The Western Water Use Management Model (WWUMM) is the most important tool that NPNRD uses to make management decisions by determining whether we are at a deficit level of irrigation.

- Almost exclusively based on collection of actual land use data (from aerial imagery and field level inspections)
- Collection of pumping data
- Climate data
WWUMM is used to determine whether an incentive-based program will be advantageous to meeting our goals and obligations under the Integrated Management Plan

- Leases
- Retirements
- Recharge Facilities
- Allocation Buy Downs
- Cost-share investments
Allocations

Allocations are far and away the most beneficial to meeting our goals, and have, arguably, made agriculture in this District more efficient, and thereby more profitable through the reduction of pumping costs.

This more efficient application of water including more efficient timing of irrigation has also improved yields.
Allocations – The Hub of NPNRD Regulations

- Drought Planning
- Creative Management Solutions
- On-Farm Irrigation Efficiencies
- Regulatory Incentive
- Enhanced Streamflow
- Consumptive Use Credits
- Scientific Research and Modeling
- Cost-Share Programs
- Property Tax Expenditures
First IMP Increment Allocation Design

• 2008 COHYST Analyses
  • Established that NPNRD had 8,000 Acre-Feet of Post-1997 Depletions
  • Determined overall NPNRD crop mix net irrigation requirement (NIR) or irrigation consumptive use
    • 15 Acre-Inches / Acre

• Post-1997 Depletions Mitigation
  • Place a 14 Acre-Inch / Acre pumping limit on all ground water irrigated lands
  • Goal to reduce crop consumptive use by 1 Acre-Inch / Acre
  • Estimated to make up the 8,000 acre-feet per acre

• Management Style Unique in Platte Basin
Beyond COHYST

• Enter **Western Water Use Management Modeling**

  • Highly data driven modeling

  • Extensive land use dataset with multiple data sources creating a robust understanding of water use

  • Integration of the metered data into modeling
    • Unique in Platte Basin

  • Used as a decision support tool for NPNRD and DNR
Land Use Dataset Information
Change Modeling Discussion
Change Modeling Discussion

- Modeling Design
  - Baseline Model
    - Typically the historic model with everything that actually happened
  - Modified Model
    - Modify one feature of the model
    - Example: Remove irrigated lands from the model to determine the depletive affects
- Analysis
  - Baseline Model – Modified Model = Change
  - Change is typically streamflow or baseflow
Unit Response Functions
Unit Response Functions

• Determine accretive impacts from retiring ground water irrigated acres, similar to depletion zone in the COHYST model

• Used for Evaluation of Incentive Based Programs (EPIC)
Figure 2: Retirement Analysis

Annual Change in Stream Baseflow (dimensionless)
Allocation Analysis
Allocation Analysis

• Generalized Concept
  • Determine the effectiveness of NPNRD’s allocations at reducing consumptive use and depletions

• Comparison of:
  • Metered Pumping from NPNRD
    • Actual pumping at each farm
  • Modeled Pumping created through WWUM Modeling
    • Pumping at the full consumptive use of the crops for the groundwater only lands

• IMPORTANT We assumed no benefit from allocations on commingled lands due to dual sources of water
Allocation Analysis

• Generalized Concept
  • Comparison (cont.):
    • Completed by comparing two ground water model runs
    • Repeat recharge and pumping from 2009 through 2013 for 50 years into the future to provide a planning information for the District
NPNRD Corn Only Lands
Metered CU vs. Modeled CU

<table>
<thead>
<tr>
<th>Year</th>
<th>Metered Corn Acre-Inches/Acre</th>
<th>Modeled Corn Consumptive Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>10.67</td>
<td>10.67</td>
</tr>
<tr>
<td>2010</td>
<td>11.38</td>
<td>11.38</td>
</tr>
<tr>
<td>2011</td>
<td>12.25</td>
<td>12.25</td>
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<tr>
<td>2012</td>
<td>12.09</td>
<td>20.14</td>
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<tr>
<td>2013</td>
<td>10.58</td>
<td>21.84</td>
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<td>2014</td>
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<tr>
<td>2015</td>
<td>15.16</td>
<td>15.16</td>
</tr>
</tbody>
</table>
NPNRD Alfalfa Only Lands
Metered CU vs. Modeled CU

Acre-Inches/Acre

Metered Alfalfa Consumptive Use
Adjusted Modeled Alfalfa Consumptive Use

Year | Metered CU | Adjusted Modeled CU
--- | --- | ---
2009 | 10.45 | 17.46
2010 | 10.98 | 17.04
2011 | 12.45 | 19.92
2012 | 22.98 | 36.57
2013 | 15.79 | 25.39
NPNRD Small Grains Only Lands
Metered CU vs. Modeled CU

Acre-Inches/Acre

- 2009: 6.14
- 2010: 6.11
- 2011: 6.70
- 2012: 17.85
- 2013: 12.47

- 2009: 6.14
- 2010: 8.80
- 2011: 6.56
- 2012: 20.12
- 2013: 9.78

Bar chart showing metered small grains consumptive use and adjusted modeled small grains consumptive use from 2009 to 2013.
Platte Basin Depletions
Growth In Depletions

BACKGROUND: The First Increment of the Upper Platte basin-wide plan was adopted in 2009. It is a requirement that a technical analysis of the first basin-wide plan must occur in the ten years following its adoption. This technical analysis is needed to determine the path forward in order to achieve the goals and objectives set for the plan. First Increment efforts also worked to establish the overall difference between current and fully appropriated levels of development.

SECOND INCREMENT

The Single Planning Group will help define the progress towards fully appropriated conditions to be made during the second increment.

16,880 AF
Starting point for Second Increment
(mitigation of 16,880 AF of depletions from post 1997 uses required in first increment)

Range of estimated depletions offset benefits of first increment actions (43,600 AF to 126,170 AF)

SUPPLY & DEMAND BALANCE

The Single Planning Group will help define the progress towards fully appropriated conditions to be made during the second increment. The scale below shows values taken from the Basin-Wide Supply and Demand Analysis.

-858,080 AF
SW, GW, M&I uses only
-225,860 AF
Net Surface Water Loss*
+181,600 AF
Net Surface Water Loss
-45,380 AF
Net Surface Water Loss + Instream Flow Demands*
-959,630 AF
Net Surface Water Loss + Hydropower Demands*

* All figures reflect the average annual difference when comparing supplies with Surface Water (SW), Ground Water (GW), and Municipal and Industrial (M&I) consumptive uses.
North Platte NRD
Potential Depletions
Moving Forward
NPNRD Total Depletions
Groundwater Depletions Resulting from GW Only Wells

![Graph showing NPNRD Total Depletions with Year from 1950 to 2050, showing the level of development from 1997 and the current level of development.](image-url)
Total Depletions

GW Only

Total Pumping and Depletions with Commingled Wells
Thanks!

• Questions
• Comments