Evaluating NRCS Water Conservation Practice Impacts over the Ogallala Aquifer

Toward Sustainable Groundwater in Agriculture: An International Groundwater Conference
Burlingame CA
June 30, 2016
Noel Gollehon, NRCS

Irrigated acres location, 2012

United States Department of Agriculture
Natural Resources Conservation Service

Area of Ogallala Aquifer acres

United States Department of Agriculture
Natural Resources Conservation Service

Location of Ogallala Aquifer

Location of the Ogallala High Plains Aquifer showing the aquifer boundary, major cities and roads, and altitude of land surface

United States Department of Agriculture
Natural Resources Conservation Service

Saturated Thickness of the Ogallala Aquifer, 2009

Saturation thickness, in feet

Source: US Geological Survey

Water level changes in the Ogallala Aquifer, Predevelopment to 2013

- By well, range from a rise of 85 feet to a decline of 256 feet
- Area-weighted average was a decline of 15.4 feet
- Area-weighted average was a decline of 2.1 foot from 2011–13
- Total aquifer storage in 2013 was about 2.92 billion acre-feet
- Change in water in storage, PD to 2013, was a decline of 266.7 million acre-feet

United States Department of Agriculture
Natural Resources Conservation Service

Source: US Geological Survey
Importance of Groundwater in Ogallala Area

<table>
<thead>
<tr>
<th>State</th>
<th>Total freshwater withdrawals (mgd)</th>
<th>Groundwater share of total</th>
<th>Agriculture</th>
<th>Ag GW share of total</th>
<th>GW share of Ag</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>2,117</td>
<td>36%</td>
<td>93%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>KS</td>
<td>3,250</td>
<td>94%</td>
<td>91%</td>
<td>87%</td>
<td>95%</td>
</tr>
<tr>
<td>NE</td>
<td>6,897</td>
<td>67%</td>
<td>82%</td>
<td>62%</td>
<td>76%</td>
</tr>
<tr>
<td>NM</td>
<td>1,132</td>
<td>84%</td>
<td>91%</td>
<td>75%</td>
<td>83%</td>
</tr>
<tr>
<td>OK</td>
<td>368</td>
<td>97%</td>
<td>87%</td>
<td>85%</td>
<td>98%</td>
</tr>
<tr>
<td>SD</td>
<td>88</td>
<td>80%</td>
<td>88%</td>
<td>75%</td>
<td>85%</td>
</tr>
<tr>
<td>TX</td>
<td>4,277</td>
<td>98%</td>
<td>93%</td>
<td>92%</td>
<td>99%</td>
</tr>
<tr>
<td>WY</td>
<td>1,394</td>
<td>28%</td>
<td>95%</td>
<td>26%</td>
<td>28%</td>
</tr>
<tr>
<td>Total</td>
<td>19,523</td>
<td>74%</td>
<td>89%</td>
<td>68%</td>
<td>77%</td>
</tr>
</tbody>
</table>

NRCS role in Ogallala Aquifer Area

NRCS provides technical and financial assistance to farm and ranch operators to improve resource conditions on their operation

- All voluntary participation
- Wide spectrum of resources addressed:
  - Water quantity and quality,
  - Soil loss from water and wind,
  - Soil quality,
  - Wildlife habitat,
  - Air quality.

Applicable NRCS Practices

NRCS delivers assistance via practices

- Each practice is applied according to a "practice standard"
- Management and Technology Practices
  # 590 – Irrigation Water Management
  # 441 – Micro-Irrigation Systems
  # 442 – Sprinkler Irrigation Systems
- Cropping System Adjustment Practices
  # 328 – Conservation Crop Rotation
  # 512 – Forage and Grassland Planting
  # 528 – Prescribed Grazing
  # 645 – Upland Wildlife Habitat

Method to estimate water quantity impacts from NRCS practices

1. Estimates of reduced water applications associated with each practice were developed by State-level NRCS water management engineers
2. Administrative data was used to identify the practices applied in counties over the Ogallala High Plains Aquifer from 2009-2015
3. Reduced water applications, area of practice application, and Federal financial assistance were calculated for each practice application
4. Data were summed to the state or region level for presentation

Water application reductions

- Management and Technology Practices
  # 590 – Irrigation Water Management
  States ranged from 1.2 to 4.0 inches per acre
  # 441 – Micro-Irrigation Systems
  States ranged from 4.0 to 7.5 inches per acre
  # 442 – Sprinkler Irrigation Systems
  States ranged from 3.0 to 6.5 inches per acre
Water application reductions

- Cropping System Adjustment Practices
  - # 328 – Conservation Crop Rotation
    States ranged from 7.0 to 23.0 inches per acre
  - # 512 – Forage and Grassland Planting
  - # 528 – Prescribed Grazing
  - # 645 – Upland Wildlife Habitat
    States ranged from 9.0 to 24.0 inches per acre

Two funding pools

- Just to complicate, two funding pools:
  - General EQIP
    Environmental Quality Incentives Program
    Voluntary program open to all eligible producers
    Over 160 available practices including irrigation technology and management
  - Ogallala Aquifer Incentives Program (OAI)
    A subset of EQIP targeted to producers over the Ogallala aquifer
    Voluntary program open to all eligible producers
    Practices focus on irrigation technology and management and cropping system adjustments to reduce groundwater pumping

Application: Irrigation Technology and Management

- General EQIP = 4,361
  - Micro-irrigation Technology: 1,159
  - Sprinkler irrigation Technology: 1,207
  - Improved Irrigation Management: 1,005
- OAI = 1,760
  - Micro-irrigation Technology: 155
  - Sprinkler irrigation Technology: 334
  - Improved Irrigation Management: 271
- Total = 6,121

Water Reduction: Irrigation Technology and Management

- General EQIP = 519,000 af
  - Micro-irrigation Technology: 102,000 af
  - Sprinkler irrigation Technology: 148,000 af
  - Improved Irrigation Management: 271,000 af
- OAI = 199,000 af
  - Micro-irrigation Technology: 15,000 af
  - Sprinkler irrigation Technology: 34,000 af
  - Improved Irrigation Management: 150,000 af
- Total = 717,000 af

Federal Obligations: Irrigation Technology and Management

- General EQIP = 78.6 m$
  - Micro-irrigation Technology: 56.4%
  - Sprinkler irrigation Technology: 26.5%
  - Improved Irrigation Management: 16.4%
- OAI = 43.5 m$
  - Micro-irrigation Technology: 19.9%
  - Sprinkler irrigation Technology: 22.0%
  - Improved Irrigation Management: 56.1%
- Total = 122.7 m$
  - Micro-irrigation Technology: 76.3%
  - Sprinkler irrigation Technology: 48.5%
  - Improved Irrigation Management: 25.2%

Cropping System Adjustments

- OAI = 741 Applications
  - Cropping Continues: 662
  - Grassland Conversion: 79
- OAI = 64,500 af Water reductions
  - Cropping Continues: 34.6
  - Grassland Conversion: 29.9
- OAI = 9 m$
  - Cropping Continues: 1.6
  - Grassland Conversion: 7.4

Source: USDA, NRCS based analysis of Administrative data
NRCS activities $/acre foot

Federal obligation per acre foot of reduced water

<table>
<thead>
<tr>
<th>NRCS Program</th>
<th>General EQIP</th>
<th>OAI</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/acre-foot</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>600</td>
</tr>
</tbody>
</table>

- Mico-irrigation
- Sprinkler
- Management
- Cropping Continues
- Grassland Conversion

Summary of NRCS in Ogallala Area

- NRCS provides assistance for water conservation
- Programs are voluntary
- Programs have reduced water applications
  - Cumulative total of about 780,000 acre-feet from 09-15
  - Federal cost of $131 million
  - Federal cost of $167 per acre-foot without considering future water reductions from current actions
- Effectiveness of the effort?
  - Reductions account for a small portion of annual groundwater withdrawals (<1%)
  - Addresses other resource concerns and social objectives

United States Department of Agriculture
Natural Resources Conservation Service