

Cover Crops, A Bigger Picture

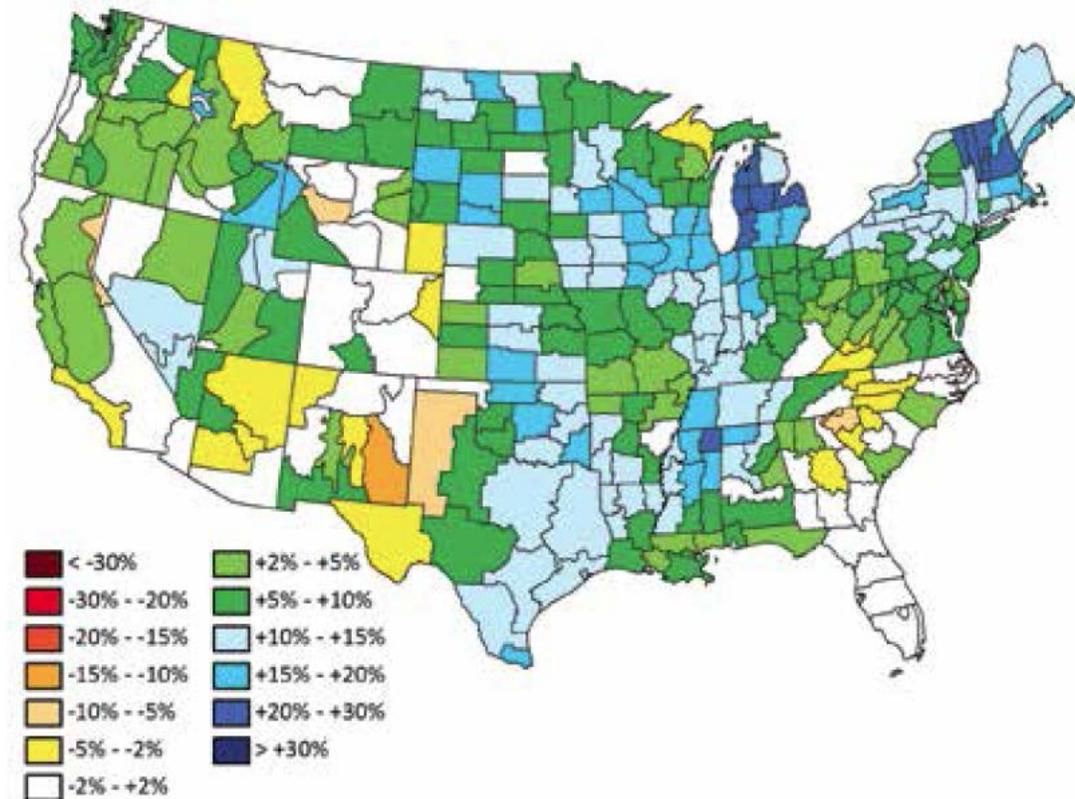
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Precipitation Shifts

- Increased fall precipitation.
- Increased precipitation intensity.
- Increased urbanization and runoff.
- River channelization.

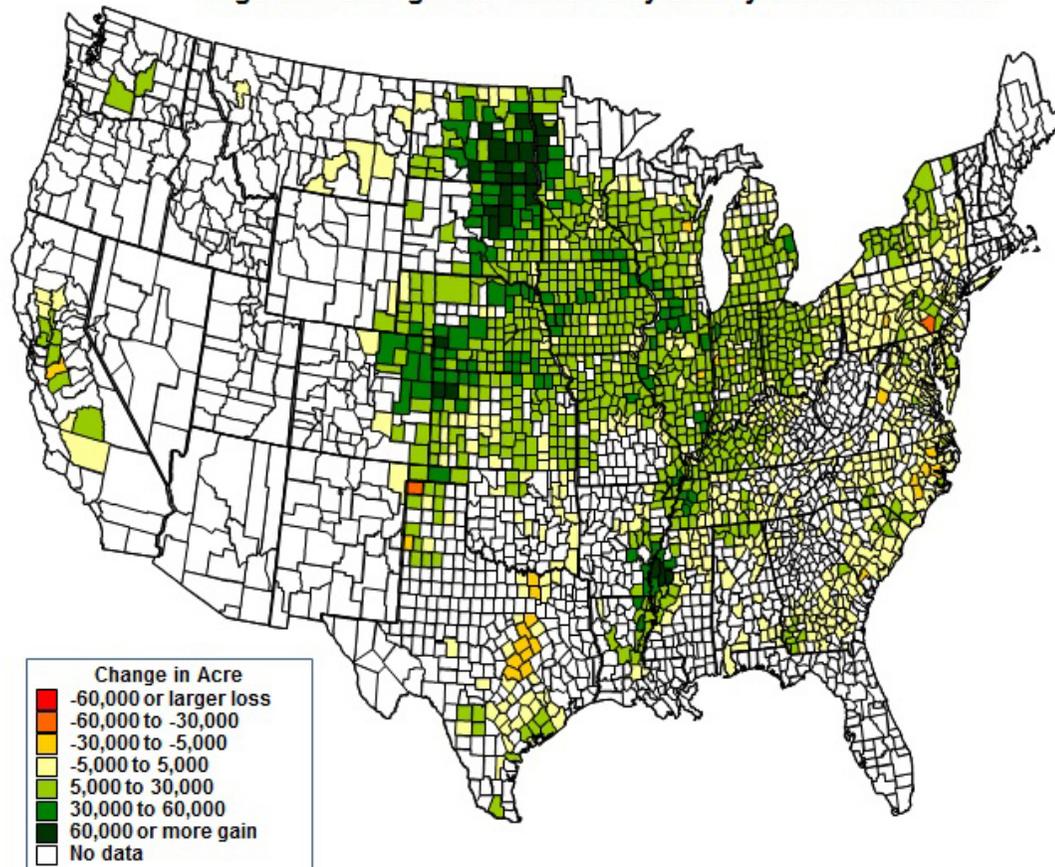
FIGURE 1 | ANNUAL PRECIPITATION BY CLIMATE DIVISION

Lineartrend changes in annual precipitation by climate division across the continental United States from 1895–2013. Values are percent changes over time. All of the Corn Belt has seen changes ranging from a few percent to 20+%. Image contributed by Brent McRoberts and John Nielsen-Gammon, Office of the State Climatologist, Texas A&M University.



Crop Production Shifts

Figure 1. Change in Corn Acres by County from 2006 to 2012.



- Precipitation shifts.
- Irrigation development.
- Crop genetic development.
- Economics.

Cost of Erosion/Runnoff

- Nutrient loss
- Sedimentation
- Water Quality
 - Algae Bloom
 - Hypoxic Zones
 - Treatment Cost



Runoff Reduction Strategies

- Infield management strategies
 - Fertilizer application changes
 - Tillage changes
 - Cover crops
- Edge of field practices
 - Field buffers
 - Wetlands
- Land use changes
 - Extended rotations
 - Transition from row crops to perennial crop

Cover Crop Benefits



- Can reduce nitrate loss by 30-60%
- Erosion reduction
- Increased infiltration.
- Runoff reduction

Spring Planting Challenges



Cost of Erosion

| Depth inches | No-Till ~ years | pH | OM % | Ib/ac | | | | |
|-----------------|--------------------|-----|---------|-------|------|-----|-----|------|
| | | | | P205 | Ca | Mg | K20 | CEC |
| 0-2 | >18 | 5.9 | 2.2 | 104.1 | 2707 | 242 | 273 | 9.5 |
| 2-4 | | 6.1 | 1.3 | 36.6 | 266 | 202 | 151 | 8.6 |
| 4-6 | | 6.2 | 1 | 17 | 2861 | 206 | 120 | 9 |
| 0-6 | | 6 | 1.6 | 63 | 3050 | 242 | 208 | 10.2 |

Summary of 2.5 acre Grid Sampling from "On Farm Research," Field located Whiteside, Lincoln County

Corn Rye Soybeans

Sediment Loss Savings by Soil (t/ac/yr)

| | | |
|--|--------|--------|
| Keswick silt loam, 5 to 9 percent slopes, eroded | 5.7107 | 3.7106 |
| Keswick silt loam, 9 to 14 percent slopes, eroded | 3.505 | 2.2565 |
| Mexico silt loam, 1 to 4 percent slopes, eroded | 3.1974 | 2.9282 |
| Bucklick silty clay loam, 5 to 9 percent slopes, eroded | 3.0562 | 1.8146 |
| Bucklick silty clay loam, 9 to 14 percent slopes, eroded | 2.0968 | 1.8943 |
| Crider silt loam, 5 to 9 percent slopes, eroded | 4.4329 | 2.7804 |
| Hatton silt loam, 2 to 5 percent slopes | 2.6426 | 2.5285 |
| Hatton silt loam, 5 to 9 percent slopes | 2.0815 | 1.8544 |

No Till System of corn/soybeans with rye cover between corn and soybeans. 2.6 tons/ac. to 1.8 tons/ac.

Sediment Loss Savings by Soil (t/ac/yr)

| | | |
|--|--------|--------|
| Keswick silt loam, 5 to 9 percent slopes, eroded | 5.7061 | 2.6459 |
| Mexico silt loam, 1 to 4 percent slopes, eroded | 2.6461 | 1.5974 |
| Bucklick silty clay loam, 5 to 9 percent slopes, eroded | 2.9956 | 1.0321 |
| Bucklick silty clay loam, 9 to 14 percent slopes, eroded | 2.6265 | 0.9828 |
| Crider silt loam, 5 to 9 percent slopes, eroded | 1.7859 | 0.8331 |
| Hatton silt loam, 2 to 5 percent slopes | 4.3769 | 1.7479 |

No Till System of corn/soybeans with rye cover after soybeans. 2.6 tons/ac. to .8 tons/ac.

Rye Suitability

- Fibrous Roots for Erosion Control
- Wide Window of Establishment
- Consistent Chemical Control
- Establishment Flexibility

Managing Rye

- Soybeans
 - Respond well to rye



- Corn
 - Can be stand issues
 - Potential Yield Loss



Broadcasting

- Early vigor in corn.
- Early September seeding time.
- Wide seeding window.



Seeding Rye

- Adaptable to drill and row unit seeding.
- Can be seeded to deeply.



Nitrogen Needs With Cover Crops

- Supplier of Nitrogen
- Timing of Nitrogen Availability



Corn Response

| | | | | | | |
|--------------------------|---------------------------|-------------------------|---|--------------------------|---------------------------|---------------------------|
| | | | NORTH  | | | |
| NO COVER 200 LBS N | CEREAL RYE 70 LBS/AC | RADISH 8 LBS/AC | CRIMSON CLOVER 15 LBS/AC | BALANSA CLOVER 4 LBS/AC | ANNUAL RYEGRASS 16 LBS/AC | NO COVER 0 LBS N |
| RADISH 8 LBS/AC | NO COVER 0 LBS N | BALANSA CLOVER 4 LBS/AC | ANNUAL RYEGRASS 16 LBS/AC | CEREAL RYE 70 LBS/AC | NO COVER 200 LBS N | CRIMSON CLOVER 15 LBS/AC |
| CEREAL RYE 70 LBS/AC | NO COVER 200 LBS N | NO COVER 0 LBS N | RADISH 8 LBS/AC | CRIMSON CLOVER 15 LBS/AC | BALANSA CLOVER 4 LBS/AC | ANNUAL RYEGRASS 16 LBS/AC |
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20 X 100 Plots
Periodic Senor Readings Summer 2015
Hand/Machine Harvest



Sensor Readings

- Greenseeker and Holland Scientific sensor
- Measures relative color and biomass.



North Plots Drilled Aug. 26, 2011

| Treatment | Mean | |
|------------------------------|-----------|----|
| Crimson Clover | 70 | A |
| Winter Oats + Crimson Clover | 79 | A |
| Winter Oats | 88 | A |
| Tillage Radish | 101 | AB |
| Control | 101 | AB |
| Forage Turnip | 104 | AB |
| Winter Oats + Austrian Peas | 113 | AB |
| Purple Top Turnip | 141 | B |
| Gulf Annual Ryegrass | 145 | B |
| LSD (P=0.01) | 52 | |



Nutrient Capture



Weed Suppression



Winter Annuals Possibly Controlled

Spring Management



Get killed in an timely manner
Soil moisture management
Nitrogen management

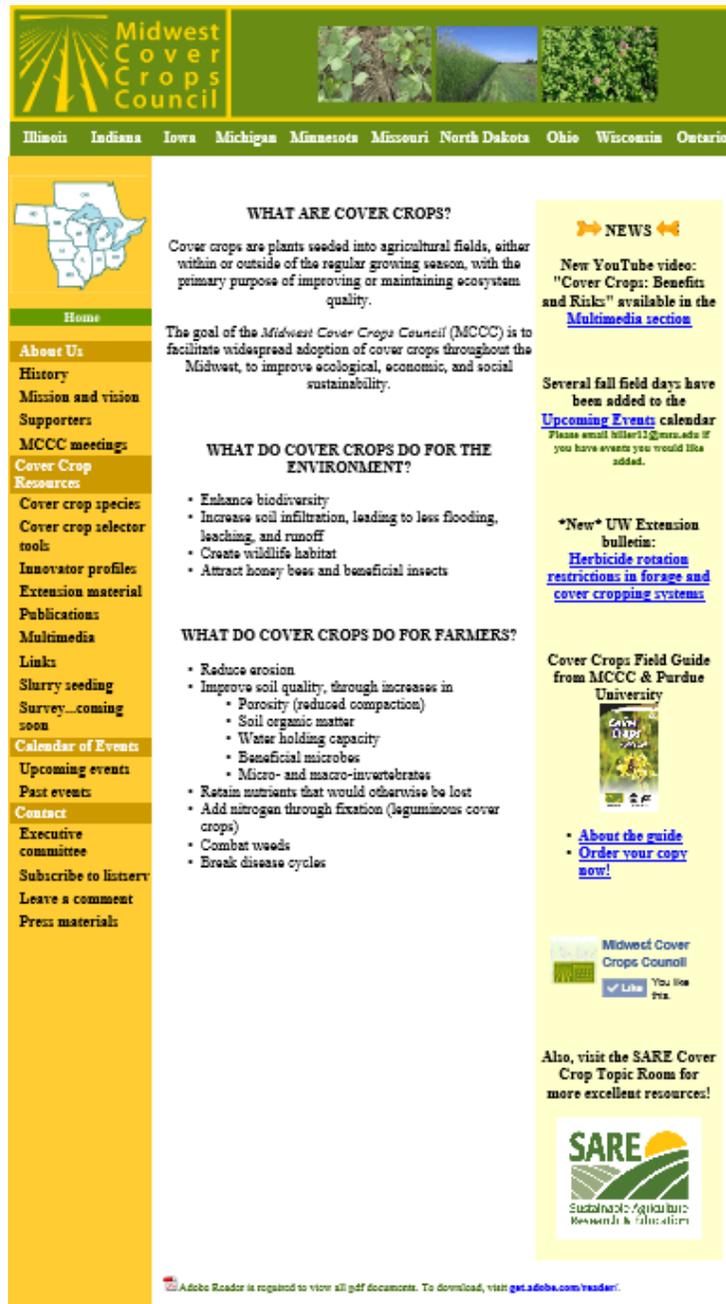
Potential Weed?





The screenshot shows the SARE website homepage. At the top left is the SARE logo with the tagline 'Sustainable Agriculture Research & Education'. Below it is a navigation menu with links for Grants, Project Reports, Learning Center, Professional Development, State Programs, Events, Newsroom, and About SARE. A search bar is located on the right. The main content area features a large image of a field with a headline for the 'National Conference on Cover Crops and Soil Health'. Below this are sections for 'Regional News' (listing North Central, Southern, Western, and Northeast SARE), 'What is Sustainable Agriculture?' with a definition and goals, 'Spotlight' (highlighting 'Hable Español?' and 'Sustainable Pest Management'), and 'From the Field' (highlighting 'Fair Trade Strategy for Northeast "Eco-Growers"'). A map of the United States is also visible, color-coded by region.

- SARE
 - Educational Materials
 - Grant Opportunities
 - Educational Meetings
 - State level programs



The screenshot shows the website for the Midwest Cover Crops Council. At the top, there is a navigation bar with state names: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, North Dakota, Ohio, Wisconsin, and Ontario. Below this is a map of the Midwest region. The main content area is divided into three columns. The left column contains a sidebar with various links such as 'Home', 'About Us', 'History', 'Mission and vision', 'Supporters', 'MCCC meetings', 'Cover Crop Resources', 'Cover crop species', 'Cover crop selector tools', 'Innovator profiles', 'Extension material', 'Publications', 'Multimedia', 'Links', 'Slurry seeding', 'Survey...coming soon', 'Calendar of Events', 'Upcoming events', 'Past events', 'Contact', 'Executive committee', 'Subscribe to listserv', 'Leave a comment', and 'Press materials'. The middle column features three sections: 'WHAT ARE COVER CROPS?' with a definition and the council's goal; 'WHAT DO COVER CROPS DO FOR THE ENVIRONMENT?' with a list of benefits like enhanced biodiversity and soil infiltration; and 'WHAT DO COVER CROPS DO FOR FARMERS?' with a list of benefits like reduced erosion and improved soil quality. The right column is a 'NEWS' section with updates on a new YouTube video, an upcoming events calendar, and a new UW Extension bulletin about herbicide rotation restrictions. At the bottom, there is a link to a 'Cover Crops Field Guide from MCCC & Purdue University' and a social media 'Like' button for the Midwest Cover Crops Council. A SARE logo is also present at the bottom right of the page.

- Midwest Cover Crop Council
 - Selector Tool
 - Cover Crop Species
 - Publications

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