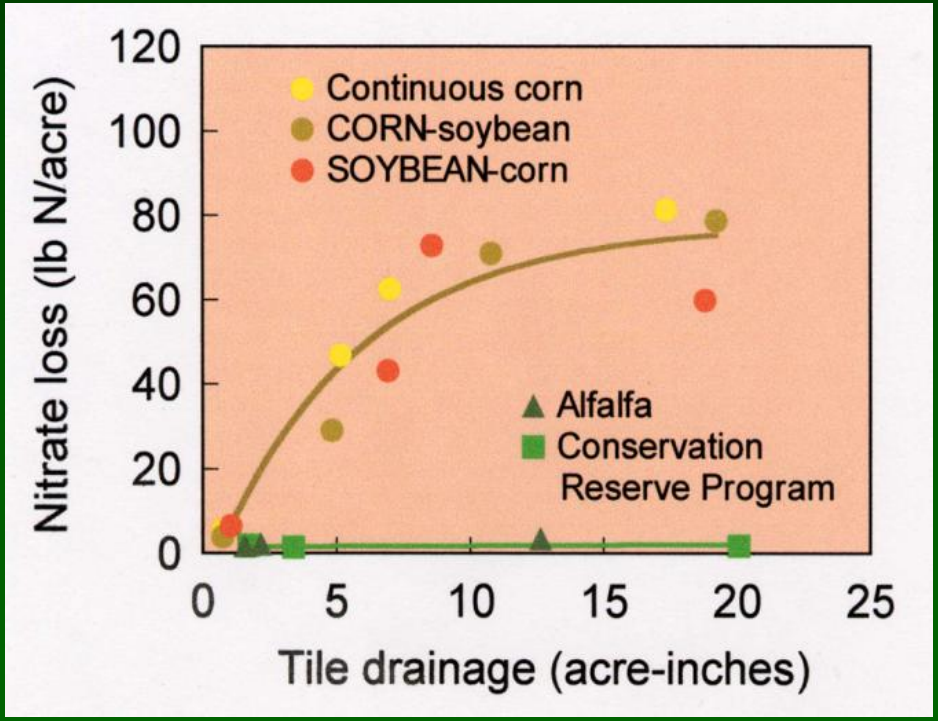
Perennial Forages and Water Quality -- Surface Runoff

- In row crop systems most P is lost with eroded sediment
- Reduced erosion with forage = lower P loss
- But…
  - Erosion in establishment year
  - Dissolved runoff P from frozen forage vegetation



Silage corn, convention tillage, Marshfield, WI. (2 events excluded). Jokela et al

Alfalfa improves surface water quality – Leaching to subsurface tile



- Alfalfa and CRP vs Corn/Corn-SB
  - Less tile discharge
  - Much lower nitrate-N concentration
  - Much reduced nitrate loss

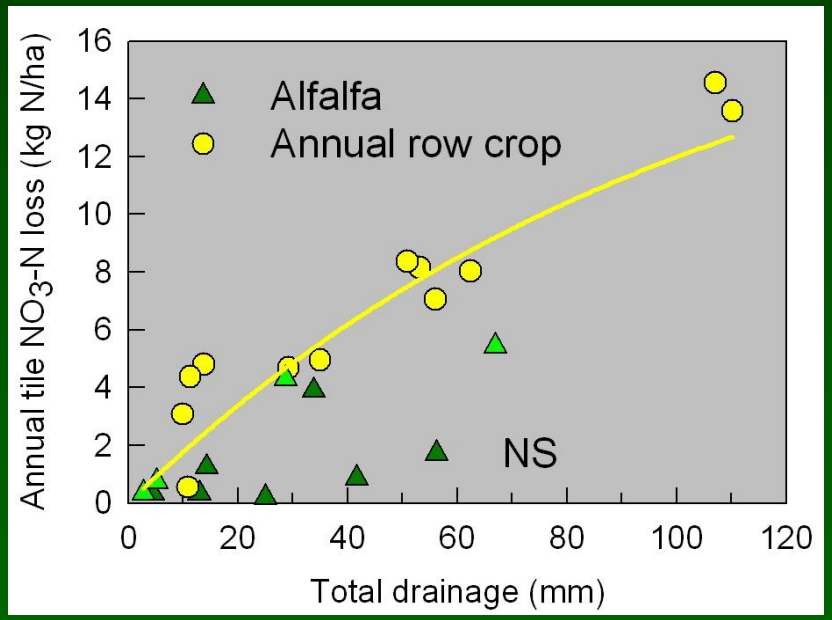
Lamberton, MN

Randall et al., 1997

How about alfalfa “waterways”?

April

October



MN; Russelle et al

PEI Dept Agric. & For.

Lynn Betts, NRCS

Alfalfa “waterways” work well with tiles at normal depths (3-4 feet)

What about manure on perennial forages?

Benefits

- Supply nutrients: P, K, micros (N on grass)
- In-season applications
- Large nutrient removal
- Limits nitrate leaching

Concerns

- Plant damage
- Soil compaction
- Pathogen and disease risk?
- Nutrient runoff
- Excessive N at stand termination if big N credit

Alternative Application Methods

- Improved N utilization
- Less contamination of forage
- Decreased nutrient runoff
- More uniform application

Benefits of perennial forages in dairy cropping systems

- Provide N credits and lower fertilizer costs
- Increase corn yields in rotation
- Reduce erosion
- Improve water quality – surface runoff and nitrate leaching
- Improve soil quality
- Additional window for manure application
- Wildlife habitat